Series

1

INTRODUCTION

A series is a sequence of letters, numbers, words, or objects that are arranged in a certain way. This arrangement follows specific patterns or rules. These can be patterns with numbers, letters, or both together.

Learning about series is important because it teaches us how to arrange things in order. It also helps us spot any mistakes or things that don't fit in the sequence. Understanding series is crucial for you as it familiarises you with the structured way of organising things in a particular order. It also helps identify irregularities or flaws in a series that disrupts its organisation.

In this chapter, we will cover three types of series, which will have further subtypes:

I. **Number series**
II. **Alphabetical series**
III. **Alphanumeric series**

I. NUMBER SERIES

In this section, we deal with the questions in which a series of numbers (generally called the terms of the series) is given. These terms follow a certain pattern throughout the series. Basically, the following patterns can be asked in the exam:

SERIES BASED ON ADDITION AND SUBTRACTION

In an addition and subtraction series, each number in the sequence is linked to the previous one through a simple rule of adding or subtracting a fixed amount. For example, if we start with a number and consistently add the same number to it, we get a series like 2, 5, 8, 11, where we're adding 3 each time. Alternatively, if we subtract a number each time, like starting with 10 and subtracting 2, we get 10, 8, 6, 4, and so on. This kind of series is easy to understand and solve once we know the amount being added or subtracted.

EXAMPLES

E1. What is the value of X in the given series:
4, 5, 8, 13, 20, 29, X ?

(a) 38 (b) 40
(c) 42 (d) 39

Ans: (b)

Explanation:

Here, 4 (+1) 5 (+3) 8 (+5) 13 (+7) 20 (+9) 29

+2

We can clearly see the pattern by the diagram

So the difference between X and 29 should be 11

Hence X = 29 + 11 = 40

E2. Find the odd one out in the following series:
197, 165, 131, 97, 57

(a) 165 (b) 131
(c) 97 (d) 51

Ans: (c)

Explanation:

Here,

1st term = 197

2nd term = 197 - 32 = 165

3rd term = 165 - 34 = 131

4th term should be 131 - 36 = 95

But, in the given series the 4th term is 97 Hence, 97 doesn't follow the pattern of the series.

SERIES BASED ON MULTIPLICATION AND DIVISION

In a series based on multiplication and division, each term in the sequence is connected to the previous one through either multiplying or dividing by a certain number. For instance, if we start with a number and continuously multiply it by the same number, like starting with 2 and multiplying by 3 each time, we get a series like 2, 6, 18, 54, and so on. Conversely, if we divide by a fixed number each time, such as starting with 100 and dividing by 2, the series would be 100, 50, 25, 12.5, etc.

EXAMPLES

E3. What is the missing term in the given series: 32, 48, 120, ?, 450, 675

(a) 150 (b) 180

(c) 210 (d) 275

Ans: (b)

Explanation:

Here, 1st term = 32

2nd term = 32 × **1.5** = 48

3rd term = 48 × **2.5** = 120

4th term = X (lets say)

5th term = 180 × **2.5** = 180

6th term = 450 × **1.5** = 675

Observe that the terms of series are 1.5 and 2.5 times multiple of previous term alternatively.

Hence, the 4th term should be 120 × 1.5 = 180.

E4. Consider the following matrix:

51	60	75	84	93	102
19	23	29	31	37	41

Which number is wrongly placed in the matrix?

(a) 84 (b) 41

(c) 75 (d) 60

Ans: (a)

Explanation:

Consider the 1st column and 1st row, 51 = (19 – 2) × 3

Now, 2nd column and 1st row, 60 = (23 – 3) × 3

Now, 3rd column and 1st row, 75 = (29 – 4) × 3

Now, 4th column and 1st row, 84 ≠ (31 – 5) × 3

Now,5th column and 1st row, 93 = (37 – 6) × 3

Now, 6th column and 1st row, 102 = (41 – 7) × 3

Hence, 84 is wrongly placed and it should be replaced by (31 – 5) × 3 i.e. 78.

SERIES BASED ON PRIME NUMBERS

In a prime number series, the sequence involves operations like addition, subtraction, multiplication, or division using prime numbers. This series can be a bit more complex as it involves either performing arithmetic operations on prime numbers themselves or using prime numbers as the basis for operations on other numbers. **For example,** a series might progress by adding consecutive prime numbers (like 2, 3, 5, 7, etc.) to a starting number. Alternatively, the series might be the prime numbers themselves being multiplied or divided in some pattern. Understanding these prime number-based patterns is essential, especially in exams where quickly deciphering such sequences can make a significant difference.

EXAMPLES

E5. What is the value of X in the given series:

7, 14, 42, 210, 1470, X

(a) 16170 (b) 13230

(c) 10290 (d) 19110

Ans: (a)

Explanation:

Here, 1st term = 7

2nd term = 7 × 2 = 14

3rd term = 14 × 3 = 42

4th term = 42 × 5 = 210

5th term = 210 × 7 = 1470

You can observe that 2, 3, 5, 7 are the consecutive prime numbers and the next prime number is 11.

Therefore, 6th term = X = 1470 × 11 = 16170.

E6. Find the odd one out in the following series:

27, 38, 51, 66, 87, 110

(a) 38 (b) 66

(c) 51 (d) 87

Ans: (b)

Explanation:

Here, 1st term = 27

2nd term = 27 + 11 (prime) = 38

3rd term = 38 + 13 (next prime) = 51

Hence next term should be 51 + 17 (next prime) = 68, but in the given series the 4th term is 66.

Also, the next term is 68 + 19 = 87 and the last term = 87 + 23 = 110.

Hence, 66 is the odd one out.

Note:

Don't get confused by the 1st four terms as they are at a difference of 11, 13, and 15, respectively, and the next difference is 21, so 87 is an odd one. Check all the terms of the series.

SERIES BASED ON ADDITION/ SUBTRACTION OF SQUARES OR CUBES OF NUMBERS

In a series based on squares or cubes of numbers, we create each term by adding or subtracting the square or cube of a number, following a specific pattern. **For example,** if we start with a number and keep adding the square of another number (like 1, 2, 3, 4) to it, the series might look like 3 ($2+1^2$), 7 ($3+2^2$), 16 ($7+3^2$), 30 ($14+4^2$), and so on. Or, if we subtract the cube of a number each time from a starting number, the series could be something like 101, 100 ($101-1^3$), 92 ($100-2^3$), 65 ($92-3^3$), and so on. This kind of series is a bit more complex but becomes easier once we understand how the squares or cubes are being used in the pattern. It's a useful concept for solving problems in exams, where spotting and understanding such patterns can be very helpful.

EXAMPLES

E7. What is the missing term in the given series:
3, 4, 8, 17, 33, ?,

(a) 55 (b) 58
(c) 64 (d) 56

Ans: (b)

Explanation:

Here, 1st term = 3

2nd term = $3 + 1^2 = 3 + 1 = 4$

3rd term = $4 + 2^2 = 4 + 4 = 8$

4th term = $8 + 3^2 = 8 + 9 = 17$

5th term = $17 + 4^2 = 17 + 16 = 33$.

Hence, the next term or 6th term

$= 33 + 5^2 = 33 + 25 = 58$

E8. What is the next term in the given series?
226, 101, 37, 10, 2, ?

(a) –2 (b) 1
(c) –1 (d) 0

Ans: (b)

Explanation:

Here 1st term = 226

2nd term = $226 - 5^3 = 226 - 125 = 101$

3rd term = $101 - 4^3 = 101 - 64 = 37$

4th term = $37 - 3^3 = 37 - 27 = 10$

5th term = $10 - 2^3 = 10 - 8 = 2$.

Hence the next term should be $2 - 1^3 = 2 - 1 = 1$

E9. What is X in the sequence
4, 196, 16, 144, 36, 100, 64, X?

(a) 48 (b) 64
(c) 125 (d) 256

Ans: (b)

Explanation:

We can observe from the given series: 4, 196, 16, 144, 36, 100, 64, X

Odd Number Place	Even Number Place
$4 = 2^2$	$196 = 14^2$
$16 = 4^2$	$144 = 12^2$
$36 = 6^2$	$100 = 10^2$
$64 = 8^2$	$X = 8^2 = 64$

MISCELLANEOUS SERIES

Mixture/Miscellaneous series refers to a sequence of elements that follows a specific, but often complex, pattern. The challenge in these types of questions is to identify the underlying patterns that govern the series.

EXAMPLES

E10. What is the value of X in the given series?
5, 11, 30, 87, X, 601

(a) 226 (b) 228
(c) 238 (d) 240

Ans: (c)

Explanation:

The given series is 5, 11, 30, 87, X, 601

We observe the following pattern,

$11 = 5 \times 2 + 1^3$

$30 = 11 \times 2 + 2^3$

$87 = 30 \times 2 + 3^3$

Similarly, $X = 87 \times 2 + 4^3 = 238$

$601 = 238 \times 2 + 5^3$

E11. What is the wrong number in the given series:
14, 6, 5, 6.5, 12, 28, 86

(a) 5 (b) 86
(c) 6.5 (d) 28

Ans: (d)

Explanation:

We observe the following pattern,

1st term of the series = 14

2nd term of the series = $14 \times 0.5 - 1 = 6$

3rd term of the series = $6 \times 1 - 1 = 5$

4th term of the series = $5 \times 1.5 - 1 = 6.5$

5th term of the series = $6.5 \times 2 - 1 = 12$

Similarly, the **6th term of the series**
= 12 × 2.5 – 1 = 29, but in the series it is 28.

E12. Find the wrong term in the given series.

2000, 976, 720, 656, 640, 637, 635

(a) 976 (b) 656

(c) 637 (d) 635

Ans: (c)

Explanation:

By observing the following series,

$2000 - 976 = 1024 = 4^5$

$976 - 720 = 256 = 4^4$

$720 - 656 = 64 = 4^3$

$656 - 640 = 16 = 4^2$

Similarly, the next term should be

$640 - 4^1 = 640 - 4 = 636$ and not 637

$636 - 635 = 1 = 4^0$

So, the wrong term in the series is 637.

TYPES OF QUESTIONS

Now on the basis of patterns we discussed there are basically 5 types of questions that are asked in the exams.

TYPE 1: TO FIND THE MISSING TERM OF THE SERIES.

We are given a series of numbers, including one or more missing terms. This series follows a certain pattern. By identifying that pattern, we need to find the missing term.

QUESTIONS

Q1. What is the value of X in the sequence

20, 10, 10, 15, 30, 75, X? **(UPSC CSAT 2022)**

(a) 105 (b) 120

(c) 150 (d) 225

Ans: (d)

Explanation:

The given series is: 20, 10, 10, 15, 30, 75, X and we need to find the value of X

By observing the given sequence we can find the pattern as shown in figure given below:

20 , 10 , 10 , 15 , 30 , 75 , X

× 0.5 × 1 × 1.5 × 2 × 2.5 × 3

Hence, $X = 3 \times 75 = 225$

Q2. What is the value of X in the sequence

2, 12, 36, 80, 150, X? **(UPSC CSAT 2022)**

(a) 248 (b) 252

(c) 258 (d) 262

Ans: (b)

Explanation:

Given sequence is: 2, 12, 36, 80, 150, X

We need to find the value of X

For this we will make a table of differences

Term	1st diff	2nd diff	3rd diff
2	12 – 2 = 10	14	6
12	36 – 12 = 24	20	6
36	80 – 36 = 44	26	X – 246
80	150 – 80 = 70	X – 220	
150	X – 150		
X			

Here, we observe that 3rd difference of the terms = 6

So, X – 246 = 6

Hence, X = 252

Q3. What is the missing number 'X' of the series

7, X, 21, 31, 43? **(UPSC CSAT 2015)**

(a) 11 (b) 12

(c) 13 (d) 14

Ans: (c)

Explanation:

Given series = 7, X, 21, 31, 43

To find the value of X

We will find the difference between the consecutive numbers as shown in the figure given below:

7 , × , 21 , 31 , 43

+6 +8 +10 +12

Then the difference between x and 21 should be 8.

X = 21 – 8 = 13

Q4. What is X in the sequence

132, 129, 124, 117, 106, 93, X? **(UPSC CSAT 2019)**

(a) 74 (b) 75

(c) 76 (d) 77

Ans: (c)

Explanation:

The given sequence: 132, 129, 124, 117, 106, 93, X

We analyzed the following pattern:

132 – 129 = 3

129 – 124 = 5

124 – 117 = 7

117 – 106 = 11

106 – 93 = 13

We can infer that 3, 5, 7, 11 and 13 are consecutive prime numbers.

So, the next prime number after 13 would be 17

93 – X = 17

X = 93 – 17 = 76

Q5. A simple mathematical operation in each number of sequence 14, 18, 20, 24, 30, 32... results in a sequence with respect to prime numbers. Which one of the following is the next number in the sequence? **(UPSC CSAT 2020)**

(a) 34 (b) 36

(c) 38 (d) 40

Ans: (c)

Explanation:

We can get a pattern in the sequence as:

14 = 13 + 1

18 = 17 + 1

20 = 19 + 1

24 = 23 + 1

30 = 29 + 1

32 = 31 + 1

This is sequence of prime numbers starts from : 13, 17, 19, 23, 29, 31,

Now the next term of sequence will be next prime number that is: 37

Hence next term of our original sequence is

37 +1 = 38

TYPE 2: TO FIND THE ODD ONE OUT

In these types of questions every term of a series except one term or one group follows a certain pattern and you will have to find that odd term or group.

QUESTIONS

Q6. Find the odd one from the following series:

83, 87, 89, 97, 101

(a) 87 (b) 83

(c) 97 (d) 101

Ans: (a)

Explanation:

Here, we can observe that 83, 89, 97 and 101 are prime numbers but 87 is not a prime number.

87 = 3 x 29, hence a composite number.

Q7. Replace the incorrect term by correct term in the given sequence

3, 2, 7, 4, 13, 10, 21, 18, 31, 28, 43, 40

where odd terms and even terms follow the same pattern. **(UPSC CSAT 2021)**

(a) 0 (b) 1

(c) 3 (d) 6

Ans: (a)

Explanation:

Consider the odd series:

3 + 4 = 7

7 + 6 = 13

13 + 8 = 21

21 + 10 = 31

31 + 12 = 43

Similarly consider the even series:

0 + 4 = 4

4 + 6 = 10

10 + 8 = 18

18 + 10 = 28

28 + 12 = 40

Hence, The first term should be 0 instead of 2 in even series.

Q8. Choose the group which is different from the others: **(UPSC CSAT 2023)**

(a) 17, 37, 47, 97 (b) 31, 41, 53, 67

(c) 71, 73, 79, 83 (d) 83, 89, 91, 97

Ans: (d)

Explanation:

2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67, 71, 73, 79, 83, 89, 97 are the prime numbers between 1 to 100.

We can observe that all the numbers in options (a), (b), and (c) are prime numbers.

However, Number 91 in option (d) is a composite number.

As, 91 = 13 × 7.

Hence, Group (d) is different from the others.

TYPE 3: TO FIND THE NTH TERM OF THE SERIES

In this type of question a series of numbers will be given to us and you are asked to find a specific term of that series like the 100^{th} term or 1000^{th} term etc.

QUESTIONS

Q9. Find the 100th term of the given series:

1, 3, 5, 7, 9, 11....

(a) 103 (b) 198

(c) 199 (d) 201

Ans: (c)

Explanation:

This sequence follows a pattern that nth term is 2n – 1

1st term of series = 1 = 2 × 1 – 1

2nd term of the series = 3 = 2 × 2 – 1

Hence 100th term of the series = 2 × 100 – 1 = 199

Hence, The 100th term is 199.

TYPE 4: FIND THE MISSING NUMBER IN A GIVEN MATRIX

Missing Numbers in a Matrix puzzle are a common type of question in reasoning and aptitude tests. These puzzles present you with a matrix or a grid containing numbers in a specific pattern. Your task is to identify the pattern and figure out the missing number in the matrix.

QUESTIONS

Q10. Consider the following matrix:

4	7	9	2	X	1
12	42	72	2	30	0

What is the missing number at X in the matrix?

(a) 5 (b) 6

(c) 8 (d) 0

Ans: (b)

Explanation: We can clearly observe the following pattern,

In Column 1, $4 \times (4 - 1) = 12$

In Column 2, $7 \times (7 - 1) = 42$

In Column 3, $9 \times (9 - 1) = 72$

In Column 4, $2 \times (2 - 1) = 2$

In column 6, $1 \times (1 - 1) = 0$

By following the same pattern in Column 5, $X \times (X - 1) = 30$

So, the missing number is 6.

Q11. You are given two identical sequences in two rows:

Sequence 1	**8**	**4**	**6**	**15**	**52.5**	**236.5**
Sequence 2	**5**	**A**	**B**	**C**	**D**	**E**

What is the entry in the place of C for the Sequence-2? **(UPSC CSAT 2021)**

(a) 2.5 (b) 5

(c) 9.375 (d) 32.8125

Ans: (c)

Explanation:

The pattern observed in Sequence-1 is shown in the figure below:

8 , 4 , 6 , 15 , 52.5 , 236.5

× 0.5 × 1.5 × 2.5 × 3.5 × 4.5

Using the same pattern we will identify the terms of Sequence-2 as shown in figure below:

5 A B C

5 × 0.5 2.5 × 1.5 3.75 × 2.5

↓ ↓ ↓

2.5 3.75 9.375

The value of C = 9.375

TYPE 5: MISCELLANEOUS PATTERN QUESTIONS

In these types of questions the pattern or demand of the question will be different from the types and patterns we discussed earlier in this chapter, these can be the puzzles or series of dates, puzzle on numbers etc. We will try to understand these by some questions that UPSC asked in the previous years:

QUESTIONS

Q12. Consider the sequence given below:

4/12/95, 1/1/96, 29/1/96, 26/2/96 ...

What is the next term of the series?

(UPSC CSAT 2018)

(a) 24/3/96 (b) 25/3/96

(c) 26/3/96 (d) 27/3/96

Ans: (b)

Explanation: In the given sequence:

2nd term = 4/12/95 + 28 days = 1/1/96

3rd term = 1/1/96 + 28 days = 29/1/96

4th term = 29/1/96 + 28 days = 26/2/96

The year 1996 is a leap year.

So, there are 29 days in February 1996.

So, 5th term will be 26/2/96 + 28 days = 25/3/96

Q13. Consider the following sequence of numbers: 5 1 4 7 3 9 8 5 7 2 6 3 1 5 8 6 3 8 5 2 2 4 3 4 9 6

How many odd numbers are followed by the odd number in the above sequence? **(UPSC CSAT 2020)**

(a) 5 (b) 6

(c) 7 (d) 8

Ans: (b)

Explanation:

Given sequence:

5 1 4 **7 3 9** 8 **5 7** 2 6 **3 1 5** 8 6 3 8 5 2 2 4 3 4 9 6

The odd numbers followed by another odd number are: 5, 7, 3, 5, 3, and 1 (as shown by bold and underlined numbers)

So, required number of odd numbers = 6

II. ALPHABETICAL SERIES

These types of series are formed with the help of the English alphabet. These sequences can be created using different rules or patterns, such as:

- **Skipping Letters:** This series is formed by skipping a set number of letters between each element in the sequence. **For example,** if you skip one letter, you get a series like A, C, E, G, I, and so on, where B, D, F, H are skipped.

- **Pair of Opposite Letters:** This involves pairing letters that are on opposite ends of the alphabet. **For example,** A is paired with Z, B with Y, C with X, and so on, like this:

A	B	C	D	E	F	G	H	I	J	K	L	M
Z	Y	X	W	V	U	T	S	R	Q	P	O	N

- **Continuous Sequence of Letters:** This is the simplest type, where you just use the letters of the alphabet in their regular order, like A, B, C, D, E, all the way up to Z. There's no skipping or jumping; each letter follows the next in the usual way.

TYPES OF QUESTIONS

There are mainly 3 types of questions asked in the exams from the alphabetical series.

TYPE 1: FIND THE MISSING OR END TERM OF A SINGLE LETTER OR GROUP OF LETTERS SERIES

These series are created by skipping a specific number of letters between each term. The pattern of skipping can be forward, backwards, or a combination of both within the series. To solve these types of questions, you need to figure out the rule for how many letters are being skipped each time. Here are some examples to help understand how these series work.

QUESTIONS

Q14. Find the next term of the series:

B, E, H, K, ?

(a) K (b) L

(c) M (d) N

Ans: (d)

Explanation:

Pattern of the above series is shown in the figure:

B , E , H , K , N

+3 +3 +3 +3

The next letter is "N".

Q15. Find the missing term in the following series: MQCP, NPEN, OOGL, PNIJ, ?

(a) QMKH (b) QKKH

(c) QMJK (d) QMKI

Ans: (a)

Explanation:

Consider the 1st letter of each term as shown in figure:

MQCP , NPEN , OOGL , PNIJ , Q....

+1 +1 +1 +1

Hence, 1st letter of missing term will be P +1 = Q

Now, 2nd letter of each term is as shown in figure:

MQCP , NPEN , OOGL , PNIJ , QM....

–1 –1 –1 –1

Hence the 2nd letter of the missing term will be N – 1 = M. (option (b) eliminated)

Now, 3rd letter of each term is as shown in figure:

MQCP , NPEN , OOGL , PNIJ , QMK....

+2 +2 +2 +2

Hence the 3rd letter of missing term will be I + 2 = K (option c eliminated)

Now, consider the 4th letter of the each term as shown in figure:

MQCP , NPEN , OOGL , PNIJ , QMKH

–2 –2 –2 –2

4th letter of 4th term = L - 2 = J

Hence, 4th letter of of missing term = J-2 = H

Hence the missing term is QMKH

TYPE 2: FIND THE MISSING TERMS IN CONTINUOUS SERIES

In this kind of series, we typically use lowercase letters from the alphabet to create a group of letters, which is then repeated. The task for us is to figure out which group of letters should fill in the empty spaces in the series, following a specific pattern. The following questions will help us understand the concept.

Note:
In continuous series, firstly count the total given letters and try to divide the series into equal parts to find the possible patterns in the given series. **For example,** a series with 15 letters can be divided into smaller part of 3 or 5 letters to find the pattern in the series.

QUESTIONS

Q16. Consider the sequence *a_c e_ _b c_d a b_e d* that follows a certain pattern. Which of the following completes the sequence?

(a) bddab (b) cdebe
(c) bdaec (d) eacbd

Ans: (c)

Explanation:

The given sequence: *a_c e_ _b c_d a b_e d*

There are total 15 letters in the sequence

Let's break this sequence into three sets of 5 alphabets each: *a_c e_/ _b c_d/ a b_e d*

we can observe that the sequence is a repetition of **abced**.

The complete sequence is abced/abced/abced

bdaec is the correct answer.

Q17. Consider the sequence ABC_ _ABC_DABBCD_ABCD that follows a certain pattern. Which of the following complete the sequence?

(UPSC CSAT 2023)

(a) DACB (b) CDAB
(c) DCCA (d) DDCA

Ans: (d)

Explanation:

The given sequence:

ABC_ _ABC_DABBCD_ABCD

There are 20 elements in this series.

We can break this sequence in four sets of 5 elements each.

ABC_ _ /ABC_D/ABBCD/_ABCD

The third set ABBCD gives us an idea that one letter is repeating itself.

Now, we can check from the options to further confirm our observation.

Using option (d), we get the complete sequence: ABCDD/ABCCD/ABBCD/AABCD

We can see that in the first set the 4th letter is repeating, in the second set the 3rd letter is repeating, and so on.

Hence, option (d) is correct.

Q18. In the series: _b_a_ba_b_abab_aab; fill in the six blanks (_) using one of the following given four choices such that the series follows a specific order.

(UPSC CSAT 2021)

(a) bababa (b) baabba
(c) bbaabb (d) ababab

Ans: (d)

Explanation:

The given series is _b_a_ba_b_abab_aab.

Total number of letters in this series = 18

Now, we will break the series in 3 letters:

_b_ / a_b / a_b / _ab / ab_ / aab

By trying options, we can find out the pattern being followed in this series i.e.

abb / aab

Using this pattern, fill the blanks:

abb / aab / abb / aab / abb / aab

Q19. Consider the following arrangement that has some missing letters: abab_b_bcb_dcdcded_d

The missing letters which complete the arrangement are:

(UPSC CSAT 2020)

(a) a, b, c, d (b) a, b, d, e
(c) a, c, c, e (d) b, c, d, e

Ans: (c)

Explanation:

Total no. of letters in arrangement = 20

We can break the arrangement in 4 arrangements of 5 letters each as:

abab_: here missing letter will be a because it is a sequence of ab.

b_bcb: here the missing letter will be c because it is a sequence of bc.

_dcdc: here missing letter will be c because it is a sequence of cd.

ded_d: here missing letter will be e because it is a sequence of de.

Hence the missing letters are: a,c,c,e

TYPE 3: MISCELLANEOUS PATTERN QUESTIONS

In this type, we will explore some different types of alphabetical series through Questions.

QUESTIONS

Q20. What is the middle term of the sequence

– A, B, B, C, C, C, D, D, D, D, … Z?

(a) Q (b) R
(c) S (d) T

Ans: (c)

Explanation:

The given sequence is: A, B, B, C, C, C, D, D, D, D, ... Z

The number of terms in the given sequence will be = 1 + 2 + 3 + 4 + ...+ 26

sum of 1st 26 natural numbers = $\frac{26(26+1)}{2}$ = 13 × 27 = 351

So the middle term will be 352/2 = 176th term

Now, sum of 1st 18 natural numbers

= $\frac{18(18+1)}{2}$ = 9 × 19 = 171

And the 18th letter of English alphabet is R and 19th is S

Clearly, the 171th term is R and S will come from 172nd to 190th term.

So 176th term (middle term) is "S"

Q21. In the series AABABCABCDABCDE..., which letter appears at the 150th place?

(a) M (b) N

(c) O (d) P

Ans: (b)

Explanation:

The given series is AABABCABCDABCDE...

We can observe the pattern here as A, AB, ABC, ABCD, ABCDE ...

This means 1 term has 1 letter, 2nd term has 2 letters and so on.

If the given series has 17 terms, then the sum of letters = (1 + 2 + 3 +...+17) = $\frac{17 \times 18}{2}$ = 153

So, the term having 17 letters will have the 150th letter of the series.

This term will start from 137th letter and end at 153rd letter. The term is ABCDEFGHIJKLMNOPQ.

So, the 150th term is N.

Hence, option (b) is correct.

Q22. Consider the following arrangement

A B Q M Y D I M Y V B X P Z E O W T C F S J K N U Q

If each letter is attached a value equal to its place value in the above arrangement starting from the left, then what will be the sum of the numbers attached to all the vowels in the arrangements?

(a) 60 (b) 61

(c) 64 (d) 65

Ans: (c)

Explanation:

There are a total 26 letters in the given arrangement.

Place value of each vowels is:

A = 1, E = 15, I = 7, O = 16, U = 25

Now the sum of place values of vowels = 1 + 15 + 7 + 16 + 25= 64

Q23. What is the middle terms of the sequence Z, Z, Y, Y, Y, X, X, X, X, W, W, W, W, W,.....,A?

(UPSC CSAT 2023)

(a) H (b) I

(c) J (d) M

Ans: (b)

Explanation:

The given sequence is:

Z, Z, Y, Y, Y, X, X, X, X, W, W, W, W, W,..., A

So, the number of terms in the given sequence

= 2 + 3 + 4 + ... + 27 = $\frac{27\,(27+1)}{2}$ – 1 = 378 – 1 = 377

So, the middle term is 378/2 = 189th

Now, 377 – (27(A) + 26(B) + 25(C) + 24(D) + 23(E) + 22(F) + 21(G) + 20(H)) = 189

So, the 189th term must be I.

Q24. In the series AABABCABCDABCDE.., which letter appears at the 100th place? **(UPSC CSAT 2022)**

(a) G (b) H

(c) I (d) J

Ans: (c)

Explanation:

The given series is: AABABCABCDABCDE...

The pattern of the series is: A, AB, ABC, ABCD, ABCDE,...

It's an arithmetic series where the first term has 1 letter, the second term has 2 letters, and so on.

Sum of first n natural numbers = $\frac{n(n+1)}{2}$ where 'n' is the number of terms in this series,

Now we need to find the 100th term.

When n = 13; sum of 1st 13 natural numbers is $\frac{13 \times 14}{2}$ = 91

Hence 91st letter of the sequence is 13th letter of alphabets which is "M"

Series from term 92nd to 105th is ABCDEFGHIJKLMN and 100th term will be 'I'.

III. ALPHANUMERIC SERIES

This type of series is a combination of alphabetical series and numerical series and can follow any of the patterns we have discussed earlier in this chapter.

Remembering the alphabetical sequence and their position number can help us solve problems on this topic quickly.

This type of series combines both alphabetical and numerical elements, and it can follow any of the patterns discussed earlier in this chapter. It's helpful to remember the order of the alphabet and the corresponding position numbers of each letter. This knowledge can significantly speed up solving these mixed series problems.

A	B	C	D	E	F	G	H	I	J	K	L	M
1	2	3	4	5	6	7	8	9	10	11	12	13
N	O	P	Q	R	S	T	U	V	W	X	Y	Z
14	15	16	17	18	19	20	21	22	23	24	25	26

A	B	C	D	E	F	G	H	I	J	K	L	M
26	25	24	23	22	21	20	19	18	17	16	15	14
N	O	P	Q	R	S	T	U	V	W	X	Y	Z
13	12	11	10	9	8	7	6	5	4	3	2	1

Examples will help us to understand the series in a better way.

EXAMPLES

E13. What is the missing term of the series

9, P, 25, Q, 8, H, 16, ?, 18?

(a) A (b) B

(c) R (d) I

Ans: (b)

Explanation:

The given series is 9, P, 25, Q, 8, H, 16, ?, 18

We observe that in the given series, each alphabet corresponds to the difference between numbers around that alphabet as shown in given table:

25 – 9 = 16	P
25 – 8 = 17	Q
16 – 8 = 8	H
18 – 16 = 2	B

So, B is the missing term in the series

E14. Find the correct term of the given series in place of "?"

15F, 29K, 56K, 108I, ?

(a) 216N (b) 208J

(c) 188N (d) 224J

Ans: (b)

Explanation:

1st consider the number series:

15, 29, 56, 108 we can observe that

1st term = 15

2nd term = $15 \times 2 - 2^0 = 29$

3rd term = $29 \times 2 - 2^1 = 56$

4th term = $56 \times 2 - 2^2 = 108$

Hence 5th term should be $108 \times 2 - 2^3 = 208$

Now observe the alphabetical series:

F is at 6th place in alphabets 6 = 1 + 5

K is at 11th place in alphabets 11 = 5 + 6

Hence we can observe that sum of digits of no. associated with the alphabet is place value of alphabet.

Hence alphabet associated with 208 is J because 2 + 0 + 8 = 10,

E15. Consider the following alphanumeric series:

K 4 M P H & T * 6 8 7# B 9 K L @ 6 % U & * 2

How many numbers are there in the above series which are immediately followed by symbols and immediately preceded by alphabets?

(a) None (b) One

(c) Two (d) Three

Ans: (a)

Explanation:

Given series is:

K 4 M P H & T * 6 8 7# B 9 K L @ 6 % U & * 2

We need to check numbers in the above series which are immediately followed by symbols and immediately preceded by alphabets.

Number 4 is eliminated because it is followed and preceded by letters.

Similarly, 6, 8 and 7 are eliminated because these are either preceded or followed by a number.

9 is followed and preceded by letters hence eliminated.

6 is surrounded by symbols hence eliminated.

Hence, there is no number that is immediately followed by symbols and immediately preceded by alphabets.

PRACTICE QUESTIONS

1. What is the next alphabet in the given sequence : B, E, J, Q,?

(a) W (b) X

(c) Y (d) Z

2. Choose the group which is different from the others:

(a) A, E, G, I (b) B, D, F, H

(c) I, M, Q, S (d) Q, W, Y, C

3. What are the next terms of the given series

– Y, R, V, N, S, J, P, F, _, _?

(a) M, B (b) M, C

(c) N, B (d) N, C

4. What is the next term of the series

– 9, I, 25, Y, 8, H, 16, P, 18,?

(a) Q (b) R

(c) S (d) T

5. Find the next term in the given series.

TUV, NOP, HIJ, DEF,?

(a) ZAB (b) YZA

(c) XYZ (d) CAB

6. Consider the following sequence: R E 5 D A P $ 3 T I Q 7 9 B # 2 K % U 1 M W 4 * J 8 N

Find the odd one out from the given options based on the given arrangement:

(a) BK7 (b) M*U

(c) DPE (d) WJ1

7. What is the value of X in the given series

23, 30, 44, 65, 93, X?

(a) 120 (b) 128

(c) 118 (d) 108

8. Terms of given series follow a certain pattern, by observing that pattern find the term which will replace "X" in the given series: 8, 4, 6, 15, X, 236.25

(a) 46.5 (b) 48.5

(c) 50.5 (d) 52.5

9. Find the number which replace "X" in the given sequence: 30, 42, X, 72, 90

(a) 52 (b) 50

(c) 54 (d) 56

10. Find the next term of the given sequence

15, 8, 9, 15, 32,...

(a) 77.5 (b) 80

(c) 82.5 (d) 85

11. Terms of given series follow a certain pattern, by observing that pattern find the term which will replace "X" in the given series: 4, 2.5, 4, 8.5, 20.5, X

(a) 52.75 (b) 55.75

(c) 51.75 (d) 50.75

12. Find the number which replaces "X" in the given sequence: 2, 10, X, 68, 130, 222

(a) 25 (b) 30

(c) 34 (d) 32

13. Find the number which replace "X" in the given series: 30, 42, X, 72, 90, 110

(a) 52 (b) 50

(c) 54 (d) 56

14. Consider the following matrix:

4	7	9	2	?	1
12	42	72	2	30	0

What is the missing number in the matrix?

(a) 5 (b) 6

(c) 8 (d) 0

15. Consider the following matrix:

47	61	75
58	35	63
45	54	?

What is the missing number in the matrix?

(a) 42 (b) 35

(c) 27 (d) 12

16. Consider the following matrix:

35	5	0
19	7	5
47	8	?

What is the missing number at? in the matrix?

(a) 7 (b) 5

(c) 3 (d) 1

17. What is the wrong number in the given series:

126, 154, 184, 216, 250, 286, 320

(a) 320 (b) 250

(c) 216 (d) 126

18. What is the wrong number in the given series:

7, 27, 50, 121, 255, 482, 838

(a) 27 (b) 50

(c) 255 (d) 838

19. What is the wrong number in the given series:
14, 6, 5, 6.5, 12, 28, 86
(a) 5 (b) 86
(c) 6.5 (d) 28

20. Find the wrong term in the given series
2000, 976, 720, 656, 640, 638, 635
(a) 976 (b) 656
(c) 638 (d) 635

21. What is the next term of the series -
KAL, KEL, KIL, KOL, ?
(a) KSL (b) KUL
(c) KVL (d) KXL

22. What is the next term of the series –
WXEF, UVGH, STIJ, QRKL, ?
(a) OPMN (b) YZCD
(c) KLMN (d) IJKL

23. Consider the following arrangement
U G H R L D I M Y V B X P Z E O W T C F S J K N A Q
If each letter is attached a value equal to its place value in the above arrangement starting from the left, then what will be the sum of the numbers attached to all the vowels in the arrangements?
(a) 60 (b) 61
(c) 64 (d) 65

24. Find the correct term of the given series in place of "?": 16G, 31D, 60F, 116H,?
(a) 216N (b) 224H
(c) 188N (d) 224J

25. Consider the sequence of words given below. SAND CARE RUIN MOON NICE
If in each of the given words, every consonant is changed to its previous letter and every vowel is changed to its next letter according to the English alphabetical series, then in how many words, thus formed, at least one vowel will appear?
(a) One (b) Two
(c) Three (d) None

26. Consider the sequence PQR_ _PQR_SPQQRS_PQRS that follows a certain pattern. Which of the following completes the sequence?
(a) SPRQ (b) RSPQ
(c) SRRP (d) SSRP

27. Consider the sequence a_b e_ _c b_d a c_e d that follows a certain pattern. Which of the following completes the sequence?
(a) dbdab (b) cdebe
(c) cdaeb (d) eacbd

28. Consider the sequence ABC_ _AAB_CBA_ _CCB_A_ _CBA that follows a certain pattern. Which of the following completes the sequence?
(a) BCCACABB (b) BBBACACB
(c) CABCAABC (d) CBCABABC

ANSWERS

1. (*d*)	2. (*b*)	3. (*a*)	4. (*b*)	5. (*a*)	6. (*c*)	7. (*b*)	8. (*d*)	9. (*d*)	10. (*c*)
11. (*b*)	12. (*b*)	13. (*d*)	14. (*b*)	15. (*d*)	16. (*a*)	17. (*a*)	18. (*a*)	19. (*d*)	20. (*c*)
21. (*b*)	22. (*a*)	23. (*c*)	24. (*b*)	25. (*d*)	26. (*d*)	27. (*c*)	28. (*d*)		

EXPLANATIONS

1. (d)

Explanation:

The given series is: B, E, J, Q, ?

The numbers corresponding to these alphabets are:

B	2	$1^2 + 1$
E	5	$2^2 + 1$
J	10	$3^2 + 1$
Q	17	$4^2 + 1$

So, the next term should be $5^2 + 1 = 26^{th}$ alphabet i.e., Z.

2. (b)

Explanation:

By observing the given options,

Option A		Option B		Option C		Option D	
A	1	B	2	I	9	Q	17
E	5	D	4	M	13	W	23
G	7	F	6	Q	17	Y	25
I	9	H	8	S	19	C	3

The number corresponding to each alphabet is odd except in case of option (b), where each alphabet corresponds to an even number.

3. (a)

Explanation:

The given series is Y, R, V, N, S, J, P, F, ?, ?

We observe that this series is a combination of two series: Y, V, S, P and R, N, J, F

In 1st series, the pattern followed is

Y	25
V	22
S	19
P	16

So, the next term should be 16 – 3 = 13th letter i.e. M

In 2nd series, the pattern followed is

R	18
N	14
J	10
F	6

So, the next term should be 6 – 4 = 2nd letter i.e. B

The next term of the series is M, B.

4. (b)

Explanation:

The given series is 9, I, 25, Y, 8, H, 16, P, 18, ?

We observe that in the given series, each alphabet corresponds to the number before that alphabet.

9	I
25	Y
8	H
16	P
18	R

So, R will come at 18th place in the alphabet series.

5. (a)

Explanation:

Observe the middle letter of each term, it is a vowel. Right most letters are the next letter to vowel and leftmost is the previous letter.

Now in 1st term middle letter is "U", in 2nd term "O", in 3rd term "I", in 4th term it is "E"

So the middle letter of next term will be "A"

And the rightmost letter will be "B" and the leftmost letter will be "Z".

Hence the next term of the series will be ZAB.

6. (c)

Explanation:

Given arrangement is:

R E 5 D A P $ 3 T I Q 7 9 B # 2 K % U 1 M W 4 * J 8 N

Now observe the option carefully:

In all other options except option (c), the first element moves 3 steps forward to give the second elements, which in turn moves 5 steps backward to give the third element.

But this is not followed by option (c).

7. (b)

Explanation:

The given series is 23, 30, 44, 65, 93, X

By observing,

1st term of the series = a_1 = 23

2nd term of the series = a_2 = 30 = 23 + 7

3rd term of the series = a_3 = 44 = 30 + 14

4th term of the series = a_4 = 65 = 44 + 21

5th term of the series = a_5 = 93 = 65 + 28

So, the next term of the series should be a_6 = X = 93 + 35 = 128

8. (d)

Explanation:

The given series is 8, 4, 6, 15, X, 236.25

By observing the above series,

1st term of the series = a_1 = 8

2nd term of the series = a_2 = 4 = 8 × 0.5

3rd term of the series = a_3 = 6 = 4 × 1.5

4th term of the series = a_4 = 15 = 6 × 2.5

5th term of the series = a_5 = X = 15 × 3.5 = 52.5

6th term of the series = a_6 = 236.25 = 52.5 × 4.5

So, X = 52.5

9. (d)

Explanation: The given series is: 30, 42, X, 72, 90, and we need to find the value of X

By observing the given sequence

1st term of sequence = a_1 = 30 = (5 × 5) + 5

2nd term of sequence = a_2 = 42 = (6 × 6) + 6

3rd term of sequence = a_3 = X = (7 × 7) + 7 = 56

4th term of sequence = a_4 = 72 = (8 × 8) + 8

5th term of sequence = a_5 = 90 = (9 × 9) + 9

So, the value of X in the given series is 56.

10. (c)

Explanation:

The given series is: 15, 8, 9, 15, 32, and we need to find the value of next term

Let the next term be X

By observing the given sequence

1st term of sequence = $a_1 = 15$

2nd term of sequence = $a_2 = 8$ hence $a_2 = 15 \times 0.5 + 0.5 = 8$

3rd term of sequence = $a_3 = 9$ hence $a_3 = 8 \times 1 + 1 = 9$

4th term of sequence = $a_4 = 15$ hence $a_4 = 9 \times 1.5 + 1.5 = 15$

5th term of sequence = $a_5 = 32$ hence $a_5 = 15 \times 2 + 2 = 32$

So, the next term of sequence should be

$a_6 = 32 \times 2.5 + 2.5 = 82.5$

Thus, X = 82.5

11. (b)

Explanation:

The given series is 4, 2.5, 4, 8.5, 20.5, X.

Here, we have to find the value of X.

By observing the given sequence

1st term of the sequence = $a_1 = 4$

2nd term of the sequence = $a_2 = 2.5 = 4 \times 0.5 + 0.5$

3rd term of the sequence = $a_3 = 4 = 2.5 \times 1 + 1.5$

4th term of the sequence = $a_4 = 8.5 = 4 \times 1.5 + 2.5$

5th term of the sequence = $a_5 = 20.5 = 8.5 \times 2 + 3.5$

$a_6 = 20.5 \times 2.5 + 4.5 = 55.75$

So, according to the given pattern the next term of the given sequence should be

So, X = 55.75

12. (b)

Explanation:

The given series is 2, 10, X, 68, 130, 222

By observing the above series

1st term of the sequence = $a_1 = 2 = 1^3 + 1$

2nd term of the sequence = $a_2 = 10 = 2^3 + 2$

3rd term of the sequence = $a_3 = X$

4th term of the sequence = $a_4 = 68 = 4^3 + 4$

5th term of the sequence = $a_5 = 130 = 5^3 + 5$

6th term of the sequence = $a_6 = 222 = 6^3 + 6$

We can deduce the pattern clearly.

So, $X = 3^3 + 3 = 30$

13. (d)

Explanation:

The given series is 30, 42, X, 72, 90, 110

1st term of the series = $a_1 = 30 = 5^2 + 5$

2nd term of the series = $a_2 = 42 = 6^2 + 6$

3rd term of the series = $a_3 = X$

4th term of the series = $a_4 = 72 = 8^2 + 8$

5th term of the series = $a_5 = 90 = 9^2 + 9$

6th term of the series = $a_6 = 110 = 10^2 + 10$

By observing the given series, we can deduce that $X = 7^2 + 7 = 56$

14. (b)

Explanation:

We can clearly observe the following pattern,

In Column 1, $4 \times (4 - 1) = 12$

In Column 2, $7 \times (7 - 1) = 42$

In Column 3, $9 \times (9 - 1) = 72$

In Column 4, $2 \times (2 - 1) = 2$

In column 6, $1 \times (1 - 1) = 0$

Let the missing number is x.

By following the same pattern in Column 5,

$x(x - 1) = 30 \Rightarrow 6 \times 5 = 30$

So, $x = 6$.

15. (d)

Explanation:

We can clearly observe the following pattern.

In Column 1, 47 + 58 + 45 = 150

In Column 2, 61 + 35 + 54 = 150

The sum of the all three elements of each column is 150.

Let the missing number be x.

In Column 3,

$75 + 63 + x = 150 \Rightarrow x = 150 - 138 = 12$

So, the missing number is 12.

16. (a)

Explanation:

We observe the following pattern,

In Column 1, $35 = 5 \times 7 + 0$

When 35 is divided by 5, the remainder is 0.

In Column 2, $19 = 7 \times 2 + 5$

When 19 is divided by 7, the remainder is 5.

In Column 3, $47 = 8 \times 5 + 7$

When 47 is divided by 8, then the remainder is 7.

So, the missing number is 7.

17. (a)

Explanation:

The given series is 126, 154, 184, 216, 250, 286, 320

By observing the following pattern,

1^{st} term of the series = $a_1 = 126 = 11^2 + 5$

2^{nd} term of the series = $a_2 = 154 = 12^2 + 10$

3^{rd} term of the series = $a_3 = 184 = 13^2 + 15$

4^{th} term of the series = $a_4 = 216 = 14^2 + 20$

5^{th} term of the series = $a_5 = 250 = 15^2 + 25$

6^{th} term of the series = $a_6 = 286 = 16^2 + 30$

Similarly, the 7th term of the series is $a_7 = 17^2 + 35 = 324$ and not 320.

So, the wrong term in the series is 320

18. (a)

Explanation:

The given series is 7, 27, 50, 121, 255, 482, 838

By observing the following pattern,

1^{st} term of the series = $a_1 = 7 = 2^2 + 3$

3^{rd} term of the series = $a_3 = 50 = 7^2 + 1$

4^{th} term of the series = $a_4 = 121 = 11^2 + 0$

5^{th} term of the series = $a_5 = 255 = 16_2 - 1$

6^{th} term of the series = $a_6 = 482 = 22^2 - 2$

7^{th} term of the series = $a_7 = 838 = 29^2 - 3$

So, the 2^{nd} term of the series should be $a_2 = 4^2 + 2 = 18$ and not 27.

19. (d)

Explanation:

We observe the following pattern,

1^{st} term of the series = $a_1 = 14$

2^{nd} term of the series = $a_2 = 14 \times 0.5 - 1 = 6$

3^{rd} term of the series = $a_3 = 6 \times 1 - 1 = 5$

4^{th} term of the series = $a_4 = 5 \times 1.5 - 1 = 6.5$

5^{th} term of the series = $a_5 = 6.5 \times 2 - 1 = 12$

Similarly, the 6th term of the series = $a_6 = 12 \times 2.5 - 1 = 29$ and not 28

7^{th} term of the series = $a_7 = 29 \times 3 - 1 = 86$.

So, the wrong term in the series is 28

20. (c)

Explanation:

By observing the following series,

$2000 - 976 = 1024 = 4^5$,

$976 - 720 = 256 = 4^4$,

$720 - 656 = 64 = 4^3$,

$656 - 640 = 16 = 4^2$

Similarly, the next term should be

$640 - 4^1 = 640 - 4 = 636$ and not 638

$636 - 635 = 1 = 4^0$

So, the wrong term in the series is 638.

21. (b)

Explanation:

The given series is KAL, KEL, KIL, KOL, ?

We can clearly observe that the first and last letter of every word is same i.e. K and L.

The middle letters are A, E, I and O which are vowels.

The next vowel is U.

So, the next term of the series is KUL.

22. (a)

Explanation:

The given series is WXEF, UVGH, STIJ, QRKL, ?

Now, split each word in pairs of two i.e. WX/EF, UV/GH, ST/IJ and QR/KL

We can clearly observe that WX, UV, ST and QR are written in reverse alphabets. So the next two alphabets are OP.

Similarly, EF, GH, IJ and KL are written in alphabetical order. So, the next two alphabets are MN.

So, the next term of the series is OPMN.

23. (c)

Explanation:

There are a total 26 letters in the given arrangement.

Place value of vowels is:

A = 25, E = 15,I = 7, O = 16, U = 1

Now the sum of place values of vowels = 25 + 15 + 7 + 16 + 1 = 64

24. (b)

Explanation:

1st consider the number series:

16, 31, 60, 116 we can observe that

1^{st} term = 16

2^{nd} term = $16 \times 2 - 1 = 31$

3^{rd} term = $31 \times 2 - 2 = 60$

4^{th} term = $60 \times 2 - 4 = 116$

Hence 5^{th} term should be $116 \times 2 - 8 = 224$

Now observe the alphabetical series:

G is at 7^{th} place in alphabets 7 = 1 + 6

D is at 4^{th} place in alphabets 4 = 3 + 1

Hence we can observe that the sum of digits of no. associated with the alphabet is the place value of the alphabet.

Hence alphabet associated with 224 is H because 2 + 2 + 4 = 8,

And the 8th letter of the English alphabet is H.

25. (d)

Explanation:

Given condition is: every consonant is changed to its previous letter and every vowel is changed to its next letter according to the English alphabetical series

By given condition,

SAND is converted into RBMC (no vowel)

CARE is converted into BBQF (no vowel)

RUIN is converted into QVJM (no vowel)

MOON is converted into LPPM (no vowel)

NICE is converted into MJBF (no vowel)

Hence, none of the converted words contain a vowel.

26. (d)

Explanation:

The given sequence: PQR_ _PQR_SPQQRS_PQRS

There are a total of 20 alphabets in this series.

Let's break this sequence into four sets of 5 alphabets each.

PQR_ _

PQR_S

PQQRS

_PQRS

The third set PQQRS gives us a clue that one letter is being repeated.

Now, we can check from the options to further confirm our presumption.

Using option (d), we get the complete sequence: PQRSSPQRRSPQQRSPPQRS

We can see that in the first set 4th letter S is getting repeated, in the second set 3rd letter is getting repeated, and so on.

27. (c)

Explanation:

The given sequence: a_b e_ _c b_d a c_e d

There are total 15 letters in the sequence

Let's break this sequence into three sets of 5 alphabets each.

a_b e_/ _c b_d/a c_e d

we can observe that the sequence is a repetition of acbed.

Hence the complete sequence is acbed/acbed/acbed

28. (d)

Explanation:

Given sequence is : ABC_ _AAB_CBA_ _CCB_A_ _CBA

We can observe that the given sequence is repetition of ABCCBA

So the complete sequence is ABCCBAABCCBAABCCBA.

To complete the original sequence we need to fill CBCABABC in the blanks.

Analogy & Classification

2

Analogy

INTRODUCTION

Analogy means similarity or correspondence or having similar features.

Analogy questions assess a candidate's reasoning and knowledge by identifying relationships between pairs of items. Various relationship types can be used, including quantity and unit, worker and tools, cause and effect, word synonym, word antonym, country and capital, state and capital, country and currency, animals and their young, male and female, animals and their habitats, games and playing locations, and occupations, workplaces, and tasks etc.

There are basically 3 types of Analogy on which the questions can be asked:

1. Word Analogy
2. Number Analogy
3. Alphabet Analogy

WORD ANALOGY

The concept of word analogy involves establishing a connection between a pair of words. These pairs can encompass a wide range of relationships, such as quantity and units, workers and tools, cause and effect, word synonyms, country-capital, state-capital, country-currency, animal and their young ones, male-female, and more. In these types of questions, a word pair is presented with a specific relationship, and candidates are asked to identify or establish a similar relationship for another word. They may also be required to select an analogous pair from given options that share a comparable relationship.

The following example will give you a clearer understanding of such analogy-based questions.

EXAMPLES

E1. Kilogram is related to weight in the same way kilometer is related to which of the following?

(a) Energy (b) Distance

(c) Temperature (d) Heat

Ans: (b)

Explanation:

Kilograms are units to measure weight in the same way the unit of measuring distance is a kilometer.

TYPES OF QUESTION

Now we will discuss the types of questions on word analogy that can be asked in the exam. Mainly there are 3 types of questions asked in the exams.

TYPE 1: DIRECT ANALOGY

This type of analogy, involves three elements where a clear relationship exists between two of them. Your goal is to identify an option from the given choices that forms a similar type of relationship with the third element. This requires analyzing how the first two items are connected and finding a choice that connects in the same way with the third item.

QUESTIONS

Q1. College is related to students in the same way as Hospital is related to?

(a) Doctors (b) Nurses

(c) Patients (d) Medicines

Ans: (c)

Explanations:

Students receive education at college, just as patients receive treatment at a hospital.

Q2. Squadron Leader is related to flying officers in the same way as major is related to...

(a) lieutenant (b) Colonel

(c) Brigadier (d) General

Ans: (a)

Explanation:

Major in the Army is equivalent to Squadron Leader in the Air Force, while Lieutenant in the Army is equivalent to Flying Officer in the Air Force.

TYPE 2: COMPLETING THE ANALOGOUS PAIR

In this question type, you are given a pair of words that have a specific relationship. Your task is to understand the nature of this relationship and then find, from the given options, another word that forms a similar relationship with a third provided word. It's like recognizing the pattern in the first pair and finding a word that fits the same pattern with the third word.

QUESTIONS

Q3. Konkani : Goa :: Dogri : ?

(a) Jammu and Kashmir (b) Odisha

(c) Haryana (d) Madhya Pradesh

Ans: (a)

Explanation:

Here 2nd is state and 1st is the local language of state as Konkani is the local language of Goa in the same way Dogri is the local language of Jammu and Kashmir.

Q4. Cobbler: Leather:: Carpenter : ?

(a) Furniture (b) iron

(c) Gold (d) Wood

Ans: (d)

Explanation:

As Cobbler uses Leather to make shoes, carpenters use wood to make Furniture.

TYPE 3: CHOOSING THE ANALOGOUS PAIR

In this question type, you're presented with a given pair of words that have a specific relationship. You are then provided with four pairs of words as options. Your objective is to choose the pair where the relationship between the words mirrors the relationship observed in the initial pair. This involves identifying the nature of the connection in the given pair and finding the option that reflects a similar connection.

QUESTIONS

Q5. Which of the following has the same relationship as Traitor : Country : : ?

(a) Jailor : law (b) Teacher : Education

(c) King : Kingdom (d) Apostate : Religion

Ans: (d)

Explanation:

Traitor is the one who betrays the country. Similarly the Apostate is the one who renounces the religion.

Q6. Which of the following has the same relationship as Cells : Cytology : : ?

(a) Worms : Ornithology (b) Insects : Entomology

(c) Diseases : Physiology (d) Tissues : Morphology

Ans: (b)

Explanation:

Cytology is the study of cells in a similar way as Entomology is the study of insects.

TYPE 4: CHOOSING SIMILAR WORDS

In this question type, you are given a set of three or more words, followed by a selection of four additional words as options. Your task is to identify the word among the choices that share a similar characteristic or quality with the initial group of three words. Essentially, you need to determine what makes the first three words alike and then select the option that fits the same criterion.

QUESTIONS

Q7. Chandigarh, Panji, Ranchi, ?

(a) Ahmedabad (b) Kanpur

(c) Gangtok (d) Amritsar

Ans: (c)

Explanation:

Chandigarh, Panji and Ranchi are the capitals of states Haryana, Goa and Jharkhand respectively and in the options Gangtok is the capital of the state Sikkim.

Q8. Violet, Blue, Red

(a) Black (b) White

(c) Orange (d) Paint

Ans: (c)

Explanation:

Violet, Blue and red are the colors of rainbow and from options Orange is a rainbow color.

NUMBER ANALOGY

In Number Analogy, you are given two numbers or sets of numbers that have a specific relationship between them. From the given alternatives, there's another number or set of numbers that has a similar kind of relationship as the first pair. Your challenge is to recognize this pattern or relationship and select the alternative that exhibits the same connection.

QUESTIONS

Q9. 2 : 16 :: 3 : ?

(a) 27 (b) 81

(c) 36 (d) 72

Ans: (b)

Explanation:

16 is 4 powers of 2.

4 power of 3 is 81.

Q10. 2 : 6 :: ?

(a) 5 : 20 (b) 9 : 45

(c) 11 : 45 (d) 7 : 77

Ans: (d)

Explanation:

First number is multiplied by the next prime as 2 is multiplied by 3 and is equal to 6.

In the options 7 is multiplied by next prime 11 and it equals 77.

Q11. Choose the group which is different from the others: (UPSC CSAT 2023)

(a) 17, 37, 47, 97

(b) 31, 41, 53, 67

(c) 71, 73, 79, 83

(d) 83, 89, 91, 97

Ans: (d)

Explanation:

2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67, 71, 73, 79, 83, 89, 97 are the prime numbers between 1 to 100.

We can observe that all the numbers in options (a), (b), and (c) are prime numbers.

However, number 91 in option (d) is a composite number.

As, $91 = 13 \times 7$.

Hence, this group is different from the others

ALPHABET ANALOGY

In Alphabet Analogy, you are presented with two sets of letters that are connected by a certain relationship. Your objective is to understand this specific relationship and then choose another set of letters from the given options that demonstrate the same type of relationship as the initial pair with the third set of letters. This requires analyzing the pattern or rule that links the first two sets and finding a similar link in one of the provided letter sets.

QUESTIONS

Q12. HEALTH : GDZKSG :: ZINC : ?

(a) YHMB (b) AJOD

(c) YJNC (d) AIOD

Ans: (a)

Explanation: We can clearly observe that in this code,

H	H – 1	G
E	E – 1	D
A	A – 1	Z
L	L – 1	K
T	T – 1	S
H	H – 1	G

Similarly, ZINC will be written as YHMB.

Z	Z – 1	Y
I	I – 1	H
N	N – 1	M
C	C – 1	B

Q13. CAT : 57 :: RAT : ?

(a) 42 (b) 56

(c) 46 (d) 51

Ans: (a)

Explanation: Here, C + A +T = 24 + 26+ 7 (backward letter positions) = 57

So, RAT = R+A+T = 9+26+7 = 42

Classification

Classification involves organizing items within a particular group based on a shared characteristic they have and subsequently identifying the one that doesn't fit or is different from the rest.

These questions focus on words, letters, and numbers. They involve identifying the unique item in a list of four or five elements that don't quite fit with the others based on a specific defining quality. Our task is to find the one that doesn't belong to the group.

TYPES OF QUESTION

Now we will discuss the types of questions that can be asked in the exam. There are mainly 4 types of questions.

TYPE 1: CHOOSING THE ODD WORD

In these problems, we are given a set of real-world words that share common features except for one that's different. Our job is to identify the word that doesn't fit in or is the "odd one out."

QUESTIONS

Q14. Which of the following is different from the others in some manner?

(a) Orange (b) Banana
(c) Papaya (d) Pear

Ans: (a)

Explanation:

Orange is a citrus fruit which is different from all other options hence orange is an odd one out.

Q15. Which of the following is different from the others in some manner?

(a) Mumbai (b) Delhi
(c) Pune (d) Kolkata

Ans: (c)

Explanation:

Mumbai, Delhi, and Kolkata are capital cities and Pune is not a capital city.

TYPE 2: CHOOSING THE ODD PAIR OF WORDS

In this classification method, various pairs are grouped together based on shared characteristics or properties, such as names, locations, purposes, circumstances, or origins. We have to identify the odd pair of words from the 4 options.

QUESTIONS

Q16. Four pairs of words are given, out of these words one pair does not have the same common relationship as the rest pairs. Find that odd pair.

(a) Dim : Bright (b) Wrong : Right
(c) Shallow : Deep (d) Genuine : Real

Ans: (d)

Explanation:

Genuine is synonym for real, all others are Antonym to each other.

Q17. Four pairs of words are given, out of these words one pair does not have the same common relationship as the rest pairs. Find that odd pair.

(a) Flag : Flagship (b) Court : Courtship
(c) War : Worship (d) Friend : Friendship

Ans: (c)

Explanation:

War and Worship are not related to each other, all others are related to each other.

TYPE 3: CHOOSING THE ODD LETTER GROUP

In this type of problem, some groups of letters are given and one of them is different from the rest, the task is to find that odd group of letters.

QUESTIONS

Q18. Choose the group of letters which are different from others

(a) Z (b) T
(c) H (d) Q

Ans: (d)

Explanation:

All the letters except letter Q occupy the even number position in the english alphabet.

Q19. Choose the group of letters which are different from others

(a) DFIMR (b) CEHLQ
(c) GILPU (d) HJMPT

Ans: (d)

Explanation:

Except option (d) the difference between 1st and 2nd letter is 2, 2^{nd} and 3^{rd} letter is 3, 3^{rd} and 4^{th} letter is 4 and 4^{th} and 5^{th} letter is 5.

But in option (d) the difference between 3^{rd} and 4^{th} letter is 3.

TYPE 4: CHOOSING THE ODD NUMBER/ PAIR OF NUMBERS

In this classification scenario, you're provided with a set of numbers or pairs of numbers. Among these, all except one share common characteristics and can be considered similar. Our task is to select the one that is different from the rest.

QUESTIONS

Q20. Four numbers are given in the options. Out of these, three are alike in a certain way and one is different. Choose the one which is different from the rest.

(a) 2 (b) 32

(c) 72 (d) 128

Ans: (c)

Explanations:

Except 72 all numbers can be written as power of 2.

Q21. Four pair of numbers are given in the options. Out of these, three are alike in a certain way and one is different. Choose the pair which is different from the rest.

(a) 21 : 24 (b) 28: 32

(c) 14 : 16 (d) 54 : 62

Ans: (d)

Explanation: All the pairs except pair (d) are in the ratio 7 : 8, but option (d) is not in ratio 7 : 8.

Practice Questions

Direction(1–15): In question number (1 to 15) three terms are given and you need to find the fourth term in such a manner that relationship between 1st term and 2nd term is same as the relationship between third and fourth term:

1. Robbers: Gang :: Players:
(a) Band (b) Team
(c) Crowd (d) Crew

2. Republic: India :: Monarchy:
(a) Canada (b) USA
(c) Ukraine (d) Russia

3. AMIT: DQNZ :: RIYA:
(a) ULDG (b) UMCG
(c) VMDE (d) UMDG

4. DEN: WVM :: HUT:
(a) RFG (b) SFI
(c) SFG (d) RTF

5. AMUL: PYQE :: NIKE:
(a) BCJD (b) IOMR
(c) IKML (d) IMOR

6. EVERYTHING: DXDTXVGKMI :: MOTIVATION:
(a) LPSJWBSJNO (b) LQSKUCSKNP
(c) LPSKWZSKPM (d) LPSJVBSJNP

7. 85: 9 :: 125:
(a) 15 (b) 13
(c) 11 (d) 17

8. BREAK: CUJHT :: CHAIN:
(a) DJENU (b) DKFPW
(c) DJKNU (d) DKJMW

9. CALENDAR: ACELDNRA :: BACHELOR:
(a) ACBLROEH (b) ABELCHRO
(c) ABHCLERO (d) ABLEHCRO

10. KILOMETER: OLIKMRETE :: LANDSCAPE:
(a) DNALSEPAC (b) NDALSPEAC
(c) ALNACSEAP (d) NADLSACPE

11. 6: 210 :: 8:
(a) 360 (b) 506
(c) 630 (d) 504

12. CAD : 628 :: DAF :
(a) 964 (b) 832
(c) 864 (d) 824

13. INTO: 5101611 :: LOVE
(a) 8111181 (b) 1311521
(c) 1211225 (d) 811181

14. APPLE: 50 :: MANGO:
(a) 125 (b) 100
(c) 75 (d) 50

15. F:343 :: H:
(a) 216 (b) 729
(c) 512 (d) 225

16. Which of the following is different from the others in some manner?
(a) Mouse (b) Printer
(c) Keyboard (d) Scanner

17. Find the odd one out
(a) DW (b) FU
(c) HR (d) KP

18. Find The Odd one out
(a) FBJD (b) HDLF
(c) GCIE (d) JFNH

19. Find the odd one out
(a) 64 (b) 27
(c) 125 (d) 81

20. Find the odd one
(a) 3-4-15 (b) 5-7-25
(c) 6-8-31 (d) 7-9-33

Answers

1. (*b*)	2. (*a*)	3. (*d*)	4. (*c*)	5. (*b*)	6. (*b*)	7. (*c*)	8. (*b*)	9. (*c*)	10. (*a*)
11. (*d*)	12. (*b*)	13. (*d*)	14. (*d*)	15. (*b*)	16. (*b*)	17. (*c*)	18. (*c*)	19. (*d*)	20. (*c*)

EXPLANATIONS

1. (b)

Explanation:

Relationship followed: Individual and group

Robbers: a group of robbers is called a gang.

Option A: Band is a group of musicians

Option B: Team is a Group of Players.

Option C: Crowd is a group of people.

Option D: Crew is a group of Sailors.

2. (a)

Explanation:

Relationship followed: Constitutional Form and Country

Republic: India

Option A: Canada is having Constitutional Monarchy.

Option B: USA is a Republic.

Option C: Ukraine is a Republic.

Option D: Russia is a Republic.

3. (d)

Explanation:

Relationship followed: Adding consecutive numbers to successive letters

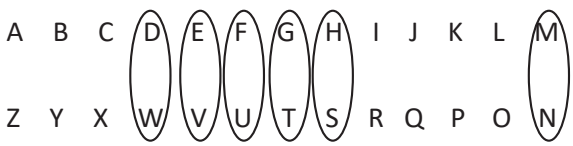
A	M	I	T		R	I	Y	A
+3	+4	+5	+6		+3	+4	+5	+6
D	Q	N	Z		U	M	D	G

The code for RIYA is UMDG.

4. (c)

Explanation:

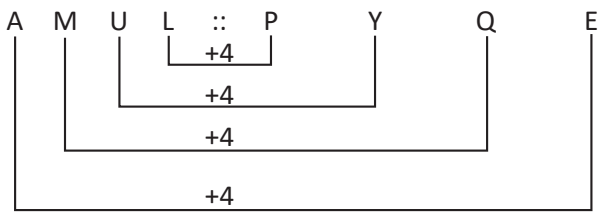
Relationship followed: Opposite letters

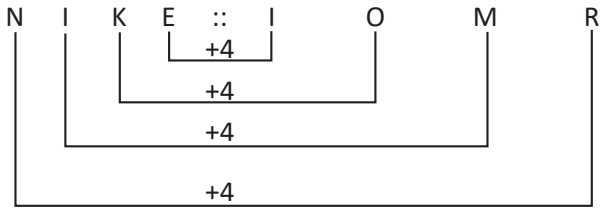


5. (b)

Explanation:

Relationship followed: Adding +4 from last to first





6. (b)

Explanation:

Relationship followed: previous letter and second next letter are placed alternatively in the analogical term

E	V	E	R	Y	T	H	I	N	G
–1	+2	–1	+2	–1	+2	–1	+2	–1	+2
D	X	D	T	X	V	G	K	M	I

Therefore

M	O	T	I	V	A	T	I	O	N
–1	+2	–1	+2	–1	+2	–1	+2	–1	+2
L	Q	S	K	U	C	S	K	N	P

7. (c)

Explanation:

Relationship followed : $X : \sqrt{(X-4)}$

85 : 9, here 85 – 4 = 81 and $\sqrt{81} = 9$

Similarly, 125 – 4 = 121 and $\sqrt{121} = 11$

8. (b)

Explanation:

Relationships followed: first letter plus 1, second letter plus 3, third letter plus 5 .....

B	R	E	A	K
+1	+3	+5	+7	+9
C	U	J	H	T

then,

C	H	A	I	N
+1	+3	+5	+7	+9
D	K	F	P	W

9. (c)

Explanation:

Relationship followed: Reversing the letters in pairs of two

CA (AC) LE (EL) ND (DN) AR (RA)

Similarly

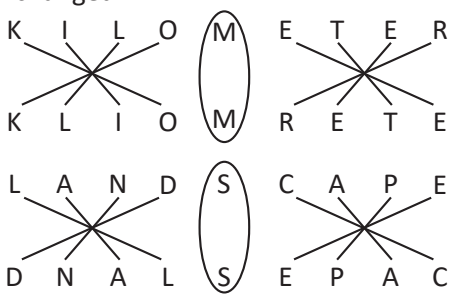
BA (AB) CH (HC) EL (LE) OR (RO)

Thus the code is ABHCLERO

10. (a)

Explanation:

Relationship followed: Reversing the order of first four letters and last four letters by keeping the middle letter unchanged



11. (d)

Explanation:

Relationship followed: X: ($X^3 - X$)

6:210 i.e. 6 : ($6^3 - 6$)

Similarly, $8^3 = 512$, $512 - 8 = 504$

12. (b)

Explanation:

Relationship followed: Assign the values and multiply with 2

C A D

(3 1 4) × 2 = 6 2 8

Similarly, D A F

(4 1 6) × 2 = 8 3 2

13. (d)

Explanation:

Relationship followed: value of the letter minus 4

9	14	20	15
I	N	T	O
–4	–4	–4	–4
5	10	16	11

then,

12	15	22	5
L	O	V	E
–4	–4	–4	–4
8	11	18	1

Therefore LOVE: 811181

14. (d)

Explanation:

Relationship followed: Assign the values and add them

A (1) P (16) P (16) L (12) E (5)

1 + 16 + 16 + 12 + 5 = 50

M (13) A (1) N (14) G (7) O (15)

13 + 1 + 14 + 7 + 15 = 50

15. (b)

Explanation:

Relationship followed: value of the letter and the cube of next number

F is the 6th letter of the alphabet and 343 is cube of 7 i.e. (6 + 1)

Similarly, H is the 8th letter of the alphabet and cube of next number will be $9^3 = 729$

16. (b)

Explanation:

Pattern Followed: Input and Output Devices

Mouse, Keyboard and Scanner are input devices

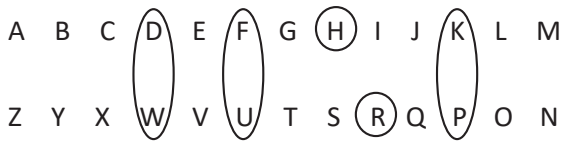
Printer is an output Device.

17. (c)

Explanation:

Pattern Followed:

In the following arrangement of alphabets, R is not below H:



18. (c)

Explanation:

Pattern Followed: To obtain second, third and fourth alphabets: –4, +8, –6 is followed but the same is not true for the third alphabet of option (c).

(A)	F	–4	B	+8	J	–6	D
(B)	H	–4	D	+8	L	–6	F
(C)	G	–4	I	**+6**	E	–6	D
(D)	J	–4	F	+8	N	–6	H

19. (d)

Explanation:

Pattern Followed: Cube of numbers

$4^3 = 64$

$3^3 = 27$

$5^3 = 125$

$9^2 = 81$

64, 27 and 125 are cubes of numbers but 81 is square of 9.

20. (c)

Explanation:

Pattern Followed: X–Y–Z where Z = (X + Y) × 2 + 1

(3 + 4) × 2 + 1 = 15

(5 + 7) × 2 + 1 = 25

(6 + 8) × 2 + 1 ≠ 31

(7 + 9) × 2 + 1 = 33

Z = (X + Y) × 2 + 1 holds for all options except C.

Coding & Decoding

3

INTRODUCTION

Coding-Decoding is an important part of problem-solving in many exams. It's like solving a secret code where letters, numbers, or words are changed using some fixed rules. To crack these codes, you need to figure out the pattern or rule used in the coding process. Once you understand this, you can decode the message to find out what it really means.

These codes rely on a specific pattern, principle, or rule that the reader needs to understand initially. Afterwards, they can decode the message by applying the same rules and principles to uncover the true meaning or content of the message.

In reality, there is no consistent or specific type or category that allows us to categorise coding-decoding questions uniformly. This chapter breaks down different types of coding-decoding questions you might see in exams. For each type, we give examples and explain how to solve them. This way, you can get a clear idea of how to approach these questions and practice them effectively.

However, it's essential to understand the letter positions before solving these types of questions.

Position of Alphabets in Forward Order

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26

EXAMPLES

E1. What is the position of the letter I in the reverse order?

(a) 18 (b) 15

(c) 16 (d) 17

Ans: (a)

Explanation:

As we know, the position of the letter I in forward order is 9

So, the position number of I in reverse order

= 27 – 9 = 18

Note:

Backward position of letter = 27 - forward position of letter.

Position of alphabets in Reverse order:

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

Opposite letters:

A	B	C	D	E	F	G	H	I	J	K	L	M
Z	Y	X	W	V	U	T	S	R	Q	P	O	N

Letter opposite to A = 27 − Corresponding position of A = 27 – 1 = 26 = Z

Letter opposite to B = 27 − Corresponding position of B = 27 – 2 = 25 = Y

Letter opposite to C = 27 − Corresponding position of C = 27 – 3 = 24 = X

And so on.

TRICKS TO REMEMBER

Remembering the position of each alphabet can be quite challenging, so we often create simple tricks to help us recall their place values easily. Some of them are discussed below:

Trick 1: CFILORUX and EJOTY Formula:

3	6	9	12	15	18	21	24
↓	↓	↓	↓	↓	↓	↓	↓
C	F	I	L	O	R	U	X

(remember this word)

5	10	15	20	25
↓	↓	↓	↓	↓
E	J	O	T	Y

(similar to word jyoti)

Things will become easier if you remember and use these formulas. In the 1st formula, we have the position values of C, F, I, L, O, R, U, and X, which are the multiples of three, which will make it easier to remember the position value of the alphabet in the forward direction.

EXAMPLES

E2. If CAT = 24 in a certain code language, then what will be the code for "PACE" in that code?

(a) 48 (b) 25

(c) 19 (d) 29

Ans: (b)

Explanation:

Here C + A + T = 3 + 1+ 20 (forward letter positions) = 24.

So, PACE = P + A + C + E = 16 + 1 + 3 + 5 = 25.

We can use the formula here to find the code for PACE:

To find the place value of P: As P is nearest to the letter "O" in our formula and the place value for "O" is 15 and "P" is next to "O".

So, the place value for "P" will be 16.

Similarly, we can find the place value of other letters by using the formula which will be

A = 1, C = 3 and E = 5.

Hence, PACE = 16 + 1 + 3 + 5 = 25.

Trick 2:

To find the position value in reverse order, we can use the 1st formula by reversing the alphabet as shown in the figure below:

X	U	R	O	L	I	F	C
↓	↓	↓	↓	↓	↓	↓	↓
3	6	9	12	15	18	21	24

EXAMPLES

E3. If CAT = 57 in some coding language, then what will be the code for RAT in this coding language?

(a) 42 (b) 56

(c) 46 (d) 51

Ans: (a)

Explanation:

Here, C + A + T = 24 + 26 + 7 (backward letter positions) = 57

So, RAT = R + A + T = 9 + 26 + 7 = 42

We can also use the formula here to find the code for RAT.

To find the place value of R:

As R is in our formula and the place value in reverse order is 9.

Place value of A in reverse order is 26 which is very easy to check.

To find the place value of T from the backward side: As T is nearest to the letter "R" in our formula and the place value for "R" is 9 and "T" is 2 letters behind "R".

So, the place value of "R" will be 7.

Hence, the code for RAT in that coding language will be 42.

TYPES OF QUESTIONS

TYPE 1: LETTER CODING

This type of question involves words where letters are substituted with other letters based on a specific pattern or rule to create a code. Your task is to identify the coding pattern or rule and then answer the subsequent questions based on this code. The challenge is to figure out the pattern or rule used in the coding. Once you understand how the coding works, you can solve related questions.

QUESTIONS

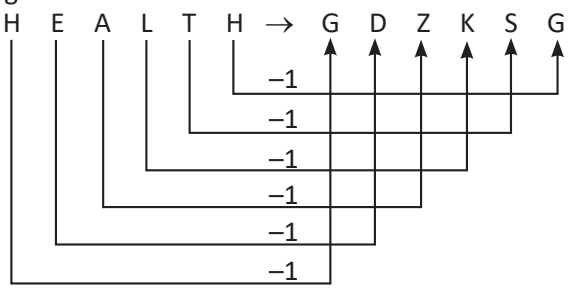
Q1. In a certain code language the word HEALTH is written as GDZKSG. How will the word ZINC be written in that language?

(a) YHMB (b) AJOD
(c) YJNC (d) AIOD

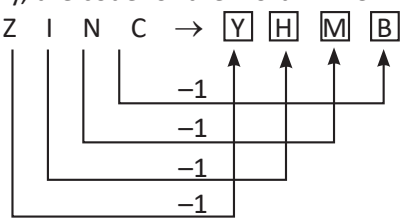
Ans: (a)

Explanation:

We can clearly observe that in this code by the figure given below:



Similarly, the code for the word "ZINC" will be:



Q2. In a certain code, FISH is written as ILVK, how is ROAD written in that code?

(a) URDG (b) USEH
(c) TRCF (d) SQBE

Ans: (a)

Explanation:

We observe that,

F	F + 3	I
I	I + 3	L
S	S + 3	V
H	H + 3	K

Similarly, ROAD will be written as URDG.

R	R + 3	U
O	O + 3	R
A	A + 3	D
D	D + 3	G

Q3. In a certain code language, 'GIVE' is written as 'VIEG' and 'OVER' is written as EVRO'. How will 'DISK' be written in that same code?

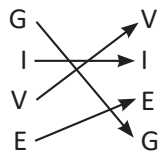
(a) SIDK (b) KISD
(c) KDSI (d) SIKD

Ans: (d)

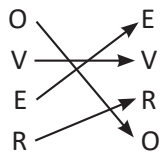
Explanation:

We need to decode the pattern, consider the images given below:

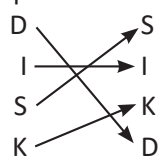
The code for GIVE is VIEG



And by observing the code for OVER



By observing this pattern the code for DISK will be



Q4. If 'ZERO' is written as 'CHUR', then how is 'PLAYER' written? **(UPSC CSAT 2013)**

(a) SOCACT (b) SODBGT
(c) SODBHT (d) SODBHU

Ans: (d)

Explanation:

Here, we are required to decode the pattern.

ZERO is written as CHUR.

We can see that the underlying pattern is very simple, as

Z + 3 = C, E + 3 = H, R + 3 = U, O + 3 = R

We will follow the same pattern to code PLAYER.

P + 3 = S, L + 3 = O , A + 3 = D ,

Y + 3 = B ,E + 3 = H , R + 3 = U

So, the required code is SODBHU.

Q5. If the order of the letters in the English alphabet is reversed and each letter represents the letter whose position it occupies, then which one of the following represents 'LUCKNOW'?

(UPSC CSAT 2022)

(a) OGXPMLD (b) OGXQMLE
(c) OFXPMLE (d) OFXPMLD

Ans: (d)

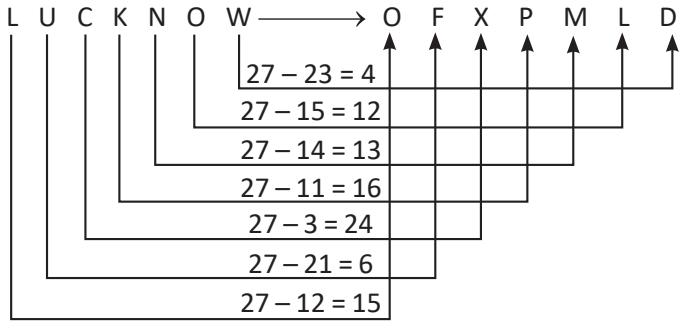
Explanation:

According to the condition given in the question we need to find the opposite letter to the letters given in the word LUCKNOW.

To understand the concept of opposite letter: opposite letter of A is Z and B is Y

Opposite Letter Position = 27 – Letter Position

So, in the case of LUCKNOW,



The word associated to LUCKNOW is "OFXPMLD"

Q6. In the English alphabet, the first 4 letters are written in the opposite order, and the next 4 letters are written in the opposite order and so on; and at the end, Y and Z are interchanged. Which will be the fourth letter to the right of the 13th letter?

(UPSC CSAT 2021)

(a) N (b) T

(c) H (d) I

Ans: (b)

Explanation:

In the English alphabet, the first 4 letters are written in opposite order, and the next 4

letters are written in opposite order and so on; and at the end Y and Z are interchanged

The English alphabet:

ABCD EFGH IJKL MNOP QRST UVWX YZ

New arrangement:

DCBA HGEF LKJI PONM TSRQ XWVU ZY

The 13th letter in the given arrangement is P

Now, 4th letter to the right of 13th letter = T.

Q7. In a code language 'MATHEMATICS' is written as 'LBSIDNZUHDR'. How is CHEMISTRY' written in that code language? **(UPSC CSAT 2021)**

(a) DIDLHRSSX (b) BIDNHTSSX

(c) BIDLHTSSX (d) DGFLIRUQZ

Ans: (b)

Explanation:

In a certain code language, MATHEMATICS is written as LBSIDNZUHDR.

M	–1	L
A	+1	B
T	–1	S
H	+1	I
E	–1	D
M	+1	N
A	–1	Z
T	+1	U
I	–1	H
C	+1	D
S	–1	R

C	–1	B
H	+1	I
E	–1	D
M	+1	N
I	–1	H
S	+1	T
T	–1	S
R	+1	S
Y	–1	X

Q8. What is the missing term @ in the following?
ACPQ : BESU : MNGI : @ **(UPSC CSAT 2020)**

(a) NPJL (b) NOJM

(c) NPIL (d) NPJM

Ans: (d)

Explanation:

In the question: 1st letter

A is related to B; B = A + 1 by same procedure M will be related to M + 1 = N

2nd letter:

C is related to E; E = C + 2 by same procedure N will be related to N + 2 = P

3rd letter:

P is related to S; S = P+3 by same procedure G will be related to G + 3 = J

4th letter:

Q is related to U; U = Q + 4 by same procedure I will be related to I + 4 = M

Hence, MNGI is related to NPJM

Q9. If LSJXVC is the code for MUMBAI the code for DELHI is **(UPSC CSAT 2018)**

(a) CCIDD (b) CDKGH

(c) CCJFG (d) CCIFE

Ans: (a)

Explanation:

Given that the code for MUMBAI is LSJXVC.

M	L	M – 1 = L
U	S	U – 2 = S
M	J	M – 3 = J
B	X	B – 4 = X
A	V	A – 5 = V
I	C	I – 6 = C

D	C	D – 1 = C
E	C	E – 2 = C
L	I	L – 3 = I
H	D	H – 4 = D
I	D	I – 5 = D

Hence, CCIDD is the code for DELHI.

Q10. A military code writes SYSTEM as SYSMET and NEARER as AENRER. Using the same code, FRACTION can be written as: (UPSC CSAT 2016)

(a) CARFTION (b) FRACNOIT

(c) NOITCARF (d) CARFNOIT

Ans: (d)

Explanation:

In a military code,

SYSTEM – SYSMET

$\Rightarrow$ SYS / TEM = SYS / MET

NEARER – AENRER

$\Rightarrow$ NEA / RER – AEN / RER

We can clearly see that in the code first half is reversed and then the second half is Reversed.

So, FRACTION is written as CARFNOIT

FRAC / TION – CARF / NOIT

TYPE 2: DIRECT LETTER CODING

In a direct letter coding system, each letter in a word is substituted with a corresponding code letter, maintaining the same sequence. This method is a simple, direct substitution where each letter in the original word is replaced by its designated code letter in the same position. Let's explore some questions to better understand how direct letter coding works.

QUESTIONS

Q11. In a certain Code 'SHARK' is written as 'AZFMG' and 'MOBILE' is written as 'TNRSPJ'. How will 'BLAME' be written in that same code language?

(a) TSFRJ (b) RPFTJ

(c) NJFTP (d) YSFG

Ans: (b)

Explanation:

Using direct coding method given in the table:

Letter	Code	Letter	Code
S	A	M	T
H	Z	O	N
A	F	B	R
R	M	I	S
K	G	L	P
		E	J

By using the table we can conclude that

Code for B is R

Code for L is P

Code for A is F

Code for M is T

Code for E is J

Hence, the code for "BLAME" is RPFTJ.

Q12. In a certain Code 'SHEEP' is written as 'GPXXQ' and 'BLEAT' is written as 'HPXTN'. How will 'SLATE' be written in that same code language?

(a) GPTNX (b) GPNTX

(c) GPXNT (d) GPXTN

Ans: (a)

Explanation:

Using direct coding method given in the table:

letter	code	letter	code
S	G	B	H
H	P	L	P
E	X	E	X
E	X	A	T
P	Q	T	N

By using the table we can conclude that

Code for S is G

Code for L is P

Code for A is T

Code for T is N

Code for E is X

Hence, code for SLATE is GPTNX

TYPE 3: NUMBER/SYMBOL CODING

In this type of question, words are given specific numerical codes, or numbers are represented by alphabetical code letters. The key here is to understand how words are translated into numbers or how numbers are converted into letters based on a certain rule. Let's look at some questions to grasp this concept better.

QUESTIONS

Q13. The letters from A to Z are numbered from 1 to 26 respectively. If IHG = 1974 and FED = 1308, then what is CBA equal to?

(a) 246 (b) 468

(c) 642 (d) 864

Ans: (c)

Explanation:

The numerical values of alphabets are

(by using formula)

IHG = 987, FED = 654, CBA = 321

According to the question,

IHG = 987 × 2 = 1974

FED = 654 × 2 = 1308

So, CBA = 321 × 2 = 642

Q14. If "O" is coded as "30" and "CAT" is coded as "48" then how will "FOOTBALL" be coded?

(a) 150 (b) 160

(c) 166 (d) 170

Ans: (c)

Explanation:

The numerical value of O is 15.

O is coded as 30 = 15 × 2

The numerical value of each alphabet in CAT is

C = 3, A = 1 and T = 20

CAT is coded as 48 = (20 + 3 + 1) × 2 = 24 × 2

Now, the numerical value of each alphabet in FOOTBALL is F = 6, O = 15, T = 20, B = 2, A = 1 and L = 12.

So, FOOTBALL is coded as

(6 + 15 + 15 + 20 + 2 + 1 + 12 + 12) × 2 = 83 × 2 = 166

Q15. In a certain code BROTHER is written as $&53@4& and DREAM is written as 9&47*. How is THREAD written in that code?

(a) *@34&7 (b) 3@&479

(c) 5@4&79 (d) 4*3@47

Ans: (b)

Explanation:

We can observe that each alphabet has a symbol/ letter associated with it.

Letter	B	R	O	T	H	E	R	D	A	M
Code	$	&	5	3	@	4	&	9	7	*

Similarly, THREAD will be written as 3@&479.

Q16. If RAMON is written as 12345 and DINESH as 675849 then HAMAM will be written as

(UPSC CSAT 2018)

(a) 92233 (b) 92323

(c) 93322 (d) 93232

Ans: (b)

Explanation:

The decoding is shown in the figure below:

R	A	M	O	N	D	I	N	E	S	H
1	2	3	4	5	6	7	5	8	4	9

Now HAMAM can be coded as:

H	A	M	A	M
↓	↓	↓	↓	↓
9	2	3	2	3

Hence, the code for HAMAM is 92323.

TYPE 4: DECIPHERING MESSAGE WORD CODING

In this type of question, analyse codes by selecting any two messages that share a common word or numeral. The code that is common to these messages represents that particular word or numeral. By repeating this process for all possible combinations of two messages, you can decode the entire message and determine the codes for each individual word or numeral. Let's look at some examples to get a clearer understanding of how to approach these questions.

QUESTIONS

Q17. In a certain code language, 'ma pa na' means 'I am male' and 'ma sa na' means ' I am female'. Which of the following means 'male'?

(a) ma (b) pa

(c) na (d) sa

Ans: (b)

Explanation:

In a given code,

ma pa na → I am male

ma sa na → I am female

Here, 'ma' and 'na' are common in both the codes and 'I' and 'am' are common in both the messages.

Hence, the code for male is 'pa'.

Q18. In a given code, '786' means 'go very fast', '958' means 'fast and slow' and '645' means 'go and work'. Which of the following is code for 'very'?

(a) 7 (b) 8

(c) 6 (d) 9

Ans: (a)

Explanation:

In a given code,

786 → go very fast ...(i)

958 → fast and slow ...(ii)

645 → go and work ...(iii)

In equation (i) and (ii), 8 and fast are common.

So, the code for 'fast' is 8.

In equation (i) and (iii), 6 and go are common.

So, the code for 'go' is 6.

Hence, from equation (i), the code for 'very' is 7.

Q19. In a certain code, '256' means 'red colour chalk', '589' means 'green colour flower' and 254' means 'white colour chalk'. The digit in the code that indicates white' is **(UPSC CSAT 2017)**

(a) 2 (b) 4

(c) 5 (d) 8

Ans: (b)

Explanation:

In a certain code:

256 → red colour chalk ...(i)

589 → green colour flower ...(ii)

254 → white colour chalk ...(iii)

Common between equations (i) and (ii) is: 5 and colour.

⇒ 5 means colour

Common between equations (i) and (iii) is: 2/5 and colour/chalk

⇒ 2 means chalk.

So, from equation (iii):

4 means white because 2 means chalk and

5 means colour.

TYPE 5: SUBSTITUTION CODING

Substitution coding is a type of coding-decoding question where specific words are replaced with other words or symbols, acting as their substitutes. The challenge lies in identifying the relationship or rule that connects the original words to their substitutes. Let's go through some examples to better understand how to tackle these kinds of questions.

QUESTIONS

Q20. If 'white' is called 'red', 'red' is called 'green', 'green' is called 'white', 'white is called 'blue' and 'blue' is called 'orange' then what would be the colour of the sky?

(a) blue (b) orange

(c) red (d) white

Ans: (b)

Explanation:

We know that the colour of the sky is blue and 'blue' is called 'orange'.

So, the colour of the sky is orange.

Q21. If ' soap' is called 'ink', 'ink' is called 'honey', 'honey' is called 'pen' 'pen' is called 'pencil' and 'pencil' is called 'butter', then what do we use in pen?

(a) ink

(b) pencil

(c) honey

(d) butter

Ans: (c)

Explanation:

We know that we use ink in pen and 'ink' is called 'honey'.

So, we use 'honey' in pen

Q22. The local terminology for 'earth', 'tree', 'food', 'water' and 'star' on another planet is 'food', 'water', 'star', 'tree' and 'earth' respectively. If someone is hungry there, then what would he eat?

(a) star

(b) food

(c) earth

(d) tree

Ans: (a)

Explanation:

On another planet:

earth → food

tree → water

food → star

water → tree

stars → earth

We know that if a person is hungry, he eats food and food is called star there.

So, he eats star.

PRACTICE QUESTIONS

1. In a certain code language, the word HEALTH is written as GDZKSG. How will the word ZINC be written in that language?
(a) YHMB (b) AJOD
(c) YJNC (d) AIOD

2. In a certain code BROTHER is written as $&53@4& and DREAM is written as 9&47*. How is THREAD written in that code?
(a) 3@34&7 (b) 3@&479
(c) 4@4&79 (d) 4*3@47

3. In a certain code language, 'sa ra ga' means 'dogs are barking', 'ra jo ma' means 'dogs and horses' and 'mo sa ko'means 'donkeys are mad'. Which word in the language means 'barking'?
(a) ga (b) ra
(c) Jo (d) sa

4. If a banana is called 'sweet', sweet is called 'soap', soap is called 'pen', pen is called 'honey', and honey is called 'sky'. Which of the following is used for washing clothes?
(a) Honey (b) Sweet
(c) Pen (d) Sky

5. In a certain code, DELHI is written as 38, how is MUMBAI written in that code?
(a) 29 (b) 39
(c) 49 (d) 59

6. In a certain code, FISH is written as ILVK, how is ROAD written in that code?
(a) URDG (b) UREH
(c) TRDG (d) SQBE

7. If "O" is coded as "30" and "CAT" is coded as "48", then how will "FOOTBALL" be coded?
(a) 150 (b) 160
(c) 166 (d) 170

8. In a code language 'EINSTEIN' is written as 'DJMTSFHO'. How is 'RUTHERFORD' written in that code language?
(a) SVUIFSGPSE (b) SWUJDTFQTD
(c) QUSJDSDPRC (d) QVSIDSEPQE

9. The letters from A to Z are numbered from 1 to 26 respectively. If IHG = 1974 and FED = 1308, then what is CBA equal to?
(a) 246 (b) 468
(c) 642 (d) 864

10. If each alphabet from A to Z is assigned a prime number in increasing order, then PET will be written as:
(a) 471167 (b) 471371
(c) 531367 (d) 531171

11. If LOUD = 13, CLOUD = 11 and LEG = 8, then MONSOON =?
(a) 9 (b) 14
(c) 15 (d) 17

12. If KITE is written as 2025, then what will be the code of REST in the same language?
(a) 3721 (b) 3844
(c) 3969 (d) 4225

13. If X =1728 and V = 1331, then how would J be written in that code?
(a) 216 (b) 124
(c) 512 (d) 125

14. If AMIT is written as 1492, then in the same code RAMA would be written as?
(a) 1419 (b) 4141
(c) 9141 (d) 1149

15. In a certain code language 'IT' is written as 'HJSU', then how will 'SUN' be written in that language?
(a) RTTOMY (b) RTTOVM
(c) RTTVOM (d) RTTVMO

16. If ACCENT is coded as YEAGLV, then DIRECT will be coded as?
(a) BKPGAV (b) FKTGEV
(c) FGTCER (d) BGPCAR

17. In a code language if 'APPEAL' is written as '367683' and 'PLAY' is written as '8369' then how will 'PEARL' be written?
(a) 36874 (b) 36148
(c) 78633 (d) 36789

18. If DENSE is coded as FRODE and COMPANY is coded as ZMBONND, then CLARIFY will be coded as
(a) EDTOJME (b) ZEJSBMD
(c) ZEJQBKD (d) ZDKSBKD

Directions (Q19-Q22):

In a certain code,

'cum num dum' means 'how are you'

'tum num com' means 'we are happy'

'tum pum dum' means 'we and you'

19. What is the code for 'happy'?

(a) cum (b) com

(c) pum (d) num

20. What is the code for 'how'?

(a) cum (b) tum

(c) pum (d) com

21. What is the code for 'you are happy'?

(a) cum com num (b) tum num com

(c) pum cum dum (d) dum num com

22. What is the code for 'how you happy'?

(a) pum cum dum (b) cum dum com

(c) num dum num (d) com cum pum

Answers

1. (*a*)	2. (*b*)	3. (*a*)	4. (*c*)	5. (*d*)	6. (*a*)	7. (*c*)	8. (*d*)	9. (*c*)	10. (*d*)
11. (*c*)	12. (*b*)	13. (*d*)	14. (*c*)	15. (*d*)	16. (*a*)	17. (*a*)	18. (*c*)	19. (*b*)	20. (*a*)
21. (*d*)	22. (*b*)								

Explanations

1. (a)

Explanation:

We can clearly observe that in this code,

H	H – 1	G
E	E – 1	D
A	A – 1	Z
L	L – 1	K
T	T – 1	S
H	H – 1	G

Similarly,

Z	Z – 1	Y
I	I – 1	H
N	N – 1	M
C	C – 1	B

Thus, ZINC will be written as YHMB.

2. (b)

Explanation:

We can observe that each alphabet has a symbol/ letter associated with it.

L - Letter; C - Code

L	B	R	O	T	H	E	R	D	A	M
C	$	&	5	3	@	4	&	9	7	*

Similarly, THREAD will be written as 3@&479.

3. (a)

Explanation:

In a certain code language,

'sa ra ga' means 'dogs are barking' ...(i)

'ra jo ma' means 'dogs and horses' ...(ii)

'mo sa ko', means 'donkeys are mad' ...(iii)

From equation (i) and (ii), we can observe that 'ra' and 'dogs' are common in both the cases.

It means 'ra' is coded for 'dogs'.

From equation (i) and (iii), we can observe that 'sa' and 'are' are common in both the cases.

This means 'sa' is coded for 'are'.

So, from equation (i) we conclude that 'ga' is coded for 'barking'.

4. (c)

Explanation:

We know that soap is used for washing clothes. But, soap is called 'pen'.

So, 'pen' is used for washing clothes.

5. (d)

Explanation:

In DELHI, the numerical value assigned to each alphabet is:

D = 4, E = 5, L = 12, H = 8 and I = 9

Now, 4 + 5 + 12 + 8 + 9 = 38

Similarly, in case of MUMBAI:

M = 13, U = 21, M = 13, B = 2, A = 1 and I = 9

So, 13 + 21 + 13 + 2 + 1 + 9 = 59

∴ MUMBAI is coded as 59.

6. (a)

Explanation:

We observe that,

F	F + 3	I
I	I + 3	L
S	S + 3	V
H	H + 3	K

Similarly,

R	R + 3	U
O	O + 3	R
A	A + 3	D
D	D + 3	G

Similarly, ROAD will be written as URDG

7. (c)

Explanation:

The numerical value of O is 15.

O is coded as 30 i.e. 15 * 2

The numerical value of each alphabet in CAT is:

C = 3; A = 1 and T = 20

CAT is coded as 48 = (3 + 1 + 20) × 2 = 24 × 2

Now, the numerical value of each alphabet in FOOTBALL is:

F = 6; O = 15; T = 20; B = 2; A = 1 and L = 12.

∴ 6 + 15 + 15 + 20 + 2 + 1 + 12 + 12 = 83

So, FOOTBALL is coded as 83 × 2 = 166

8. (d)

Explanation:

In a code language 'EINSTEIN' is written as 'DJMTSFHO'.

The pattern used in the above code is as follows:

E	E – 1	D
I	I + 1	J
N	N – 1	M
S	S + 1	T
T	T – 1	S
E	E + 1	F
I	I – 1	H
N	N + 1	O

Similarly,

R	R – 1	Q
U	U + 1	V
T	T – 1	S
H	H + 1	I
E	E – 1	D
R	R + 1	S

F	F – 1	E
O	O + 1	P
R	R – 1	Q
D	D + 1	E

Thus, 'RUTHERFORD' is written as 'QVSIDSEPQE'

9. (c)

Explanation:

The numerical values corresponding to given alphabets are:

IHG = 987

FED = 654

CBA = 321

According to the question,

IHG = 2 *987=1974

FED = 2*654 = 1308

So, CBA = 2*321=642

10. (d)

Explanation:

We have to assign a prime number to each alphabet.

A	B	C	D	E	F	G	H	I	J	K	L	M
2	3	5	7	11	13	17	19	23	29	31	37	41
N	O	P	Q	R	S	T	U	V	W	X	Y	Z
43	47	53	59	61	67	71	73	79	83	89	97	101

We can observe that

P = 53, E =11 and T = 71

So, PET will be written as 531171.

11. (c)

Explanation:

We can observe in the given code that the result is the average of numerical values assigned to each alphabet.

Given, LOUD = 13 and number of letters = 4

L = 12, O = 15, U = 21 and D = 4

$$\text{Average} = \frac{12 + 15 + 21 + 4}{4} = \frac{52}{4} = 13$$

In case of CLOUD, C = 3 and number of letters = 5

$$\text{Average} = \frac{3 + 12 + 15 + 21 + 4}{5} = \frac{55}{5} = 11$$

Also, LEG = 8 and number of letters = 3

L = 12, E = 5 and G = 7

$$\text{Average} = \frac{12 + 5 + 7}{3} = \frac{24}{3} = 8$$

Similarly, we have to find the code for MONSOON

Here, the number of letters = 7

M = 13, O = 15, N = 14 and S = 19

$$\text{Average} = \frac{13 + 15 + 14 + 19 + 15 + 15 + 14}{7} = \frac{105}{7} = 15$$

So, the code for MONSOON is 15.

12. (b)

Explanation:

We observe that the code is the square of sum of the numerical value assigned to each alphabet.

Given, KITE = 2025

We know, K = 11, I = 9, T = 20 and E = 5

$(11+ 9 + 20 + 5)^2 = 45^2 = 2025$

Similarly, in case of REST,

R = 18, E = 5, S = 19 and T = 20

$(18 + 5 + 19 + 20)^2 = (62)^2 = 3844$

So, the code for REST is 3844

13. (d)

Explanation:

We can observe that the code is the cube of half of the numerical value assigned to the given alphabet.

Numerical value of X = 24 and V = 22

We have $X = 1728 = \left(\frac{24}{2}\right)^3 = 12^3$

And $V = 1331 = \left(\frac{22}{2}\right)^3 = 11^3$

Similarly, the numerical value of J is 10

So, the code for $J = \left(\frac{10}{2}\right)^3 = 5^3 = 125$

14. (c)

Explanation:

We can observe that the numerical value is assigned to each alphabet from 1 to 9 and then repeat.

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8

Given, AMIT – 1492

Similarly, RAMA – 9141

15. (d)

Explanation:

We can observe that in the given code language,

IT – HJSU

The alphabet before and after I are H and J respectively

The alphabet before and after T are S and U respectively

Similarly, in case of SUN:

RST, TUV and MNO

So, SUN will be written as RTTVMO.

16. (a)

Explanation:

We can observe the following pattern

A	A – 2	Y
C	C + 2	E
C	C – 2	A
E	E + 2	G
N	N – 2	L
T	T + 2	V

Similarly,

D	D – 2	B
I	I + 2	K
R	R – 2	P
E	E + 2	G
C	C – 2	A
T	T + 2	V

So, DIRECT will be coded as BKPGAV

17. (a)

Explanation:

We are given that,

APPEAL = 367683 and PLAY = 8369

We can clearly see that in case of APPEAL, there are 2 P's and 2 A's, and 3 and 6 are coming two times each.

So, A/P = 3/6

E/L = 7/8.

From PLAY = 8369, we can say that L = 8 and Y = 9

So, E – 7

In case of PEARL, there should be 3, 6, 7, 8 and for R there should be another letter.

Now, we go by the options.

In option (a) and (d), 3678 is coming but in option (d) there is 9 but 9 corresponds to Y.

So, there should be another digit for R.

18. (c)

Explanation:

We can observe that in the given code, DENSE – FRODE and COMPANY – ZMBONND

		Reverse					Reverse
D	D + 1	E	F	C	C + 1	D	Z
E	E – 1	D	R	O	O – 1	N	M
N	N + 1	O	O	M	M + 1	N	B
S	S – 1	R	D	P	P – 1	O	O
E	E + 1	F	E	A	A + 1	B	N
				N	N – 1	M	N
				Y	Y + 1	Z	D

Similarly,

			Reverse Code
C	C+ 1	D	Z
L	L – 1	K	E
A	A + 1	B	J
R	R – 1	Q	Q
I	I + 1	J	B
F	F – 1	E	K
Y	Y + 1	Z	D

Similarly, CLARIFY will be coded as ZEJQBKD

19. (b)

Explanation:

We have,

'cum num dum' means 'how are you' ...(i)

'tum num com' means 'we are happy' ...(ii)

'tum pum dum' means 'we and you' ...(iii)

From equation (i) and (ii), are and num is common.

So, are = num

From equation (ii) and (iii), 'we' and 'tum' is common.

So, we = tum

From equation (i) and (iii), 'you' and 'dum' is common.

So, you = dum

In equation (i), 'num' means 'are' and 'dum' means 'you'.

So, how = cum

In equation (ii), 'tum' means 'we' and 'num' means 'are'.

So, happy = com

In equation (iii), 'tum' means 'we' and 'dum' means 'you'.

So, and = pum

how	cum	we	tum
are	num	and	pum
you	dum	happy	com

So, happy means com.

20. (a)

Explanation:

how	cum	we	tum
are	num	and	pum
you	dum	happy	com

From the above table, we can observe that 'cum' means 'how'.

21. (d)

Explanation:

how	cum	we	tum
are	num	and	pum
you	dum	happy	com

From above table, we can observe that 'you are happy' is coded as 'dum num com'.

22. (b)

Explanation:

how	cum	we	tum
are	num	and	pum
you	dum	happy	com

From above table, we can observe that 'how you happy' is coded as 'cum dum com'.

Clock

4

INTRODUCTION

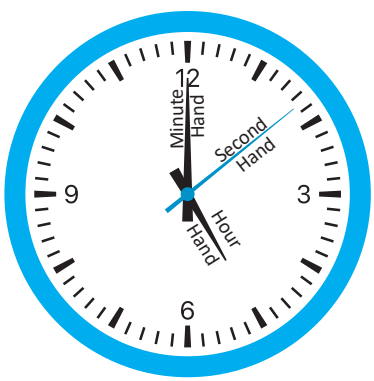
In this chapter, we'll explore how a clock works. It's a tool that shows us what time it is. With numbers and moving hands, it tells us about hours, minutes, and sometimes even seconds. The aim of this chapter is to learn the movements of the clock hands and understand the significance of the angles they form.

VARIOUS CATEGORIES OF QUESTIONS ENCOMPASSED IN THIS CHAPTER INCLUDE

- Angle Between the Hands of the Clock
- Position of Hands of the Clock
- Faulty Clock
- Time Gained or Lost by the Clock

The face of a clock is split into 12 parts for hours and 60 smaller parts for minutes. There are two hands on a clock: the big hand, called the minute hand, tells us the minutes; the small hand, known as the hour hand, tells us the hour. This design helps us read the time easily.

THE FUNDAMENTAL STRUCTURE OF A CLOCK IS OUTLINED AS FOLLOWS:



The clock represents three things i.e., **second, minute and hour.** The minute is a unit of time equal to 1/60th of an hour or 60s i.e., **1 min = 60 sec.**

An hour is a unit of measurement for the time duration of 60 min or 3600 s.

i.e., **1 h = 60 min = 3600 sec**

RELATIVE MOVEMENT OF HANDS OF CLOCK

Concept	Detail	Explanation
Movement Direction	Clockwise movement	Both the hour and minute hands move in a clockwise direction.
Speed Comparison	Relative speeds of the hands	The minute hand completes one full circle (360°) in 60 minutes, while the hour hand takes 12 hours.
Speed Ratio	Minute hand vs. Hour hand speed	The minute hand is 12 times faster than the hour hand.
Minute Spaces	Division of clock face	The clock face is divided into 60 equal minute spaces.
Hour Hand Movement	Progress of the hour hand	In 60 minutes, the hour hand moves from one number to the next (5 minute spaces).
Minute Hand Movement	Progress of the minute hand	The minute hand completes one full circle, passing all 12 numbers, in 60 minutes (60 minute spaces).
Gaining Time	Minute hand's gain over hour hand	Every hour, the minute hand gains 55 minute spaces over the hour hand (60 – 5 = 55 minutes spaces).
Gaining Rate	Time taken for the minute hand to gain over the hour hand	The minute hand gains 1 minute over the hour hand every $\frac{60}{55}$ or $\frac{12}{11}$ minutes.

TYPES OF QUESTIONS

In different competitive exams, they might ask different kinds of questions based on clocks. We've sorted these questions into 4 types.

TYPE 1: ANGLE BETWEEN THE CLOCK HANDS

This type of question asks you to find the angle between the hour and minute hands of a clock at a given time. Understanding how angles on a clock work is key to solving these problems.

A clock face is round like a circle, and the whole circle adds up to 360 degrees. When the minute hand moves all the way around the clock, from the top (12) back to the top, it goes through a full circle, or .

The clock has 12 numbers on its face. The distance between two consecutive numbers is called an **hour space** and it is equal to 30°. The minute hand of the clock moves 60-minute spaces when it completes one full revolution around the clock dial.

It means, 60 min spaces = 360°

$$\Rightarrow 1 \text{ min space} = \frac{360^\circ}{60} = 6^\circ$$

When the hour hand completes a full circle, then it crosses 12 h spaces of the dial.

It means, 12 h spaces = 360°

$$\Rightarrow 1\text{h space} = \frac{360^\circ}{12} = 30^\circ$$

$$\Rightarrow 60 \text{ min} = 30^\circ$$

$$\Rightarrow 1 \text{ min} = \frac{1^\circ}{2}$$

Thus, the angle traced **per minute** by:

- **Second hand** = 360°
- **Minute hand** = 6°
- **Hour Hand** = $\frac{1}{2}$

Let's look at a few Questions to understand this concept.

QUESTIONS

Q1. When the minute hand covers a distance of 1h 30 min, then what is the angular distance covered by it?

(a) 310° (b) 192°

(c) 540° (d) 420°

Ans: (c)

Explanation:

Total minute spaces = 1h + 30 min =

60 min + 30 min = 90 min

1 Minute space = 6°

90 Minute space = 6° × 90 = 540°

Q2. What is the angle traced by hour hand in 30 min?

(a) 17.5° (b) 18°

(c) 16.5° (d) 15°

Ans: (d)

Explanation:

Angle traced by hour hand in 1 min = (1/2)°

The angle traced by hour hand in

30 min = 30 (1/2)° = 15°

Q3. Between 6 PM and 7 PM the minute hand of a clock will be ahead of the hour hand by 3 minutes at **(UPSC CSAT 2015)**

(a) 6 : 15 PM (b) 6 : 18 PM

(c) 6 : 36 PM (d) 6 : 48 PM

Ans: (c)

Explanation:

Option (a) is not correct: hour hand will be between 6 and 7, minute hand will be at 3 so hour hand is ahead.

Option (b) is not correct: hour hand will be between 6 and 7, minute hand will be between 3 and 4 so hour hand is ahead.

Option (d) is not correct: hour hand will be between 6 and 7, minute hand will be between 9 and 10 so minute hand is ahead of hour hand more than 3 minutes even more than 10 minutes.

TYPE 2: THE POSITIONING OF CLOCK HANDS

These questions involve determining the positions of the clock hands based on given conditions. To do this, remember that the big hand is for minutes which moves faster and the little hand is for hours which moves slower. Pay attention to the details about how they move compared to each other to solve these questions.

The general formula to find the time when the minute and hour hands are *t minutes* apart between *x* and *x + 1* o'clock is given by:

$$\text{Time} = \frac{(5x \pm t) \times 12}{11} \text{ minutes past x.}$$

Here, *x* is the hour and *t* is the minute spacing between the hour and minute hand. The '+' sign is used when the minute hand is ahead, and the '-' sign is used when the hour hand is ahead.

TABLE: CLOCK HAND POSITIONS AND THEIR FREQUENCIES

Details	Hands Forming Right Angles	Hands Aligning in a Straight Line (i) Hands Coincide	Hands Aligning in a Straight Line (ii) Opposite Positions
Condition	Right Angles	Coincide	Opposite Positions
Angle Between Hands	90°	0°	180°
Minute Spaces	15 minutes	0 minutes	30 minutes
Time Calculation Formula	$\frac{(5x \pm 15) \times 12}{11}$ minutes past x.	$\frac{60\ x}{11}$ minutes past x.	$\frac{(5x \pm 30) \times 12}{11}$ minutes past x.
Frequency in 12 Hours	22 times	11 times	11 times
Frequency in 24 Hours	44 times	22 times	22 times

Note: If both hands start moving together from the same position, they will coincide every $\frac{720}{11}$ minutes, approximately 65.45 minutes.

The questions discussed below will help us more to understand these concepts.

QUESTIONS

Q4. At what time between 2 O'clock and 3 O'clock will the hands of the clock be together?

(a) $\frac{115}{11}$ min past 2 (b) $\frac{118}{11}$ min past 2

(c) $\frac{114}{11}$ min past 2 (d) $\frac{120}{11}$ min past 2

Ans: (d)

Explanation:

In the given question, x = 2 and (x + 1) = 3

Required answer = $\frac{60x}{11}$ min past 2

= $\frac{60\ x\ 2}{11}$ min past 2

= $\frac{120}{11}$ past 2

Q5. At what time between 8 O'clock and 9 O'clock, will the hands of a clock be in the same straight line but not together?

(a) $\frac{120}{11}$ min past 8 (b) $\frac{111}{11}$ min past 8

(c) $\frac{115}{11}$ past 8 (d) $\frac{114}{11}$ min past 8

Ans: (a)

Explanation:

In the given question, x = 8 and (x + 1) = 9

According to the formula.

Hands will be in the same straight line at $\frac{(5x - 30) \times 12}{11}$ min past x = $\frac{(5 \times 8 - 30)\ 12}{11}$ min past 8

= $\frac{(40 - 30) \times 12}{11}$ min past 8

= $\frac{10 \times 12}{11}$ min past 8

= $\frac{120}{11}$min past 8

Q6. At what time between 4 O'clock and 5 O'clock, will the hands of a clock be 4 min apart?

(a) $\frac{297}{11}$ past 4 and 12 .5 min past 4

(b) $\frac{290}{11}$ min past 4 and 13.4 min past 4

(c) $\frac{288}{11}$min past 4 and 17.4 min past 4

(d) $\frac{292}{11}$ min past 4 and 14.4 min past 4

Ans: (c)

Explanation:

Given that, x = 4 and (x + 1) = 5 and t = 4

Then, according to the formula,

$\frac{(5x \pm t) \times 12}{11} = \frac{(5 \times 4 \pm 4) \times 12}{11}$ min = $\frac{(20 \pm 4) \times 12}{11}$ min

Separating plus/minus sign,

= $\frac{(20 + 4) \times 12}{11}$ min past and $\frac{(20 - 4) \times 12}{11}$ min past 4

= $\frac{(24 \times 12)}{11}$ past 4 and $\frac{16 \times 12}{11}$ min past 4

= $\frac{288}{11}$ min past 4 and 17.4 min past 4

Q7. Consider the following statements:

I. Between 3:16 p.m. and 3:17 p.m., both hour hand and minute hand coincide.

II. Between 4:58 p.m. and 4:59 p.m., both minute hand and second hand coincide.

Which of the above statements is/are correct? **(UPSC CSAT 2022)**

(a) 1 only (b) 2 only

(c) Both 1 and 2 (d) Neither 1 nor 2

Ans: (c)

Explanation:

Statement-I is correct: At 3 o'clock, the minute hand is 15 minute spaces apart from the hour hand.

To coincide, it must gain 15 minutes.

We know that, 55 minutes are gained in 60 minutes. (when minute hand complete a round (60 minutes) hour hand completes just 30 degrees (5 minutes).

So, 15 minutes are gained in $\frac{60}{55} \times 15 = \frac{180}{11} = 16.36$ minutes

Hence, hour hand and minute hand will coincide at 3:16:36; This is between 3:16 pm and 3:17 pm.

Hence, statement-I is correct.

Statement-II is correct: every minute second hand cross the minute hand so it will do the same sometime between 4:58 p.m. and 4:59 p.m. hence statement-II is also correct.

Q8. At which one of the following times, do the hour hand and the minute hand of the clock make an angle of 180° with each other? **(UPSC CSAT 2021)**

(a) At 7:00 hours

(b) Between 7:00 hours and 7:05 hours

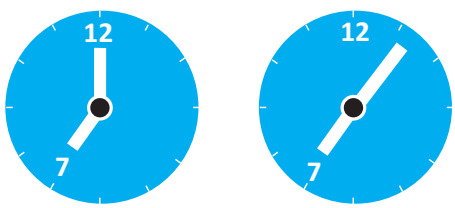
(c) At 7:05 hours

(d) Between 7:05 hours and 7:10 hours

Ans: (d)

Explanation:

In the given figure, two clocks are shown. It is clearly visible that around 7:06 or 7:07, the angle between the hour hand and the minute hand is around 180˚.



Hence, option D is the correct answer.

TYPE 3: FAULTY CLOCKS

A clock that doesn't keep time correctly is known as a faulty clock. If it shows a time that is later than the real-time, it's called "fast." **For example,** if the real-time is 6:00 but the clock shows 6:10, it's 10 minutes fast. If the clock shows an earlier time than the actual time, it's called "slow." Like, if it's really 6:00 but the clock says 5:50, it's 10 minutes slow.

Normally, the hands of a clock align at specific intervals (every $\frac{65\times5}{11}$ minutes). But if a clock is fast or slow, this alignment won't happen at these usual times.

Questions about faulty clocks usually ask you to figure out the correct time or when the clock will show the wrong time. Sometimes, they also ask you to compare the times on two different faulty clocks.

QUESTIONS

Q9. Two clocks are set correctly at 9 am on Monday. Both the clocks gain 3 min and 5 min respectively in an hour. What time will the second clock register, if the first clock which gains 3 min in an hour shows the time as 30 min past 7 pm on the same day?

(a) 7:47 pm (b) 7:51 pm

(c) 7:41 pm (d) 7:30 pm

Ans: (b)

Explanation:

According to the question,

First clock gains 3 min/h and second clock gains 5 min/h

So, the difference in minutes between these two clocks in one hour = (5 - 3) min = 2 min. Total time from 9 pm to 7:30 pm on Monday is 10h 30 minutes.

Also, the second clock gains in 10h 30 minutes

= (10 × 2)+(1/2 × 2) minutes = 21 minutes

7:30pm + 21minutes and shows the time as 7:51pm.

Q10. A man started from home at 14:30 hours and drove to village, arriving there when the village clock indicated 15:15 hours. After staying for 25 minutes, he drove back by a different route of length 1.25 times the first route at a rate twice as fast reaching home at 16:00 hours. As compared to the clock at home, the village clock is **(UPSC CSAT 2022)**

(a) 10 minutes slow (b) 5 minutes slow

(c) 10 minutes fast (d) 5 minutes fast

Ans: (d)

Explanation:

Let the speed of man be X km/hr and the distance between his home and village is Y km.

Total time taken = 16:00 pm - 14:30 pm = 3/2 hours

The total time during travelling = (3/2 - 25/60)hr = 13/12hr

By the Speed, distance, time equation :

$\frac{Y}{X} + \frac{1.25\,Y}{2X} = \frac{13}{12} \Rightarrow \frac{Y}{X} = \frac{2}{3}$ = 40 mins

Hence, time is taken from home to village by man = 40 minutes

$\Rightarrow$ So exact time on Clock when man reached village = 14:30 pm + 40 minutes = 15:10 pm

The village clock shows 15:15 pm.

So, the Village clock is 5 minutes faster

Q11. A wall clock moves 10 minutes fast every 24 hours. The clock was set right to show the correct time at 8:00 a.m. on Monday. When the clock shows the time 6:00 p.m. on Wednesday, what is the correct time? **(UPSC CSAT 2019)**

(a) 5:36 p.m. (b) 5:30 p.m.

(c) 5:24 p.m. (d) 5:18 p.m.

Ans: (a)

Explanation:

The clock shows the correct time = 8:00 a.m. on Monday

Number of hours between 8:00 a.m. on Monday to 6:00 p.m. on Wednesday = 24 + 24 + 10 = 58 hr

The clock will be faster by $\frac{58 \times 10}{24}$ minutes

So the correct time will be (6 pm-24 minutes)

Hence it's 5:36 p.m.

TYPE 4: TIME GAINED OR LOST BY A CLOCK

These questions are about figuring out how much a clock is off by, based on when the minute hand passes the hour hand. If the minute hand goes ahead of the hour hand every x minutes compared to the real time, then the clock is either gaining or losing $\left(\frac{720}{11} - x\right)\left(\frac{60 \times 24}{x}\right)$ minutes each day.

Note: If the result is (+ve) then clock gains time and if the result is (-ve), then clock loses time.

QUESTIONS

Q12. The minute hand of a clock overtakes the hour hand at intervals of 65 min of the correct time. How much does a clock gain or lose in a day?

(a) $\frac{990}{143}$ min(gain) (b) $\frac{1216}{143}$ min(gain)

(c) $\frac{1440}{143}$ min (gain) (d) $\frac{1254}{143}$ min (loss)

Ans: (c)

Explanation:

If both hands of a clock start moving together from the same position, then both the hands will coincide after every $65\frac{5}{11}$ min.

But in this clock both the hour hand minute hands are meeting after 65 min. So the clock is gaining time.

For every 65 min the clock is gaining 5/11 minutes.

For every 1 minute the clock is gaining (1/65) × (5/11) = 1/143 In 24 hours or 1440 minutes the clock gains = 1440/143 minutes.

Alternative method:

Required result $= \left(\frac{720}{11} - x\right)\left(\frac{60 \times 24}{x}\right)$ [where x is 65]

$= \left(\frac{720}{11} - 65\right)\left(\frac{60 \times 24}{65}\right) = \left(\frac{720 - 715}{11}\right)\left(\frac{12 \times 24}{13}\right)$

$= \left(\frac{5}{11}\right)\left(\frac{288}{13}\right) = \left(\frac{1440}{143}\right)$ (gain as positive sign)

Q13. Assume that

1. **The hour and minute hands of a clock move without jerking.**
2. **The clock shows a time between 8 o'clock and 9 o'clock.**
3. **The two hands of the clock are one above the other.**

After how many minutes (nearest integer) with the two hands will be again lying one above the other? **(UPSC CSAT 2014)**

(a) 60 (b) 62

(c) 65 (d) 67

Ans: (c)

Explanation:

Between 8 o'clock and 9 o'clock two hands of clock are one above each other when time is between 8:43 and 8:44.

After that both hands of the clock are one above each other when time is between 9:48 and 9:49.

Hence after 65 minutes two hands of the clock are one above each other.

PRACTICE QUESTIONS

1. By how many degrees does the minute hand move in the same duration of time, in which the hour hand moves by 38°?

(a) 228° (b) 456°
(c) 536° (d) 396°

2. How many degrees will the minute hand move, in the same time in which the second hand moves 1080°?

(a) 18° (b) 24°
(c) 12° (d) 15°

3. How many times in a day the hour and minute hand will be at the right angle to each other?

(a) 11 (b) 22
(c) 44 (d) 12

4. Calculate the time when the hands of the clock meet between 6:00 and 7:00?

(a) 6: 32 (b) 6: 34
(c) 6: 38 (d) 6: 36

5. A clock gains 5 seconds in 5 minutes. It was set right at 8 AM. Calculate the time that it will show at 10 PM on the next day.

(a) 10: 14: 00 PM (b) 10: 38:00 PM
(c) 9: 12:00 PM (d) 10: 28: 00 PM

6. 3 minutes are lost by a watch every hour. If it was set right at 9 AM on a Tuesday. When will it show the correct time again?

(a) 9AM on Thursday
(b) 9 AM on Friday
(c) 6 PM on Thursday
(d) 9 AM on Tuesday

7. When time changes from 11:45 A.M. to 11:49 A.M. in a clock having a circular scale of twelve hours. By how many degrees the angle formed by the minute and hour hand changes?

(a) 11 (b) 22
(c) 33 (d) 24

8. During which of the following hour, the hands of the clock will not be exactly opposite to each other between ?

(a) 2-3 O'clock (b) 12-1 O'clock
(c) 8-9 O'clock (d) 6-7 O'clock

9. What is the angle (in degrees) between the hour and minute hands of a clock 25 minutes after they meet for the 5^{th} time in a day?

(a) 127.5 (b) 132.5
(c) 147.5 (d) 137.5

10. What is the reflex angle between the hands of the clock at 5:40?

(a) 70 (b) 290
(c) 110 (d) 250

11. What is the time in the mirror image of the clock when the actual time is 3:15 ?

(a) 8:45 (b) 9:15
(c) 9:45 (d) 3:45

12. If the mirror image of the clock shows the time of 4:20 then the actual time is?

(a) 8:20 (b) 8:40
(c) 7:40 (d) 10:10

13. How many times between 11 AM to 10 PM the hands of the clock will coincide?

(a) 22 (b) 11
(c) 44 (d) 10

14. If the actual time shown by the clock is 8:40 then the water image of the clock will show the time as

(a) 3:20 (b) 10:10
(c) 9:50 (d) 4:20

15. At what time between 2 and 3 O'clock, the hands of the clock will be opposite to each other?

(a) $2: 43\frac{7}{11}$ (b) $2: 42\frac{8}{11}$
(c) $2: 32\frac{7}{11}$ (d) $2: 41\frac{8}{11}$

ANSWERS

1. (*b*) 2. (*a*) 3. (*c*) 4. (*a*) 5. (*b*) 6. (*b*) 7. (*b*) 8. (*d*) 9. (*d*) 10. (*b*)
11. (*a*) 12. (*c*) 13. (*d*) 14. (*c*) 15. (*a*)

EXPLANATIONS

1. (b)

Explanation:

Hour hand moves $\frac{1}{2}$ degree in one minute.

It moved 38^0 means 38*2 = 76minutes

A Minute hand moves 6^0 in a minute

$\therefore$ 6*76= 456 degrees

2. (a)

Explanation:

Second hand moves 6^0 degrees in one second

$\therefore$ To move 1080^0 second hand will take 1080/6 =180 seconds

Which is 3 minutes.

The minute hand also moves 6^0 each min

So, the movement of minute hand in 3 minutes = 6*3 = 18^0

3. (c)

Explanation:

In every hour the hands of the clock will be at 90^0 to each other or at 15 min spaces.

- **For example,** between 12 &1: the hands will be at 90^0 Around 12:15 (Not exactly at 12:15) and 12:50 (not exactly at 12:50)
- This is true for each hour except between 2 & 3 o'clock and 8 & 9 o'clock
- Because between 2&3 the hands will be at 90^0 somewhere between 2:25 and 2:30 and next time directly at 3:00 o'clock. (Between 2&3 only one time, exactly at 3:00 will be considered common between 2&3 o'clock and 3&4 o'clock)
- Similarly, between 8&9 the hands will be at 90^0 somewhere between 8:25 and 8:30 and next time directly at 9:00 o'clock. (Between 8& only one time, exactly at 9:00 will be considered common between 8&9 o'clock and 9&10 o'clock)
- So, 2 times for each hour and only one time for 2-3 and 8 – 9 = 10*2 + 1 + 1 = 22 times in 12 hours

For 24 hours it will be 22 + 22 = 44

4. (a)

Explanation:

The formula for finding the angle between the hands is

$\theta = \frac{11}{2}$ m – 30h (here θ = angle, m = minutes and h = hour)

When hands meet i.e.,0^0

$\theta = \frac{11}{2} * m - 30 * 6$

$m = \frac{180 * 2}{11}$

$m = 32\frac{8}{11}$

Therefore, the time between 6:00 and 7:00 when the hands of the clock meet will be 6: 32: 8/11.

5. (b)

Explanation:

Clock is gaining 5 seconds in every 5 minutes which means it will gain 60 seconds in 60 minutes i.e., it is gaining 1 minute every hour.

Total number hours from 8 AM today to 10 PM next day is 24 + 12 + 2 = 38 Hours

so, it will gain 38 minutes and the time it shows will be 10:38:00 PM.

6. (b)

Explanation:

Given that 3 minutes are lost every hour i.e., 6 min are lost every 2 hours, 60 min (1hour) are lost every 20 hours

To show correct time again it will have to lose 12 hrs.

Total time taken to loose 12 hrs= 12*(60/3) = 240 hours $\Rightarrow$ 240/24 = 10 days

i.e., after 10 days it will show correct time again, since it was set right on 9 AM Tuesday it will show correct time again on Friday 9AM.

7. (b)

Explanation:

Hour hand moves $\frac{1}{2}$ degree in one minute.

A minute hand moves 6^0 in a minute.

So, every minute of time the minute hand overtakes hour hand by 5.5^0

So, from 11:45 to 11:49 the time changes by 4 minutes hence the change in degree will be 5.5*4 = 22^0

8. (d)

Explanation:

The hands of an analog clock are opposite to each other (forming a 180-degree angle) once during each hour for a standard 12-hour Analog clock except between 5 and 7.

Between 05:00 to 07:00, i.e., for a 2 hour period, hands of an analog clock are opposite to each other only once which is when the minute hand is on the 6 and the hour hand is on the 12. Giving a total of 11 times when the hands of an analog clock are opposite to each other or forming a 180-degree angle.

Thus, hands of the clock will not be opposite to each other or at 180^0 between 6:00 and 7:00.

9. (d)

Explanation:

Hour hand moves $\frac{1}{2}$ degree in one minute.

A Minute hand moves 6^0 in a minute

So, every minute of time the minute hand overtakes hour hand by 5.5^0

When the hands meet each other the angle between them is 0^0

After 25 min the angle will be 25*5.5 = 137.5°

10. (b)

Explanation:

The angle between the clocks at 5:40

The formula for finding angle between the hands is

$\theta = \frac{11}{2} m - 30h$ (here θ = angle, m = minutes and h = hour)

$\theta = \frac{11}{2} m - 30h$

$\theta = \frac{11}{2} \times 40 - 30 * 5$

$\theta = 220 - 150 = 70^0$

This is the inner angle between the hands, Reflex angle means the angle which is greater than 180^0 and less than 360^0. Or we can say the outer angle formed by the hands of the clock

$\therefore$ The reflex angle will be $360 - 70 = 290^0$

11. (a)

Explanation:

Assuming a standard 12-hour Analog clock and a simple reflection of the clock's face in the mirror.

We write down the time on the analog clock in a digital format. That is to say,

Given time is 3:15 which is 3 hours and 15 minutes, if we separate Hours and Minutes.

For calculating the time in mirror image of the clock, we subtract the actual time from 12:00 or 11:60, i.e., hour(s) from hour(s) and minute(s) from minute(s):

Therefore,

$$\begin{array}{r} 11:60 \\ -03:15 \\ \hline 08:45 \end{array}$$

This gives us the time in the mirror image of the clock i.e., 8 hours and 45 minutes.

12. (c)

Explanation:

Assuming a standard 12-hour Analog clock and a simple reflection of the clock's face in the mirror.

We write down the time on the analog clock in a digital format. That is to say,

Given time is 04:20 which is 4 hours and 20 minutes, if we separate Hours and Minutes.

For calculating the time in the actual clock, we subtract the time in the mirror image of the clock from 12:00 or 11:60, i.e., hour(s) from hour(s) and minute(s) from minute(s):

Therefore,

$$\begin{array}{r} 11:60 \\ -04:20 \\ \hline 07:40 \end{array}$$

This gives us the time in the actual clock i.e. 7 hours and 40 minutes.

13. (d)

Explanation:

The hands of a clock coincide or are at 0-degree angle once during each hour for a standard 12-hour Analog clock except between 11:00 and 01:00.

Between 11:00 and 01:00, i.e., for a 2 hour period, hands of an analog clock coincide or are at 0-degree angle only once which is when the minute hand and the hour hand i.e., both hands are on 12. Giving a total of 11 times when the hands of an analog clock coincide or are at 0-degree angle.

Therefore, from 11 AM to 10 PM i.e. in the span of 11 hours they coincide 10 times.

14. (c)

Explanation:

For calculating the time in the water image of the clock, we subtract the actual time from 18:30 or 17:90 (based on the minute value of actual time, if minute value is less than 30 then we go for 18:30 and if its greater than 30 then we use 17:90)

$$\begin{array}{r} 17{:}90 \\ -8{:}40 \\ \hline 09{:}50 \end{array}$$

Therefore, time in the water image of the clock is 9 hours and 50 minutes.

15. (a)

Explanation:

$\theta = \frac{11}{2} m - 30h$

When the hands are opposite i.e., 180^0

$180 = \frac{11}{2} * m - 30 * 2$

$m = \frac{240 * 2}{11} = 43\frac{7}{11}$

Between 2 and 3 O'clock the hands of the clock will be opposite to each other at 2: $43\frac{7}{11}$.

Calendar

5

INTRODUCTION

A calendar is a system of organizing days. This is done by giving names to periods of time, typically days, weeks, months, and years. A date is a single and specific day within such a system.

- **Day:** It is the smallest unit in most calendars. It also represents a full rotation of the Earth on its axis.
- **Week:** A continuous collection of 7 days.
- **Month:** A month is a unit of time used to divide a year into 12 parts, with each month having around 30 or 31 days, except for February, which usually has 28 days (29 days in a leap year). (Look up the knuckle rule for months online if you struggle with remembering this)
- **Year:** A measure of time-based on the Earth's revolution around the Sun. It takes about 365.25 days for the Earth to complete one revolution around the sun.
- **Leap Year:** To account for the extra 0.25 days each year, an additional day is added to the calendar every four years, making February 29 days long instead of 28.
- **Century:** A period of 100 years is called a century.

TYPES OF YEAR

There are mainly two types of years

- **Ordinary Year:** An ordinary year is a year that has **365 days** (52 weeks + **1 extra/odd day**). In an ordinary year, the month of February has 28 days.
- **Leap Year:** A leap year is a year that has **366 days** (52 weeks **+2 extra/odd days).** There is an extra day, 29th February, in addition to the usual 28 days in February. The purpose of the leap year is to align the calendar more closely with the Earth's revolution around the Sun, which is approximately 365.25 days.

Note:

1. A century has 76 ordinary years and 24 leap years. In case the century year is a multiple of 400 (400, 800, 1200…) it has 75 ordinary years and 25 leap years.
2. A leap year repeats itself every 28 years, and an ordinary year repeats itself in 6 or 11 years, i.e, a person could use the same physical calendar for the year 2000 (a leap year) and 2028.

WAYS TO FIND THE TYPE OF YEAR

- A normal year is considered a leap year **if it is divisible by 4.** e.g., 2020, 2024, etc.
- For a **century year** (multiple of 100) to be a leap year, it **should be divisible by 400** also, e.g., 2000, 2400, etc.

EXAMPLES

E1. Which of the following is a leap year?

(a) 2014 (b) 2015
(c) 2016 (d) 2017

Ans: (c)

Explanation:

Out of the given years, only 2016 is divisible by 4 and hence, 2016 is a leap year.

E2. If a century year is a leap year, which of the following must be true?

(a) It is divisible by 4.
(b) It is divisible by 400.
(c) It is divisible by 100 but not by 400.
(d) It is not divisible by 4.

Ans: (b)

Explanation:

For a century year to be a leap year, it should be divisible by 400.

E3. Which of the following century years is not a leap year?

(a) 1200 (b) 1600
(c) 1800 (d) 2000

Ans: (c)

Explanation:

Out of the given years, only 1800 is not divisible by 400 and hence it is not a leap year.

E4. Which year will be the same calendar year as 2020?

(a) 2025 (b) 2048

(c) 2056 (d) 2060

Ans: (b)

Explanation:

2048 = 2020+28 (as we know that a leap year repeats itself after every 28 years)

ODD DAYS

In the context of calendars, odd days refer to the days that exceed a complete week in a given period i.e., when we divide the number of days by 7, the remainder (the days left over after whole weeks are accounted for) is referred to as "odd days". Odd days are always calculated for a period, i.e. we calculate the number of odd days for months, years and centuries.

Odd days are important in calendar calculations, especially when determining the day of the week for a future or a past date. By knowing the number of odd days, you can easily find out what day of the week a particular date falls on.

ODD DAYS IN MONTHS

Month	Number of Days	Odd Days
January	31 = 7 × 4 + 3	3
February	28 = 7 × 4 + 0 (Ordinary year) 29 = 7 × 4 + 1 (Leap year)	0 (Ordinary year) 1 (Leap year)
March	31 = 7 × 4 + 3	3
April	30 = 7 × 4 + 2	2
May	31 = 7 × 4 + 3	3
June	30 = 7 × 4 + 2	2
July	31 = 7 × 4 + 3	3
August	31 = 7 × 4 + 3	3
September	30 = 7 × 4 + 2	2
October	31 = 7 × 4 + 3	3
November	30 = 7 × 4 + 2	2
December	31 = 7 × 4 + 3	3

ODD DAYS IN YEARS

- **1 ordinary year** = 365 days = 52 weeks + **1 odd day**
- **1 leap year** = 366 days = 52 weeks + **2 odd days**

ODD DAYS IN CENTURIES:

- **For 100 years**

  = 76 ordinary years + 24 leap years

  = (76 × 1 + 24 × 2) odd days

  = 124 odd days

  = 17 weeks + 5 odd days

  So, 100 years have 5 odd days, i.e if 1st January 1700 was a Friday, 1st January, 1800 would be a Wednesday.

- **For 200 years**

  = (5 × 2) odd days = 10 odd days

  = 1 week + 3 odd days

  So, a period of 200 years has **3 odd days.**

- **For 300 years**

  = (5 × 3) odd days = 15 odd days

  = 2 weeks + 1 odd day

  So, 300 years have **1 odd day.**

- **For 400 years**

  = (76 + 76 + 76 + 75 = 303 ordinary years) + (24 + 24 + 24 + 25 = 97 leap years)

  = (303 × 1 + 97 × 2) odd days

  = 497 odd days = 71 weeks + **0 odd days**

  So, after a period of 400 years, we have 0 odd days.

  Also, 4x5 +1 days = 21 days = 3 weeks + 0 odd days

  (The extra 1 in the above calculation is because the 400th year is a leap year)

  Here's a table summarizing the odd days in different periods:

Year	Ordinary Years	Leap Years	Odd Days
100	76	24	5
200	152	48	3
300	228	72	1
400	303	97	0

Note:

The number of odd days is calculated based on the given rules for ordinary years and leap years in a century and for a 400-year period.

TYPES OF QUESTIONS

There are mainly 3 types of questions on Calendar.

TYPE 1: DAY GAIN (+) / DAY LOSS(-)

- **Ordinary year (±1):** (Number of odd days in a year is 1)

  In an ordinary year, 1 day is gained when we move forward by one year.

  In an ordinary year, 1 day is Lost when we move backwards by one year.

- **Leap year(±2):** (Number of odd days in a leap year is 2)

  In a leap year, 2 days are gained when we proceed forward by one year.

  In a leap year, 2 days are lost when we move backwards by one year.

Note: Depending on the date for which we have to calculate the day, the gain/loss of days can be either 1 or 2.

Ex: If we know that 27th February 2003 was Thursday, 27th February, 2004 will be a Friday (only 1 odd day). However, if we know that 1st March 2003 was a Sunday, then 1st March, 2004 will be a Tuesday (2 odd days). Basically, if the date is beyond 28th February, we add 2 odd days, otherwise we add 1.

QUESTIONS

Q1. If January 5th 2021, was Tuesday, what was the day on 5th January 2022?

(a) Monday (b) Thursday
(c) Wednesday (d) Saturday

Ans: (c)

Explanation:

Since 2021 is an ordinary year, so one odd day, therefore 5th January 2022 would be Wednesday.

Q2. If January 5th 2023, was Thursday, then what day was on 5th January 2021?

(a) Monday (b) Thursday
(c) Tuesday (d) Saturday

Ans: (c)

Explanation:

Since 2021 is 2 ordinary years back, so 2 odd days, therefore 5th January 2021 was Tuesday.

Q3. If 5th December 2023 is Tuesday, what day would fall on 5th December 2024?

(a) Monday (b) Friday
(c) Wednesday (d) Thursday

Ans: (d)

Explanation:

Since 2024 is a leap year and the date is beyond 28th February, so 2 odd days would be added. Therefore, 5th December 2024 would be Thursday.

Q4. If 10th March 2024 would fall on Sunday, then what day was it on 10th March 2023?

(a) Monday (b) Thursday
(c) Friday (d) Saturday

Ans: (c)

Explanation:

Since 2024 is a leap year, so two odd days backwards, therefore 10th March 2023 would be Friday.

TYPE 2: TO FIND THE DAY ON A PARTICULAR DATE WHEN THE REFERENCE DATE AND DAY ARE GIVEN

In order to find a particular day on the basis of a given day and date, the following steps are to be taken:

- **Step 1:** Calculate the number of days between the reference date and the target date. It involves counting the days in each month and accounting for leap years if necessary.
- **Step 2:** Calculate the number of odd days between the reference date and the target date. This is done by dividing the total number of days between the dates by 7 and taking the remainder (odd days). Odd days represent the extra days beyond complete weeks.
- **Step 3:** Move the given day of the reference date forward by the number of odd days we find in Step 2 to get the day on the target date.

QUESTIONS

Q5. If January 5th 2021 was Tuesday, then what day was it on 8th January 2022?

(a) Tuesday (b) Friday
(c) Sunday (d) Saturday

Ans: (d)

Explanation:

Since 2021 is an ordinary year, so one odd day, thus 5th of January 2022 was Wednesday, 6th was Thursday, 7th was Friday and 8th of January 2022 was Saturday.

Q6. If 8th January 1991 was Tuesday, then what day was on 8th March 1992?

(a) Tuesday (b) Thursday
(c) Sunday (d) Saturday

Ans: (c)

Explanation:

8th January 1991 to 8th January 1992, one ordinary year = 1 odd day.

From 8th January to 8th February, we have 31 days = 3 odd days

From 8th Feb to 8th March, we have 29 days (1992 is a leap year) = 1 odd day

In total, 5 odd days, so the day on 8th March 1992 was Sunday.

Q7. If the 3rd day of the month is Monday, which one of the following will be the fifth day from the 21st of this month? **(UPSC CSAT 2014)**

(a) Monday (b) Tuesday
(c) Wednesday (d) Friday

Ans: (c)

Explanation:

Given that the 3rd day of the month is Monday.

So 3 + 7 = 10 and 10 + 7 = 17 and 17 + 7 = 24th day is Monday.

So, 3, 10, 17 and 24 are Monday.

Now the 5th day from the 21st is the 26th.

Now the 24th is Monday and the 26th will be Wednesday.

Q8. Mr X has three children. The birthday of the first child falls on the 5th Monday of April, that of the second one falls on the 5th Thursday of November. On which day is the birthday of his third child, which falls on 20th December? **(UPSC CSAT 2019)**

(a) Monday (b) Thursday
(c) Saturday (d) Sunday

Ans: (b)

Explanation:

Mr. 'X' has three children.

The birthday of the 1st child falls on the 5th Monday of April.

April has 30 days.

So only two dates are possible on which any day comes 5 times.

The possible dates are 29th or 30th April on which 5th Monday can come.

Number of days in May = 31, June = 30, July = 31, August = 31, September = 30, October = 31 and November = 30.

It is given that the birthday of the 2nd child falls on the 5th Thursday of November.

The only possibilities for 5th Thursday in November are 29th or 30th.

CASE-1: If 29th April is Monday.

Then, Number of days till 29th November

= 1 + 31 + 30 + 31 + 31 + 30 + 31 + 29 = 214

Divide 214 by 7, we get 4 as a remainder.

So, if 29th April is Monday then 29th November

= Monday + 4 days = Friday.

Hence, in this case 5th Thursday is not possible in November because 4th Thursday will be on 28th November.

CASE-2: If 30th April is Monday.

Then the number of days till 29h November

= 31 + 30 + 31 + 31 + 30 + 31 + 29 = 213

Divide 213 by 7, we get 3 as a remainder.

So, on 29th November, the day is, Monday + 3 days = Thursday. (This case is consistent with the given conditions)

The birthday of 3rd child falls on 20th December.

The number of days between 29th November and 20th December = 1 + 20 = 21 days

Divide 21 by 7, we get 0 as a remainder.

So, on 20th December the day is Thursday.

Q9. In the particular year 12th January is a Sunday, then which one of the following is correct? **(UPSC CSAT 2020)**

(a) 15th July is a Sunday if the year is a leap year.
(b) 15th July is a Sunday if the year is not a leap year.
(c) 12th July is Sunday if the year is a leap year.
(d) 12th July is not a Sunday if the year is a leap year.

Ans: (c)

Explanation:

It is given that 12th January is Sunday.

Let's count Number of days between 12th January and 1st July:

If it is a normal year: (31 – 11) + 28 + 31 + 30 + 31 + 30 = 170 days.

If it is a leap year: (31 – 11) + 29 + 31 + 30 + 31 + 30 = 171.

Now we will Count Number of odd days between 12th January and 1st July:

If it is a normal year: 170 = 24 x 7 + 2 (2 odd days)

If it is a leap year: 171 = 24 x 7 + 3 (3 odd days)

Hence day on 1st July if it is normal year:

Sunday + 2 = Tuesday

Day on 1st July if it is leap year: Sunday + 3 = Wednesday

Now, if it is a normal year: 1st July = 8th July is Tuesday

If 8th July is Tuesday then 12th July is Saturday and 15th July is Tuesday.

Now, if it is a leap year: 1st July = 8th July is Wednesday

If 8th July is Wednesday then 12th July is Sunday and 15th July is Wednesday.

Q10. If today is Sunday, then which day is it exactly on 10^{10}th day? **(UPSC CSAT 2023)**

(a) Wednesday (b) Thursday
(c) Friday (d) Saturday

Ans: (b)

Explanation:

Number of odd days in this time period = Remainder $[10^{10}/7] = 4$.

If today is Sunday, then 10^{10}th day from now will be 4 days after Sunday, i.e. Thursday.

TYPE 3: TO FIND THE DAY ON A PARTICULAR DATE WHEN THE REFERENCE DATE AND DAY ARE NOT GIVEN

In order to find a particular day when reference is not given, the following steps are to be taken,

- **Step-1:** Choose the century leap year which is closest to the date you want to find. E.g. 1600, 2000 etc. The number of odd days for Century, which is divisible by 400, is 0.
- **Step-2:** Calculate the number of centuries you need to add to get to the preferred year. E.g 1900 = 1600 + 3*100. Add the odd days for the required centuries. For 300 centuries it is 1 odd day.
- **Step-3:** Calculate the number of leap years and ordinary years in the remaining date. e.g 5 feb 1969=(preferred year=1968), 1600 + 3*100 + 68. Therefore, 17 leap years and 51 ordinary years in 68 years. Add 2 odd days for every leap year and 1 odd day for every ordinary year.
- **Step-4:** Calculate the number of odd days till the preferred month and date. E.g. 5 February = 3 odd days of January and 5 odd days of February. In total, 8 odd days = 1 week + 1 odd day.
- **Step-5:** If odd day = 0/7, then the required day is Sunday

  If odd day =1, then the required day is Monday

  If odd day =2, then the required day is Tuesday

  If odd day =3, then the required day is Wednesday

  If odd day =4, then the required day is Thursday

  If odd day =5, then the required day is Friday

  If odd day =6, then the required day is Saturday

QUESTIONS

Q11. What day is it on 24 Dec 2023?

(a) Tuesday (b) Thursday

(c) Sunday (d) Saturday

Ans: (c)

Explanation:

Odd days up to the year 2000 are 0 odd days.

Odd days for next 22 years = (5 leap years x 2 odd days) + (17 ordinary year x 1 odd day) = 10+17 = 27 odd days = 3 weeks + 6 odd days

Odd days till 24 December = odd days in (January +February +March +April +May +June +July +August + September +October + November)+ 24 days of December

= 3 + 0 + 3 + 2 + 3 + 2 + 3 + 3 + 2 + 3 + 2 + 24 = 26 + 24 odd days = 50 odd days = 7 weeks + 1 odd day

Total odd days = 0+6+1 = 7 odd days = 1 week + 0 odd day

So, the day on 24th December 2023 will be a Sunday.

Q12. Which day is 10th October, 2027 if 10th October 2021 is Sunday? (UPSC CSAT 2021)

(a) Sunday (b) Monday

(c) Tuesday (d) Saturday

Ans: (a)

Explanation:

We know that 10th October 2021 is Sunday.

Till 10th october there are 5 ordinary years and 1 ordinary year.

Number of odd days in normal year = 1

Number of odd days in leap year = 2

Total number of odd days = 5 x 1 + 2 x 1= 7

Hence 10th october 2027 will be sunday.

Q13. Which date of June 2099 among the following is Sunday? (UPSC CSAT 2022)

(a) 4 (b) 5

(c) 6 (d) 7

Ans: (d)

Explanation:

5th June 2022 was Sunday (UPSC prelims was on 5th June and it was Sunday)

Difference between both the years = 2099 – 2022 = 77 years

We have a leap year after every 4 years in a century

So, Number of leap years in between 2022 and 2099 = 77/4 = 19 (we will neglect the remainder because 2022 is not a leap year)

Hence, till 2099 we will have 58 normal years and 19 leap years.

Now in a normal year we have 1 odd day and in a leap year we have 2 odd days

(Odd Days: we know that a week contains 7 days counting from Monday to Sunday. So, any number of days, which are more than the complete number of a week in a given period are called odd days. E.g., a period of 10 days contains 3 odd days)

Total Number of odd days = (58 × 1) + (19 × 2) = 58 + 38 = 96, i.e 5 odd days

So, 5th June 2099 will be Sunday + 5 = Friday And, so 7th June 2099 will be a Sunday.

PRACTICE QUESTIONS

1. Hema visits temple every 4th day, Jaya visits temple on every 5th day and Rekha visits temple on every 7th day. If they all meet at the temple on 20th July 2023. When was the last time they met at a temple?

(a) 27th February (b) 28th February
(c) 1st March (d) 2nd March

2. Select the Odd Pair :

(a) March: April (b) May: June
(c) July: August (d) October: November

3. A boy was born on 29th February 2004, if he lives for 100 years, then for how many times will he celebrate his birthday on the same date and day on which he was born?

(a) 25 (b) 13
(c) 3 (d) 26

4. Ravi visited his grandparents 11 days ago. He goes to meet them only on Sunday. What day of the week is today?

(a) Saturday (b) Friday
(c) Thursday (d) Wednesday

5. Given that if 15th July 2024 is Friday, what was the day on 14th July 1624?

(a) Saturday (b) Friday
(c) Thursday (d) Wednesday

6. If today is Tuesday, what will be the day after 250 days?

(a) Thursday (b) Sunday
(c) Saturday (d) Tuesday

7. The day on 7th March of a year is the same day on what date of the same year?

(a) 7th August (b) 7th October
(c) 7th November (d) 7th December

8. If 2nd February 2023 is Tuesday, then which will be the 4th Friday of December?

(a) 24th (b) 27th
(c) 28th (d) 31st

9. Consider the following statements:

Statement-I: February 11th is Saturday.

Statement-II: Today is 21st April.

Question: Is it Friday today?

Based on the statements above Answer the question.

(a) Question can be Answered from statement-I alone
(b) Question can be Answered from statement-II alone
(c) Both statements are required to Answer the question
(d) Both statements are not sufficient to Answer the question

10. Ajay was born on 15th March 1998, If in the same year Children's Day was celebrated on Monday. On which day of the week Ajay was born?

(a) Tuesday (b) Thursday
(c) Monday (d) Wednesday

11. Amit celebrated his birthday on Wednesday, 15 February 2012. When will he celebrate his birthday on the same day?

(a) 2018 (b) 2017
(c) 2019 (d) 2016

12. How many leap years are there between 1880 and 1960 ?

(a) 18 (b) 19
(c) 21 (d) 22

13. If 30th June 1997 is Friday, then 30th oct 2005 will be on

(a) Tuesday (b) Thursday
(c) Monday (d) Friday

14. The calendar of the year 1899 will exactly be the same as that of

(a) 1905 (b) 1910
(c) 1911 (d) 1904

15. Amar goes for swimming after a gap of every 3 days, Akbar goes for swimming after a gap of every 5 days and Anthony goes for swimming after a gap of every 8 days. If they all went to swimming together on Sunday, the next day when they all go to swimming together will be

(a) Wednesday (b) Thursday
(c) Monday (d) Tuesday

16. In a certain year, the month of August had exactly 4 Mondays and 4 Fridays. Then, August 1st of that year was on:

(a) Wednesday (b) Thursday
(c) Saturday (d) Tuesday

17. If 15th August 2025 is Wednesday, what was the day on 26th January 2023?

(a) Thursday (b) Sunday

(c) Saturday (d) Tuesday

18. If Suhana celebrated her 18th birthday on Thursday, 28th March 1898 then on which day of the week would she will celebrate her 25th birthday?

(a) Saturday (b) Friday

(c) Thursday (d) Wednesday

19. If January 26th, 2023 is Thursday, then how many Sundays are there between 26th January and 15th august of the same year?

(a) 32 (b) 30

(c) 27 (d) 29

20. On which day of the week Independence Day of the year 2000 was celebrated?

(a) Thursday (b) Sunday

(c) Saturday (d) Tuesday

ANSWERS

1. (*d*)	2. (*c*)	3. (*c*)	4. (*c*)	5. (*c*)	6. (*b*)	7. (*c*)	8. (*a*)	9. (*d*)	10. (*a*)
11. (*b*)	12. (*a*)	13. (*b*)	14. (*a*)	15. (*c*)	16. (*d*)	17. (*d*)	18. (*b*)	19. (*d*)	20. (*d*)

EXPLANATIONS

1. (d)

Explanation:

Since they meet on every 4th, 5th and 7th day

It means they met every 140 days (LCM of 4,5,7)

If They met on 20th July 2023 their last meet was before 140 days which is

July 20 is 31 + 28 + 31 + 30 + 31 + 30 + 20 = 201st day of year

Their last meet was 201-140=61st day of year

Which is 31 + 28 +2 i.e., 2nd of March.

2. (c)

Explanation:

Option A: March has 31 days and April has 30 days

Option B: May has 31 days and June has 30 days

Option C: July and August have 31 days

Option D: October has 31 days and November has 30 days

3. (c)

Explanation:

Since the date comes once in 4 years and the calendar of leap year is repeated after 28 years the boy can celebrate his birthday in 2032, 2060, 2088 i.e., 3 times in the span of 100 years.

4. (c)

Explanation:

Odd days in the span of 11 days = 11/7 i.e. 4

If it was Sunday 11 days ago then today will be Thursday.

5. (c)

Explanation:

From 1624 to 2024 the difference is 400 years.

And in the span of 400 years the odd days will be zero.

Therefore, 15th July 1624 will also be Friday and 14th July will be Thursday.

6. (b)

Explanation:

Number of odd days = 250/7, i.e., 5 odd days

Tuesday + 5 odd days will be Sunday

7. (c)

Explanation:

Calculate the number of odd days for the time periods of each option. If odd days = 0, the two dates will have the same day

Since any date in March is the same day of the week as the corresponding date in November of that year, so the same day will fall on 7th November.

8. (a)

Explanation:

Days remaining in February = 28-2 = 26, which is 5 odd days.

Odd days from 1st of March to 1st of December = 3 + 2 + 3 + 2 + 3 + 3 + 2 + 3 + 2 + 1 = 24, 3 odd days.

So, total odd days = 5+3 = 8, 1 odd day.

1st of December will be Wednesday.

First Friday will be on 3rd of December and 2nd, 3rd and 4th Fridays will be on 10th ,17th 24th respectively.

9. (d)

Explanation:

Both statements are not sufficient because the reference date is prior to February 29 and its not mentioned whether the year is leap year or normal year.

10. (a)

Explanation:

Children's day is celebrated on 14th November

Ajay was born on 15th March

Number of days remaining in March = 31-15=16 which is 2 odd days

Odd days from 1st April to 14th November = 2 + 3 + 2 + 3 + 3 + 2 + 3 + 0 = 18 i.e., 4 odd days

Total odd days = 2 + 4 = 6

If November 14th was Monday, then Ajay was born on Tuesday (6 days before Monday)

11. (b)

Explanation:

His birthday in 2013 will be on Friday (2 odd days because 2012 is a leap year)

His birthday in 2014 will be on Saturday (one odd day)

His birthday in 2015 will be on Sunday (one odd day)

His birthday in 2016 will be on Monday (one odd day)

His birthday in 2017 will be on Wednesday (2 odd days because 2016 is a leap year)

12. (a)

Explanation:

Leap years 1881 to 1896 are 16/4 = 4

1900 IS NOT A LEAP YEAR

Leap years from 1901 to 1956 = 56/4 = 14

Total Number of leap years = 4 + 14 = 18

13. (b)

Explanation:

Number of odd days till 30th June 2005 are 10 (8 normal +2 leap years), 10/7 = 3

Odd days from (1st July to oct 30th) = 3 + 3 + 2 + 30 = 38/7 i.e., 3 odd days

So total odd days will be 3 + 3 = 6

Hence 30th oct will be 6 days after Friday which is Thursday

14. (a)

Explanation:

Assume any day as first day of 1899, let us say Monday

1899 begins with Monday

1900 begins with Tuesday

1901 begins with Wednesday (Because 1900 is not a leap year)

1902 begins with Thursday

1903 begins with Friday

1904 begins with Saturday

1905 begins with Monday (1904 is a leap year so 2 odd days)

15. (c)

Explanation:

Amar goes for swimming after a gap of every 3 days i.e., every 4th day

Akbar goes for swimming after a gap of every 5 days i.e., every 6th day

Anthony goes for swimming after a gap of every 8 days i.e., every 9th day

Next time they go together will be the L.C.M of 4, 6 and 9 i.e. 36

Odd days will be 36/7, 1 odd day (remainder)

If they went together on Sunday, next they will go together on Monday

16. (d)

Explanation:

August has 31 days so the first 3 days of the month will come 5 times and others days will come exactly 4 times

It has exactly 4 Mondays so month cannot start with Monday and also Sunday and Saturday

It has exactly 4 Fridays so month cannot start with Friday and also Thursday and Wednesday

Therefore, Tuesday is the only day remaining which will fall on August 1st.

17. (d)

Explanation:

Number of odd days after 26th January 2023 to 26th January 2025 = 3 (2 normal +1 leap year)

Odd days from January 26th to August 15 = 5 + 0 + 3 + 2 + 3 + 2 + 3 + 1 5 = 33, 33/7 is 5 odd days

Total odd days will be 5+3 = 8 which will be one odd day.

So, if 15th August 2025 was Wednesday, then 26th January 2023 was Tuesday.

18. (b)

Explanation:

18^{th} birthday was on 28^{th} March 1898, Thursday

19^{th} birthday will be 28^{th} March 1899, Friday (one odd day)

20^{th} birthday will be 28^{th} March1900, Saturday (one odd day)

21^{st} birthday will be 28^{th} March1901, Sunday (one odd day, because 1900 is NOT A LEAP YEAR)

22^{nd} birthday will be 28^{th} March 1902, Monday (one odd day)

23^{rd} birthday will be 28^{th} March 1903, Tuesday (one odd day)

24^{th} birthday will be 28^{th} March 1904, Thursday (2 odd days as 1904 is a leap year.)

25^{th} birthday will be 28^{th} March 1905 Friday (one odd day)

19. (d)

Explanation:

Number of days from 27^{th} January to 15^{th} August = 5 + 2 8 + 31 + 30 + 31 + 30 + 31 + 15 = 201 days

196 + 5 days = 28 complete weeks and 5 odd days, since week is starting from Thursday there will be total of 28 + 1 = 29 Sundays

20. (d)

Explanation:

Since there are zero odd days till 2000 and no leap year in between, only consider odd days from 1^{st} January 2001 to 15^{th} august 2001 = 3 + 0 + 3 + 2 + 3 + 2 + 3 + 15 = 31 which is 3 odd days. 3 odd days means Wednesday.

Independence Day of 2001 was celebrated on Wednesday.

$\therefore$ Independence Day of year 2000 was celebrated on Tuesday.

(even though 2000 is a leap year consider only one odd day as the date comes after February)

Direction & Distance

6

INTRODUCTION

Direction signifies the relative positioning of one object in relation to another, while displacement represents the measurement of the distance between the initial and final points.

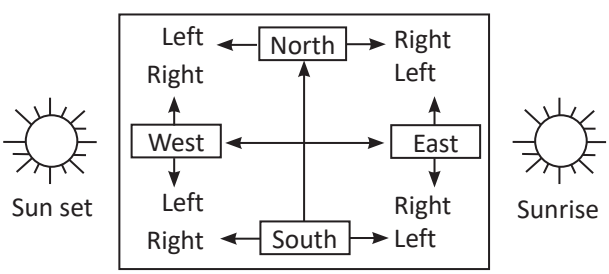
In this chapter, we deal with questions that involve a series of steps in different directions. The main goal for the candidate is to figure out the final direction they're facing or the shortest distance between two points. These types of questions test how well the candidate can follow a set of directions and understand the path they need to take. It's all about being able to track the route correctly and knowing exactly which direction you're heading in. This helps to see how good someone is at thinking logically and understanding directions and distances.

KEY CONCEPTS

MAIN DIRECTIONS

There are 4 main directions:- North, South, East and West and we all know very well that the sun rises from the east and west is opposite to east.

If you are standing and your face is towards north then west is on your left hand side and east is on your right hand side. Following figure will explain it in more clearly:

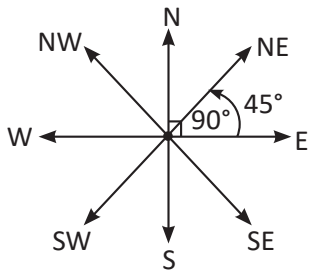


Main Directions

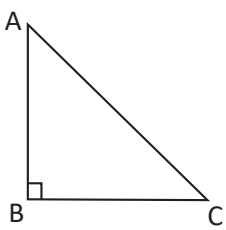
INTERMEDIATE DIRECTIONS

There are 4 Intermediate directions: North - east (NE), North - West (NW), South - West (SW) and South - East (SE)

Angle formed between two main directions is 90° and the angle formed between the main direction and the intermediate direction is 45°. Following figure will help us to understand it more.



SHORTEST DISTANCE



To find the shortest distance we need to know about pythagoras theorem:

Here, AB = perpendicular, BC = Base ,AC = hypotenuse and Angle B=90°

Now, by pythagoras theorem shortest distance between point A and C.

$\Rightarrow$ **AC** = $\sqrt{(AB)^2 + (BC)^2}$

EXAMPLES

E1. A man was going West,then she turned left,then turned 90° in clockwise direction.In which direction is he facing now?

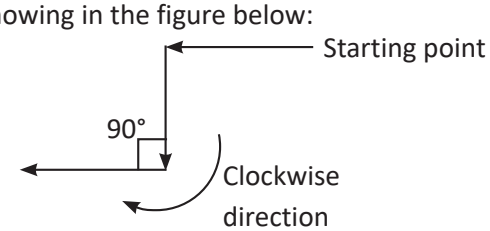
(a) East (b) West

(c) North (d) South

Ans: (b)

Explanation:

According to the question path followed by man is showing in the figure below:



It is clear from the diagram that man is facing toward the west now.

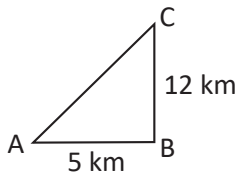
E2. A boy started his journey from point A and went 5 km in the east direction to reach point B. Then he took a left turn and went 12 km in that direction and reached point C. What is the final distance of the boy from the starting point?

(a) 13 km (b) 17 km

(c) 7 km (d) 10 km

Ans: (a)

Explanation:



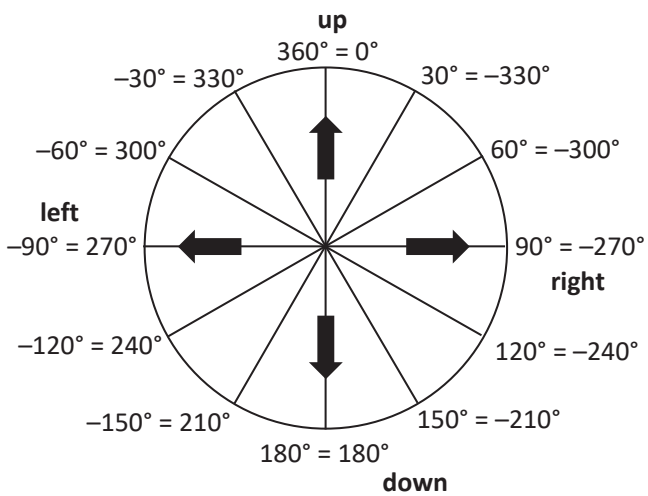
Path of boy is shown in figure as given below:

Now by pythagoras theorem:

$AC = \sqrt{(AB)^2 + (BC)^2}$

$AC = \sqrt{(5)^2 + (12)^2} = \sqrt{169} = 13$ km.

ANGLE OF MOVEMENT

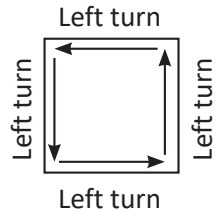


To solve the question based on angle of movement, it is necessary to know about the rotational angles which are given in the figure:

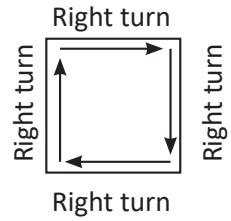
- **Left Turn:** When you turn anti-clockwise from your current direction.
- **Right Turn:** When you turn clockwise from your current direction.

THE FOLLOWING THINGS SHOULD BE KEPT IN MIND WHILE SOLVING THE PROBLEMS

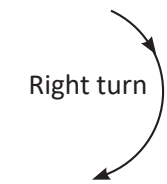
- Using diagrams is crucial in solving direction and distance problems. They help in visualizing the movement and turns.
- When plotting movements on a diagram, it's essential to mark the starting point, the path taken, turns (right or left), and the final point.
- Be careful while taking a left turn (Anti clockwise turn) and Right turn (Clockwise turn).
- Use Pythagoras theorem for calculating distances in problems involving diagonal movements (like NE, NW, SE, SW).
- Clearly mark distance along with the line of direction.



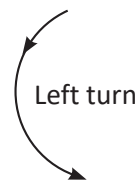
(i)



(ii)



(iii)
Clockwise



(iv)
Anti-Clockwise

TYPES OF QUESTIONS

There are five types of questions that are generally asked from this chapter in the exam:

TYPE 1: FINAL DIRECTION QUESTIONS

In this type, questions focus on identifying the final orientation or direction relative to the starting point. These problems may also involve establishing the directional relationship between two points or individuals. The goal is to trace the path taken from the start and determine the final direction faced.

QUESTIONS

Q1. From his school Sumit went 15km to the North, then he turned to the west and went 10km. Then he turned south and went 5km. At last he went 10km after turning to the east. What is the final direction of Sumit from his school?

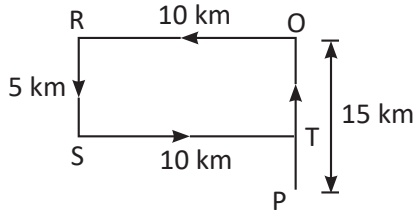
(a) East (b) West

(c) North (d) South

Ans: (c)

Explanation:

The movement of Sumit is shown in the figure given below.



By the main direction diagram it is very clear that Sumit is north of his school.

Q2. Rohan is facing the West. He turns 45° in the clockwise direction and then another 180° in the same direction and then 270° in the anti-clockwise direction. Which direction is he facing now?

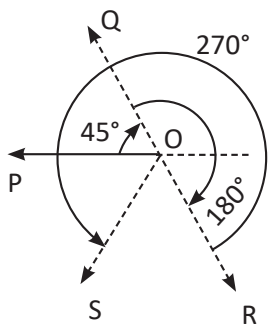
(a) South (b) West

(c) North-West (d) South-West

Ans: (d)

Explanation:

Movement of of Rohan is shown in the figure:



In this figure Rohan is standing at point O facing towards the west along line OP.

According to the question after the 1st turn his direction is along the line OQ.

After his 2nd turn his direction is along the line OR.

After his final turn the direction of Rohan is along OS which is south west direction.

Q3. The houses of A and B face each other on a road going north-south, A's being on the western side. A comes out of his house, turns left, travels 5 km, turns right, travels 5 km to the front of D's house. B does exactly the same and reaches the front of C's house. In this context, which one of the following statements is correct? **(UPSC CSAT 2011)**

(a) C and D live on the same street.

(b) C's house faces south.

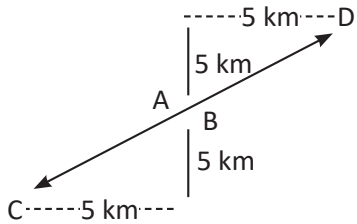
(c) The houses of C and D are less than 20 km apart.

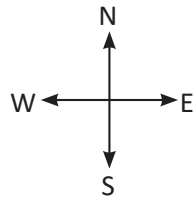
(d) None of the above

Ans: (c)

Explanation:

See the following diagrams:





These are the positions of C's house and D's house.

Now, The distance between C's house and D's house, is twice the distance between C's house and A's house.

Distance between C's house and A's house we can calculate by using Pythagoras theorem because the path of A is a right angle triangle.

So, AC = $\sqrt{(5)^2 + (5)^2} = \sqrt{50}$ = 7.1 km

Now distance between C's house and D's house, is twice the distance between C's house and A's house.

Distance between C's house and D's house = 2AC = 14.2 (approx.)

Q4. Consider the following statements : There are six villages A, B, C, D, E and F. F is 1 km to the West of D B is 1 km to the East of E A is 2 km to the North of E C is 1 km to the East of A. D is 1 km to the South of A. Which three villages are in the line?

(UPSC CSAT 2014)

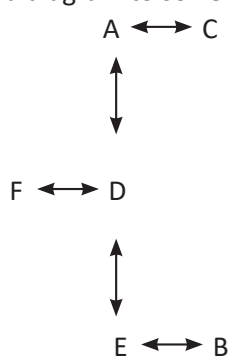
(a) A, C, B (b) A, D, E

(c) C, B, F (d) E, B, D

Ans: (b)

Explanation:

We will make a diagram to solve this question:



Each arrow represents the direction and 1 km.

Now from the diagram it is **evident that A, D and E are in the line**

TYPE 2: DISPLACEMENT QUESTIONS

In this type of questions, the focus is on figuring out how far apart the start and end points are, or how much distance there is between two points or people at the end of their journey. These questions involve calculating the shortest path or straight-line distance between positions.

QUESTIONS

Q5. Nitish went 7m towards the south east direction, then he moved towards the West and covered a distance of 14 m. From there, he went North-West a distance of 7 m and finally he moved a distance of 4 m towards East and stood at point. How far is the starting point from where he is standing now?

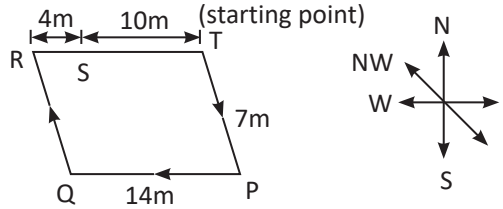
(a) 10 m (b) 4 m

(c) 14 m (d) 11 m

Ans: (a)

Explanation:

Movement of the Nitish is shown in the figure below:



Hence, the distance of Nitish from the starting point is 14 – 4 = 10m

Q6. A car started moving from point A and moved 3km toward the east to point B.

And then turned left and went 9 km to reach point C. Then again turned left and went 15 km and reached the destination D. Find the displacement of the car.

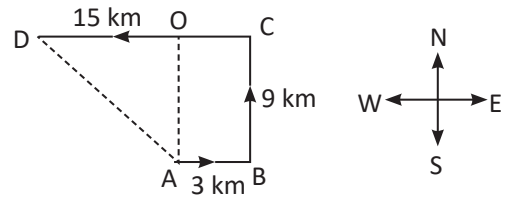
(a) 24km (b) 15km

(c) 27km (d) 21km

Ans: (b)

Explanation:

Movement of the car is shown in the figure below:



In the figure AB = 3km

BC = 9km

CD = 15km

Now by pythagoras theorem AD = $\sqrt{(12)^2 + (9)^2}$ = $\sqrt{225}$ = 15 km

Hence option (b) is the correct option.

Q7. Two friends X and Y start running and they run together for 50 m in the same direction and reach a point. X turns right and runs 60 m, while Y turns left and runs 40m. Then X turns left and runs 50m and stops, while Y turns right and runs 50 m and then stops. How far are the two friends from each other now? **(UPSC CSAT 2022)**

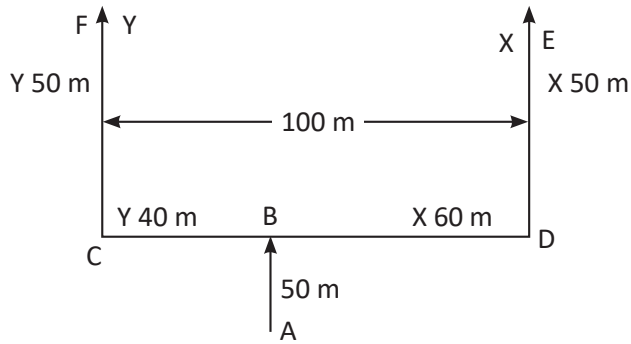
(a) 100 m (b) 90 m

(c) 60 m (d) 50 m

Ans: (a)

Explanation:

Route of X and Y is shown in the figure below:



Now according to question X and Y start running from point A and run till point B

AB = 50m, After reaching B, X turn right and reached at point D such that

BD = 60m

After reaching point B, Y turn left and reached point C such that

BC = 40m, After reaching point C, Y turn left and reach point F such that

CF = 50 m

After reaching point D, X take Right and reach point E such that DE = 50 m, Finally X and Y are T E and F respectively to find distance between X and Y we need to find EF (distance between E and F)

EF = BC + BD EF

= 60 + 40 = 100m

Q8. P, Q and R are three towns. The distance between P and Q is 60 km, whereas the distance between P and R is 80 km. Q is in the West of P and R is in the South of P. What is the distance between Q and R?

(UPSC CSAT 2019)

(a) 140 km (b) 130 km

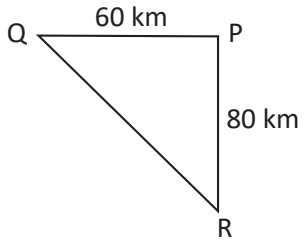
(c) 110 km (d) 100 km

Ans: (d)

Explanation:

Given that Q is in the West of P and R is in the South of P

Distance between P and Q = PQ = 60km and distance between P and R = PR = 80km



QPR is a right angled triangle.

We need to find QR.

QR = $\sqrt{(60)^2 + (80)^2} = \sqrt{10000} = 100$ km

TYPE 3: DIRECTION AND DISPLACEMENT COMBINED QUESTIONS

In these questions, you need to find out both the final direction and the straight-line distance from the starting point to the end point of a person's or object's journey. This type involves a mix of direction tracking and distance calculation.

QUESTIONS

Q9. Neeraj left his school after the classes. After leaving the school he went 5km north of his school. Then he turned to the left and went 10km and took left again and went 5km. Find the distance of Neeraj from school and final direction as well.

(a) 10km west from the school

(b) 20 km west from the school

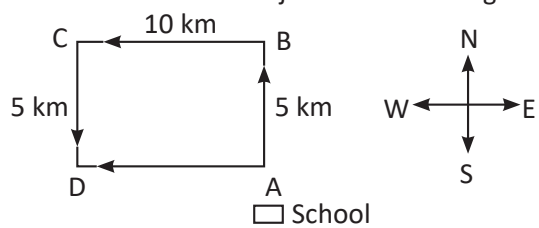
(c) 10 km north from the school

(d) 20 km east from the school

Ans: (a)

Explanation:

The movement of Neeraj is shown in the figure below:



From the figure it is very clear that Neeraj is 10km away in the west from the school.

Q10. Rajesh left his home for the office in the car. He drove 15 km straight towards North and then turned Eastwards and covered 8 km. He then turned left and covered 1 km. He again turned left and drove for 20 km and reached office. How far and in what direction is his office from the home?

(a) 21 km West

(b) 15 km North-East

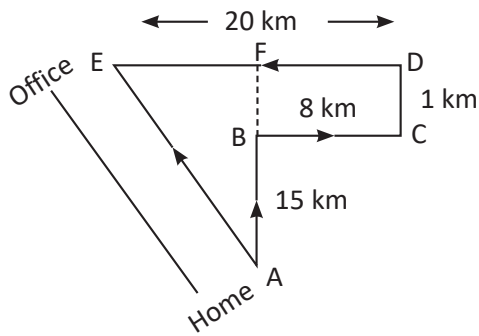
(c) 20 km North-West

(d) 26 km North-West

Ans: (c)

Explanation:

Movement of Rajesh is shown in the figure below:



Home of Rajesh is at point A and his office is at point E.

We need to find AE in the triangle AEF.

In triangle AEF, AF = 15 + 1 =16 km

And, EF = 12km.

AE = $\sqrt{(16)^2 + (12)^2} = \sqrt{400} = 20$ km

And it is clear from the figure that the direction of the office is north west from the home.

Q11. A person X was driving in a place where all roads ran either north-south or east-west, forming a grid. Roads are at a distance of 1 km from each other in parallel. He started at the intersection of two roads, drove 3 km north, 3 km west and 4 km south. Which further route could bring him back to his starting point, if the same route is not repeated?

(a) 3 km east, then 2 km south

(b) 3 km east, then 1 km north

(c) 1 km north, then 2 km west

(d) 3 km south, then 1 km north

Ans: (b)

Explanation:

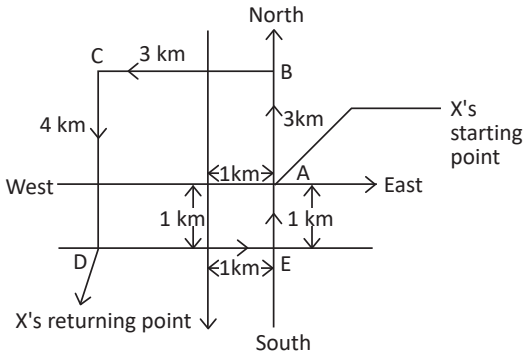
Let person X start from a point A.

He drove 3 km north and reached point B.

Then he drove 3 km west and reached point C.

Further, he drove 4 km south and reached point D.

Following figure explains the map:



Now, he has to come back to his starting point A and cannot take the same route.

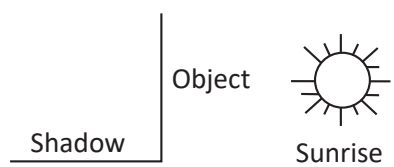
He drives 3 km east and reaches at point E and from there he drives 1 km north to reach at his starting position.

So, he should drive 3 km east, then 1 km north.

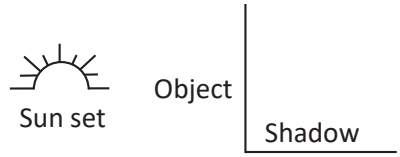
TYPE 4: SHADOW-BASED QUESTIONS

This type of question revolves around understanding how shadows are formed based on the sun's position. We all know that the sun rises in the East and sets in the West. When you face the rising sun, you're looking East, and West is behind you. Your left hand points North, and your right hand points South. In the morning, with the sun in the East, shadows are cast towards the West. Likewise, in the evening, when the sun is in the West, shadows fall towards the East. Grasping this concept helps in determining directions based on the position of shadows at different times of the day.

Shadow formation during sunrise



Shadow formation during sunset



QUESTIONS

Q12. One morning after Sunrise,Ram and Shyam were standing at Shivaji crossing in Delhi with their back opposite to each other. Ram's shadow fell exactly towards his right hand side. Which direction was Shyam facing?

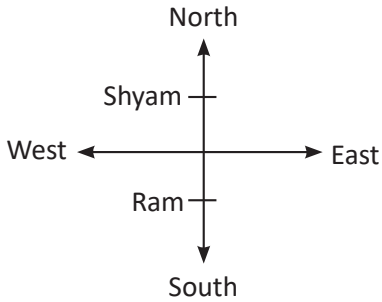
(a) East (b) West

(c) North (d) South

Ans. (c)

Explanation:

The Direction Diagram of Ram and Shyam are as follows:



As Ram's shadow fell exactly towards his right hand side, therefore he faced South. According to the question, Shyam's direction was opposite to that of Ram's, therefore Shyam was facing North.

TYPE 5: QUESTIONS ON CHANGED DIRECTIONS

These questions involve a scenario where one direction is substituted for another, and all the other directions are adjusted accordingly in a similar manner. The challenge here is to identify what a particular direction becomes after this change. **For example,** if North is changed to East, you need to figure out what the new directions for South, West, and all others would be. The key is to understand the pattern of change and apply it uniformly to all directions to find out their new orientations. This type of question tests your ability to adapt to new directional alignments and accurately determine the resulting directions.

QUESTIONS

Q13. In a meeting, the map of a village was placed in such a manner that South-East becomes North, North-East becomes West and so on. What will the South become?

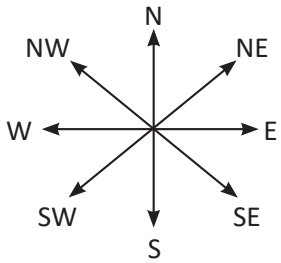
(a) North (b) North-East

(c) North-West (d) West

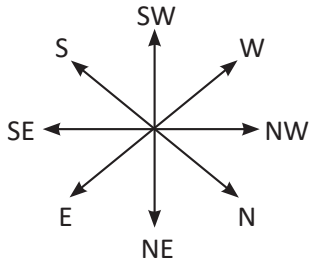
Ans. (b)

Explanation:

According to the given information, The direction diagram can be drawn as



Original directions



Directions after change

Hence, South will become North-East

Q14. If South-East becomes North and North-East becomes West and all the rest directions are changed in the same manner, what will be the direction for the West?

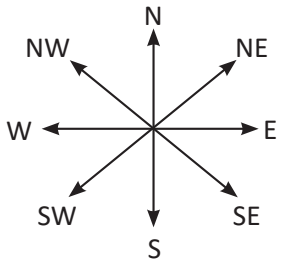
(a) North-East (b) South

(c) South-East (d) South-West

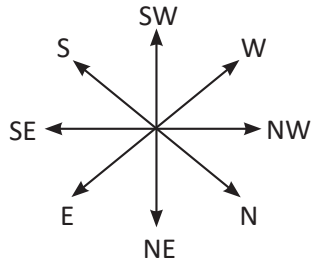
Ans. (c)

Explanation:

Based on the details provided, we can create a diagram showing the directions



Original directions



Directions after change

Looking at the picture, we can see that the South-East corresponds to the West.

PRACTICE QUESTIONS

1. **Amit is 40 m South-West of Basu. Chetan is 40 m South-East of Basu. Then, Chetan is in which direction of Amit?**
   (a) East
   (b) West
   (c) North-east
   (d) South

2. **Rahul is facing South and then he turned right and walks 40 m. Then he turned right again and walks 20 m. Then he turned left and walks 20 m and then turning right walks 20 m. Then he turned right again and walks 80 m. In which direction is Rahul from the starting point?**
   (a) North
   (b) North-west
   (c) East
   (d) North-east

3. **Sahil walks 7 kilometres towards North. From there, he walks 3 kilometres towards South. Then, he walks 3 kilometres towards East. How far and in which direction is he with reference to his starting point?**
   (a) 5 km West
   (b) 5 km North-east
   (c) 7 km East
   (d) 7 km West

4. **Varsha walks 140 metres towards west, then turns to her right and walks 140 metres and then turns to her left and walks 100 metres. Again turning to her left she walks 140 metres. What is the shortest distance (in metres) between her starting point and the present position?**
   (a) 100 (b) 240
   (c) 280 (d) 380

Directions (5-6): Read the following information carefully and answer the questions given below:

Nitish walks for 4 m from point X in the east direction. He then takes a right and a left turn and walks for 2 m and 3 m respectively and finally reaches point Z. Baarish starts walking from point Y and walks for 10 m in east direction, she then takes three consecutive right turns and walks 12 m, 3m and 4 m respectively and reaches point Z.

5. **In which direction is point Z with respect to point Y?**
   (a) Southwest (b) Northeast
   (c) Southeast (d) Northwest

6. **What is the shortest distance between starting point of Nitish and starting point of Baarish?**
   (a) 10 m (b) 6 m
   (c) 8 m (d) 4 m

7. **Point B is 12 m to the West of point A. Point C is 4 m to the North of Point B. Point D is 18 m to the South of Point E. Point F is 6 m to the West of point D. Point A lies exactly between Point E and Point D.**

   What is the shortest distance between point B and point E?
   (a) 10 m (b) 12 m
   (c) 15 m (d) 17 m

8. **Point E is 30 m north of Point D. Point G is 12 m south of Point F. Point H is 8 m north of Point A, which is 16 m west of Point B. Point C is 24m south of Point B. Point D is 18m east of Point C. Point F is 8m east of Point E.**

   What is the direction of Point F with respect to Point D?
   (a) North-west (b) North
   (c) South-west (d) North-east

Direction (9-11): In the following questions, the symbols $, %, & and * are used with the following meanings as illustrated below:

Study the given information and answer the following questions:

Note: The directions which are given indicate exact directions.

Y$Z – Z is in the south direction of Y at distance of 5m.

Y%Z – Z is in the north direction of Y at distance of 4m.

Y&Z – Z is in the east direction of Y at distance of 3m.

Y*Z – Z is in the west direction of Y at distance of 6m.

Y$*Z – Z is in the southwest direction of Y.

Y%&Z – Z is in the northeast direction of Y.

9. If F&C$B*D$E is true, then find the shortest distance between E and F?

(a) $2\sqrt{10}$ m (b) $\sqrt{103}$ m

(c) $5\sqrt{5}$ m (d) $\sqrt{109}$ m

10. If A*B%C&D is true, then find the shortest distance between D and A?

(a) 8 m (b) 5 m

(c) $\sqrt{14}$ m (d) 7 m

11. C%&H%I&R, then R is in which direction with respect to C?

(a) Northeast (b) North

(c) Southwest (d) Southeast

Direction (12-13): Study the following instructions carefully and answer the questions given below.

If a person 'Rohan' walks 15 meters towards south directions from point P to point Q, then turns towards east, walks 7 meters and reaches point R again, turns towards north direction, walks 5 meters and reaches point S. Another person 'Sohan' stands on point T, which is 15 meters west of point S. Point A is north of point T.

12. What is the direction of Rohan's Initial position with respect to point A?

(a) North-east (b) South-east

(c) East (d) Can't be determined

13. If points B, A and T are in a straight line and Point B is south-west of point Q and shortest distance between point T and point B is 11 metres, then what is the shortest distance between point Q to point B?

(a) 25 m (b) 10 m

(c) 20 m (d) Can't be determined

Direction (14-15): Read the following instructions carefully and answer the given questions.

Kartik drives his car starting from his office towards the North for 50 km. He then takes a right turn and travels for 30 km to reach 'Indian oil petrol pump'. From there, he again drives North-West for a distance of 50 km before travelling 40 km north. Finally, he turns and travels towards South-West for 100 km and stops. Kartik's last position is in west of Indian oil petrol pump.

14. What is the direction of his third turning point with respect to the 'Indian oil petrol pump'?

(a) North-West

(b) East

(c) West

(d) South-West

15. What is the shortest distance of Kartik's last position and his office?

(a) 82.6 km (b) 81.3 km

(c) 78.1 km (d) 70.4 km

Directions (16-17): Study the following information carefully and answer the questions given below:

F is 2 m to the north of A. C is 4 m to the east of A. B is 3 m to the north of C. D is 2 m to the west of B. D is 5 m to the north of E.

16. What is the shortest distance between E and B?

(a) 17 m (b) 29 m

(c) $\sqrt{29}$ m (d) $\sqrt{17}$ m

17. What is the shortest distance between A and D?

(a) 10 m (b) $\sqrt{8}$ m

(c) $\sqrt{13}$ m (d) 12 m

ANSWERS

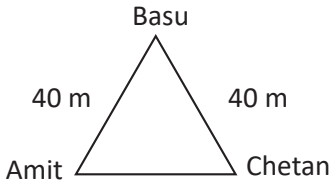
1. (*a*)	2. (*d*)	3. (*b*)	4. (*b*)	5. (*c*)	6. (*b*)	7. (*c*)	8. (*d*)	9. (*d*)	10. (*b*)
11. (*a*)	12. (*d*)	13. (*b*)	14. (*a*)	15. (*c*)	16. (*c*)	17. (*c*)			

EXPLANATIONS

1. (a)

Explanation:

It is given that Amit is 40 m South-west of Basu and Chetan is 40 m South-east of Basu.

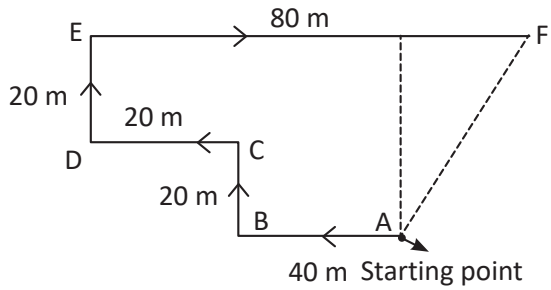


We can clearly see that Chetan is in the East of Amit.

2. (d)

Explanation:

The movement of Rahul is from A to F, as shown in the figure.

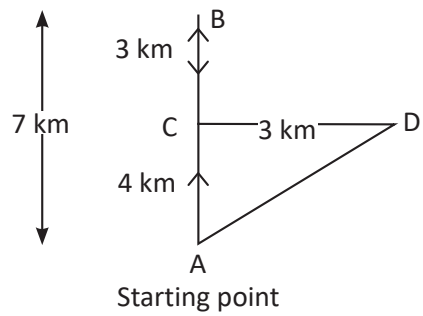


Clearly, the final position of Rahul is F which is North-east of the starting point A.

3. (b)

Explanation:

Let the starting point be A and from there Sahil walks 7 km towards North and reach at point B and from there he walks 3 km towards south and reach at point C and then walks 3 km towards East and reach at point D.



Using Pythagoras theorem in triangle ACD,

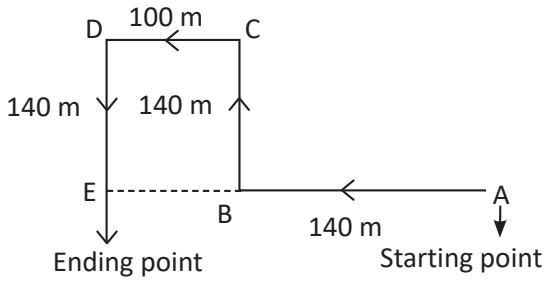
$AD^2 = AC^2 + CD^2$, $AD^2 = 4^2 + 3^2$, $AD^2 = 25$,$AD = 5$

So, Sahil is 5 km north-east from starting point.

4. (b)

Explanation:

The movements of Varsha are clearly shown in the figure from A to E.

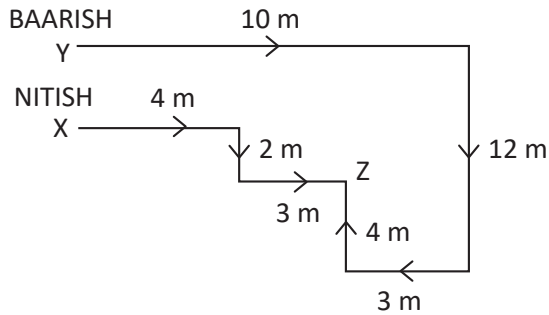


Varsha's distance from the starting position = AE = B + BE = AB + CD = 140 + 100 = 240 m

5. (c)

Explanation:

Using the given information, we can make the following path from X to Z which Nitish followed and from Y to Z which Baarish followed.

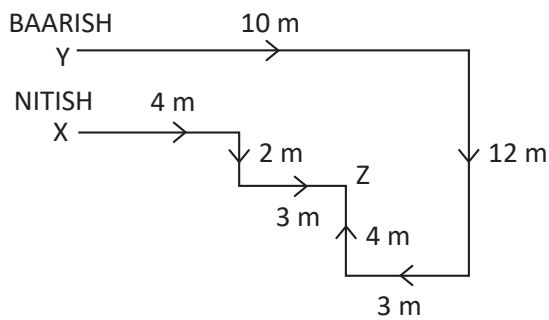


We can clearly see that Z is in southeast of Y.

6. (b)

Explanation:

From the diagram given below,

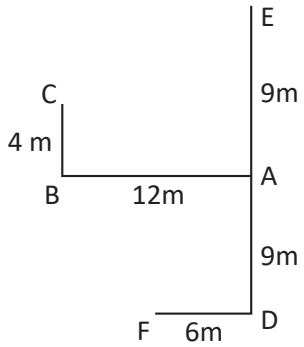


The shortest distance between point X and Y = 12 – (4 + 2) = 12 – 6 = 6 m

7. (c)

Explanation:

Using the given information, we can make the following diagram.



We have to find the shortest distance between points B and E.

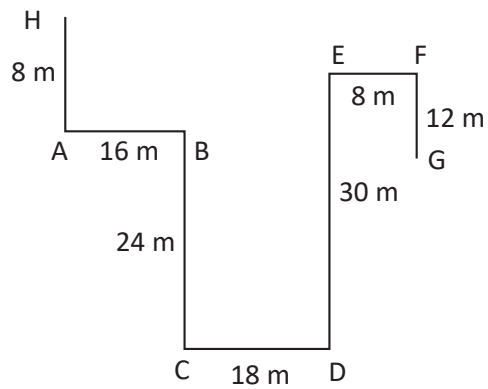
Using Pythagoras theorem,

$BE^2 = BA^2 + AE^2$, $BE^2 = 12^2 + 9^2 = 144 + 81 = 225$, $BE = \sqrt{225}$, BE = 15 m

So, the shortest distance between point B and point E = 15 m

8. (d)

Explanation:

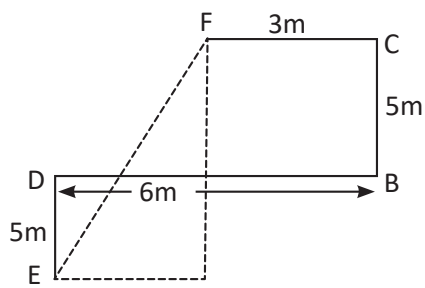


By looking at the above diagram, we can clearly see that point F is North-east of point D.

9. (d)

Explanation:

Using the given directions F&C$B*D$E, we make the following path.



The shortest distance between E and F is EF.

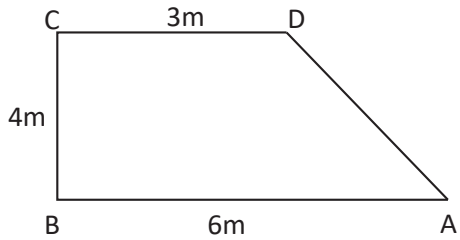
Using Pythagoras Theorem,

$EF^2 = (6–3)^2 + (5+5)^2 = 3^2 + 10^2 = 9 + 100 = 109$, $EF = \sqrt{109}$ m

10. (b)

Explanation:

Using the given directions if A*B%C&D, we make the following path.



We have to find the shortest distance between D and A.

Using Pythagoras Theorem,

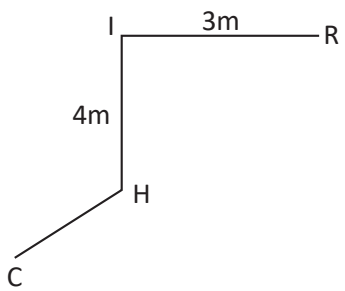
$DA^2 = 4^2 + (6 – 3)^2 = 16 + 9 = 25$, DA = 5m

So, the shortest distance between D and A = 5 m.

11. (a)

Explanation:

Using the given directions C%&H%I&R, we make the following path.

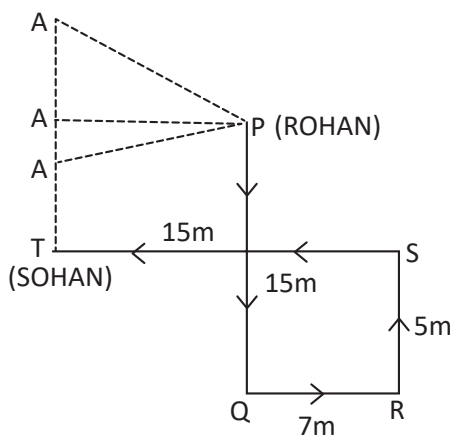


We can clearly see that R is in Northeast of C.

12. (d)

Explanation:

Using the given information, we make the following path.



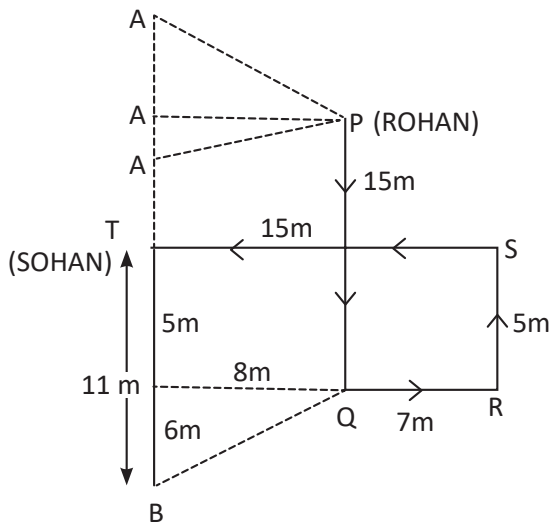
A can be anywhere above point T, where Sohan is standing.

So, clearly Rohan's Initial position i.e. P is changing with respect to A.

13. (b)

Explanation:

Using the given information, we make the following path.



We have to find the shortest distance between point Q and B.

Now, we use Pythagoras Theorem

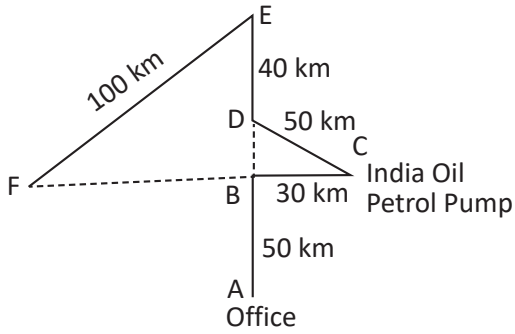
$QB^2 = (15–7)^2 + (11–5)^2 = 8^2 + 6^2 = 64 + 36 = 100$, QB = 10 m

So, the shortest distance between point Q and B is 10 m

14. (a)

Explanation:

Using the given information, we can make the following path.

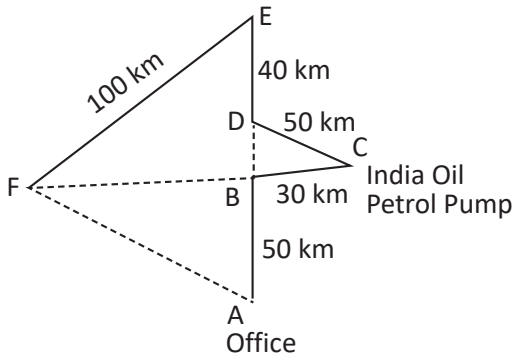


Clearly, we can see that the direction of third turning point i.e. D with respect to the 'Indian Oil Petrol Pump' i.e. C is North-west.

15. (c)

Explanation:

Using the given information, we make the following path.



Using Pythagoras theorem in triangle DBC,

$DB^2 + BC^2 = CD^2$, $DB^2 = 50^2 – 30^2 = 1600$, DB = 40km

Using Pythagoras theorem in triangle FEB,

$FE^2 = BE^2 + FB^2$, $100^2 = (40 + 40)^2 + FB^2$,

$FB^2 = 10000 – 6400 = 3600$, FB = 60 km

We have to find the shortest distance between Kartik's last position and his office i.e. FA

Using Pythagoras theorem in triangle FBA

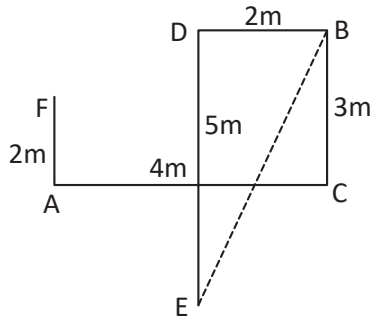
$FA^2 = FB^2 + AB^2 = 60^2 + 50^2 = 6100$

FA $\sqrt{6100}$ 78.1 km

16. (c)

Explanation:

Using the given information, we make the following path.



The shortest distance between E and B is EB.

Using Pythagoras theorem in triangle EBD,

$B^2 = BD^2 + ED^2 = 2^2 + 5^2 = 4 + 25 = 29$

EB = $\sqrt{29}$ m

17. (c)

Explanation:

The shortest distance between A and D = $\sqrt{(4-2)^2 + 3^2}$ = $\sqrt{(4+9)}$ = $\sqrt{13}$ m

Sitting Arrangement

7

INTRODUCTION

Sitting arrangement is a sequential arrangement of objects and persons on the basis of predefined conditions.

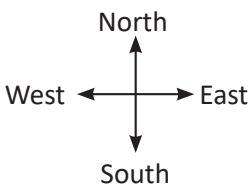
In this chapter, we'll be focusing on problems related to sitting arrangements. These types of questions typically involve providing a set of objects and then instructing you to arrange them based on the given information. Additionally, you might encounter situations where you'll need to arrange these objects within various geometric shapes, such as squares, pentagons, or hexagons.

The essence of sitting arrangement puzzles lies in understanding and interpreting various conditions – like who sits next to whom, who can't sit in a certain place, or who must be positioned between two others. It's a test of your ability to visualize spatial arrangements and apply logical deductions.

TYPES OF QUESTIONS

There are mainly two types of questions that are asked in the exam:

TYPE 1. LINEAR ARRANGEMENT

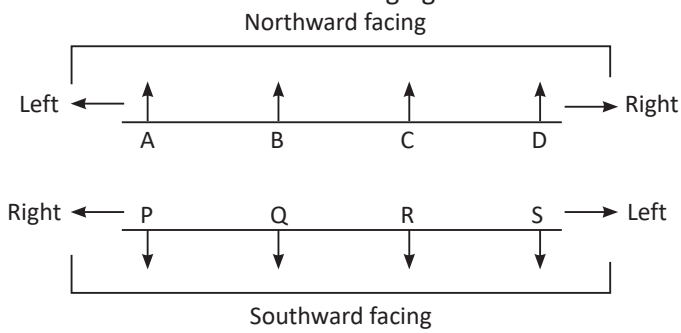


In the Linear Arrangement type of puzzles, you need to arrange objects or people in a straight line. This line can be either horizontal (side by side) or vertical (one above the other). The challenge here is to figure out where each object or person goes in the line, based on clues you're given. These clues can tell you:

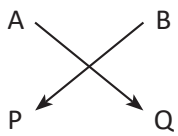
- **Exact Position:** Where exactly an object or person needs to be placed in the line.
- **Relative Position:** Where an object or person should be in relation to another.

The following facts are necessary to solve these kinds of questions:

1. If A, B, C and D are facing toward the North direction and P, Q, R and S are facing toward the South direction in a line then positions at their left and the right will be as shown in the following figures:



2. When A and B are in one line and P and Q are in other then diagonally opposite directions will be here, A is opposite to Q and B is opposite to P.



QUESTIONS

Q1. Six friends A, B, C, D, E and F are sitting in a row facing towards the North. C is sitting exactly between A And E. E is not at the end. B is sitting immediately to the right of E. F is not at the right end. D is sitting 2nd to the left end.

Who is at the right end?

(a) A (b) B

(c) C (d) D

Ans: (b)

Explanation:

We need to arrange the given data and we will do it step by step as:

We have to arrange A, B, C, D, E and F in a straight line.

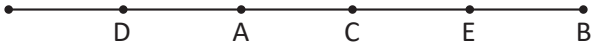
Given that C is sitting between A and E these 3 can be arranged as follows:

A C E or E C A

Now it is given that B is sitting immediately to the

right of E. Hence the arrangement of these 4 is shown in the figure below:

Also D is sitting 2nd to the left end. Hence the arrangement is:



Now, F is not at the right end so whole arrangement looks like:

Now, the above diagram is the final sitting arrangement of A, B, C, D, E and F.

From the diagram it is very clear that B is at the right end.

Q2. In a confectionery shop, the items are arranged in a rack consisting of six rows. Biscuits are kept above the tins of chocolates but below the rows of packets of chips, cakes are at the bottom and the bottles of peppermints are below the chocolates. The topmost row had the display of jam bottles, where are the bottles of peppermints from top?

(a) 5th (b) 3rd

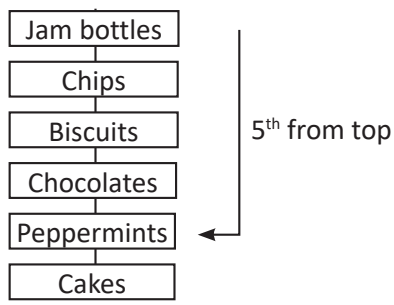
(c) 2nd (d) 4th

Ans: (a)

Explanation:

Given that jambottles are at the top place.

We will find out the arrangements using given data step by step as we did in previous example and the arrangement of the stuff look like:



Hence we can say that peppermints are at 5th from the top.

Q3. Consider the following: A, B, C, D, E, F, G and H are standing in a row facing North. B is not neighbour of G. F is to the immediate right of G and neighbour of E. G is not at the extreme end. A is sixth to the left of E. H is sixth to the right of C.

Which one of the following is correct in respect of the above? **(UPSC CSAT 2017)**

(a) C is to the immediate left of A

(b) D is the immediate neighbour of B and F

(c) G is to the immediate right of D

(d) A and E are at the extreme ends

Ans: (c)

Explanation:

The given information can be summarized as:

F is to the immediate right of G and neighbor of E and A is sixth to the left of E.

A				G	F	E	

H is sixth to the right of C. This is possible only when H is on the extreme right.

A	C			G	F	E	H

B and D are left and B is not a neighbor of G.

So, the possible arrangement is:

A	C	B	D	G	F	E	H

We can clearly see that, C is the immediate right of A and D is the immediate neighbor of B and G. A and H are at extreme ends and G is to the immediate right of D.

Q4. Four children are sitting in a row. A is occupying the seat next to B but not next to C. If C is not sitting next to D, who is/are occupying seat/seats adjacent to D? **(UPSC CSAT 2014)**

(a) B (b) A

(c) B and A (d) Impossible to tell

Ans: (b)

Explanation:

Statement-I: A is occupying the seat next to B but not next to C Possibilities can be: AB or BA, but not CAB or BAC.

Statement-II: If C is not sitting next to D then CD or DC is not possible. So C has to be next to B, and D next to A.

Hence there are two possibilities: DABC or CBAD.

In both cases A is adjacent to D.

TYPE 2: CIRCULAR ARRANGEMENT

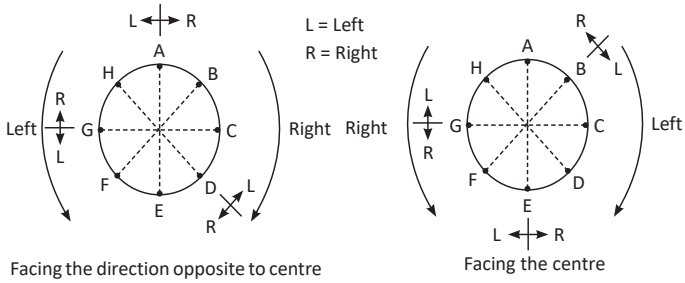
In circular sitting arrangement questions, you are presented with a set of hints or clues that guide you in organizing objects or individuals into specific patterns. The primary objective is to interpret these clues accurately to form a seating arrangement. This type of problem-solving is not just limited to circular patterns but also extends to other geometric configurations like squares, pentagons, and hexagons.

KEY CONCEPTS

- **Direction of Seating:** In circular arrangements, it's crucial to note whether the individuals are facing towards the center or away from it. This affects the interpretation of 'left' and 'right' in the clues.
- **Relative Positioning:** Clues often describe the positions of individuals relative to others, such as "Person A is to the immediate right of Person B" or "Person C and Person D are sitting opposite each other."
- **Fixed and Variable Elements:** Some clues provide fixed positions (e.g., "Person E is sitting third to the left of Person F"), while others offer more flexible arrangements. The strategy involves using fixed elements as anchors around which the variable elements are arranged.
- **Identifying Neighbours:** Determining who is sitting next to whom is a common challenge. Clues might indicate direct neighbors or relationships involving several seats between individuals.
- **Dealing with Multiple Possibilities:** Often, the initial clues lead to multiple possible arrangements. Subsequent clues are used to eliminate incorrect possibilities and arrive at the correct arrangement.

Before Solving the Questions Related to This Concepts We Need to Remember The Following Facts:

	Facing Inward	Facing Outward
Orientation	Individuals are seated around a circle, facing **towards the center.**	Individuals are seated around a circle, facing **away from** the center.
Immediate Left	The position **counter-clockwise** to an individual.	The position clockwise to an individual.
Immediate Right	The position **clockwise** to an individual.	The position **counter-clockwise** to an individual.
Example	If Person A is facing the center, the person to A's immediate left is the one seated counter-clockwise to A.	If Person B is facing outward, the person to B's immediate left is the one seated clockwise to B.



QUESTIONS

Q5. Seven persons P, Q, R, S, T, U and V are sitting in a circle. U is 2nd to the right of V, Q is the neighbor of U but not of T, T is the neighbor of R, who is 4th to the right of V and S is exactly between T and P. Who is third to the left of V?

(a) S (b) T

(c) R (d) P

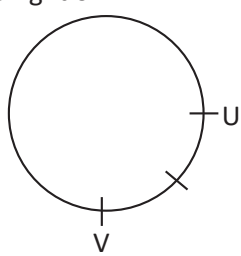
Ans: (b)

Explanation:

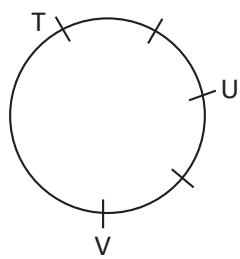
We will use the given information step by step.

7 persons: P, Q, R, S, T, U and V

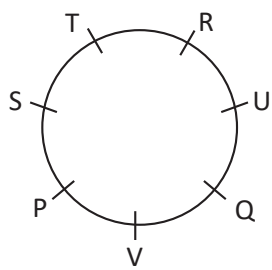
U is 2nd to the right of V.



Now, T is 4th to the right of V.



Q is the neighbor of U but not of T, T is the neighbor of R and S is between T and P.



So, T is third to the left of V.

Q6. Eight friends P, Q, R, S, T, U, V and W are sitting around a circular table facing towards the center to discuss the Israel Palestine war. They are sitting in a manner such that Q is sitting exactly between W and T. P is sitting exactly between U and V and R is sitting to the third left of V and W is sitting 3rd right of S. How many people are there between P and Q?

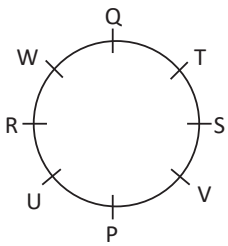
(a) 2 (b) 3

(c) 4 (d) 1

Ans: (b)

Explanation:

Following figure shows the final arrangement of the given data:



From this figure we can clearly see that there are 3 people between P and Q.

Q7. Five people A, B, C, D and E are seated about a round table. Every chair is spaced equidistant from adjacent chairs.

(i) C is seated next to A.

(ii) A is seated two seats from D.

(iii) B is not seated next to A.

Which of the following must be true?

(UPSC CSAT 2013)

I. D is seated next to B.

II. E is seated next to A.

Select the correct answer from the codes given below:

(a) I only (b) II only

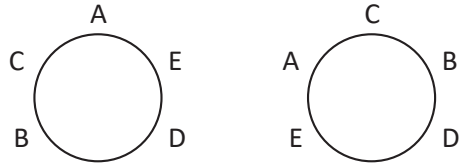
(c) Both I and II (d) Neither I nor II

Ans: (c)

Explanation:

Let's draw a circle with given conditions:

We got two possibilities:



In both the situations C is seated next to A and A is seated 2 seats to D. B is not seated next to A.

Now in both situations D is seated next to B, hence conclusion-I is true

Also E is seated next to A hence conclusion-II is also true.

Q8. Eight students A, B, C, D, E, F, G and H sit around a circular table, equidistant from each other, facing the center of the table, not necessarily in the same order. B and D sit neither adjacent to C nor opposite to C. A sits in between E and D, and F sits in between B and H. Which one of the following is definitely correct? **(UPSC CSAT 2022)**

(a) B sits in between A and G

(b) C sits opposite to G

(c) E sits opposite to F

(d) None of the above

Ans: (d)

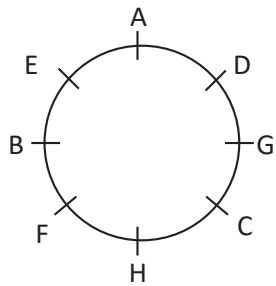
Explanation:

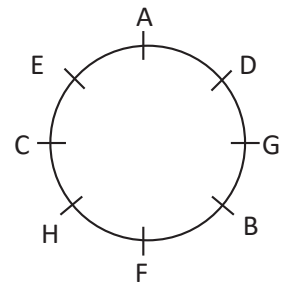
I. B and D sit neither adjacent to C nor opposite to C.

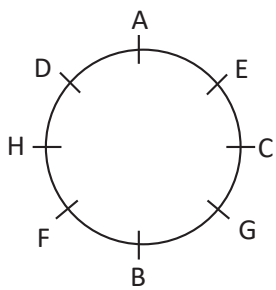
II. A sits in between E and D

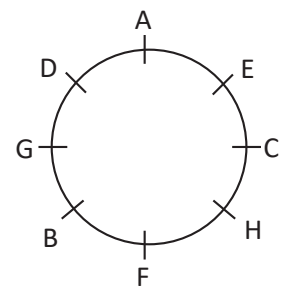
III. F sits in between B and H.

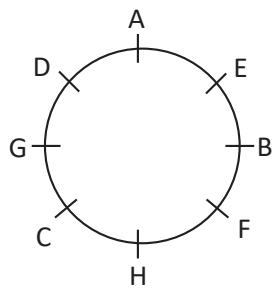
Using the given statements, following arrangements can be possible.











We can clearly see that none of the options is definitely correct.

PRACTICE QUESTIONS

1. Six persons P, Q, R, S, T and U are standing in a circle facing towards the center. P is exactly between Q and T, S is between T and U. Q is sitting to the immediate left of R. Who is standing to the left of S?

(a) T (b) U

(c) Q (d) R

Directions (Q2-Q4): Based on the given information below solve the following questions.

A family of 11 members P, Q, R, S, T, U, V, W, X, Y & Z is sitting on a bench to watch cricket match

I. S is immediate right of W who is 3rd to the right of X

II. Y is sitting between Q and P and 3rd to the left of V

III. T sits at one of the ends and P is second to the right of T

IV. R is sitting second to the left of S who is sitting next to the left of U

2. Which of the following people are sitting to the right of R?

(a) XWS (b) WSU

(c) ZPY (d) ZXQ

3. Who are the immediate neighbors of Q?

(a) Y and X (b) R and W

(c) P and W (d) V and P

4. Who is occupying the center place?

(a) X (b) W

(c) V (d) Q

Directions (Q5-Q7): Based on the given information below solve the following questions.

Eight friends P, Q, R, S, T, U, V and W are sitting in a straight line, and they are all facing north. U is sitting exactly between S and V. Q is sitting between W and P. T is third to the left of V. V is sitting at one of the corners. W is third to the left of R.

5. Who is sitting between P and T?

(a) Q (b) W

(c) S (d) R

6. Who all are sitting to the right of T?

(a) QPR (b) WQP

(c) SUV (d) VUS

7. If W and V interchange their positions, who will be at the center?

(a) RT (b) TS

(c) PR (d) QU

Directions (Q8-Q9): Based on the given information below solve the following questions.

Five sisters A, B, C, D and E are sitting in the first row to watch a movie facing south. Centre position is occupied by B. A is Sitting at the corner and which is at the right side of B. E and C are sitting on one side of B. A and C have two persons sitting between them.

8. Who are the immediate neighbors of B?

(a) A, C (b) C, E

(c) A, D (d) D, C

9. Who is sitting between A and B?

(a) C (b) E

(c) D (d) None of the above

Directions (Q10-Q12): Based on the given information below solve the following questions.

Seven persons A, B, C, D, E, F and G are sitting in a circle facing the center.

E is sitting between A and D. G is not exactly between F and C. A is to the immediate left of F. G is second to the Right of B.

10. Which of the following does not have the pair of persons sitting adjacent to each other?

(a) BF (b) DG

(c) BD (d) GC

11. Which of the following pairs has the second person sitting immediately to the right of the first?

(a) C and B (b) C and D

(c) G and D (d) D and G

12. What is the position of B?

(a) Second to the left of G

(b) Second to the left of A

(c) To the immediate left of F

(d) To the immediate right of C

Directions (Q13-Q15): Based on the given information below solve the following questions.

Eight persons A, B, C, D, E, F, G and H are sitting around a circular table facing the center but not necessarily in the same order.

C sits second to the left of A. There are two persons between C and D. E sits immediate right of H who neither sits adjacent to D nor sits second to the right of D. E sits second to the left of B. Only two persons sit between B and F. Both G and B are not immediate neighbors.

13. Who among the following persons sits to the immediate left of G?

(a) H (b) D

(c) A (d) F

14. Who among the following person sits opposite to C?

(a) H

(b) The one who sits second to the right of G

(c) A

(d) The one who sits immediate right of D

15. If F is related to A and E is related to G in a certain way. Then, who among the following person is related to H?

(a) D (b) B

(c) C (d) F

Directions (Q16-Q17): Based on the given information below solve the following questions.

Six cousins, U, V, W, X, Y and Z are sitting on a circular table; 2 are facing inwards and are exactly opposite to each other and the rest are facing outwards.

W is the immediate right of V who is facing outwards. Y and X are the immediate neighbors of Z. Y is not facing outwards. U is 2nd to the left of W. W is facing outwards

16. The 2 persons who are facing the center are

(a) Y and X (b) Y and U

(c) Y and Z (d) Y and W

17. If positions of V & X and Z & W are interchanged, then who is 2nd to the left to V?

(a) Y (b) X

(c) U (d) W

Directions (Q18-Q19): Based on the given information below solve the following questions.

Six persons are sitting in a circle facing to the center of the circle. They are A, B, C, D, E and F. F is next to the right of A. The person sitting exactly between B and D is not E. C is 2nd to the left of A.

18. Which of the following statements is not true?

(a) D is sitting just next to the C

(b) E is just next to the right of F

(c) C is second to the left of E

(d) A is second to the right of C

19. What is the position of E?

(a) Just next to the right of B

(b) Second to the left of A

(c) Between B and C

(d) To the immediate right of F

Directions (Q20-Q22): Based on the given information below solve the following questions.

There are 6 books belonging to History, Polity, Economy, Environment, Geography and Science. They are to be arranged on a vertical shelf such that each shelf will have only one book. The bottom shelf is the first shelf and the topmost is the 6th.

- There are 2 shelves between shelves on which Polity and Science are kept.
- Polity is kept on a shelf below Science's shelf.
- Neither History nor Geography are kept on a shelf immediately below or immediately above the shelf which has Polity.
- History is not on an odd numbered shelf.
- There is only one shelf between shelves of Environment and Geography.
- Geography is not on a shelf immediately below or immediately above the shelf which has Economy.

20. Which book is at the bottom shelf?

(a) Polity (b) Geography

(c) History (d) Economy

21. On which shelf is the book on the Environment kept?

(a) 2 (b) 3

(c) 5 (d) 6

22. How many shelves are there between the books on Geography and Economy?

(a) 2 (b) 3

(c) 5 (d) 6

Directions (Q23-Q24): Based on the given information below solve the following questions.

Eight persons viz., P, Q, R, S, T, U, V and W are sitting around a rectangular table in such a way that the person at the corner is facing away from the center and the person sitting in the middle is facing towards the center.

T, who sits second to the right of V and sits three places away from P. P is not an immediate neighbor of V. Two persons sit between V and U. As many persons sit between S and Q as between Q and R, who sit adjacent to U. W sits in the middle of the side.

23. Who sits third to the left of W?

(a) R

(b) The one who sits opposite to T

(c) Q

(d) The one who sits second to the right of V

24. In which of the following options, the first person sits exactly between the second and third person?

(a) VQS (b) TUR

(c) RTP (d) WVS

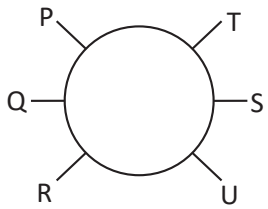
Answers

1. (*b*)	2. (*b*)	3. (*a*)	4. (*a*)	5. (*d*)	6. (*c*)	7. (*a*)	8. (*d*)	9. (*c*)	10. (*c*)
11. (*c*)	12. (*a*)	13. (*d*)	14. (*d*)	15. (*c*)	16. (*b*)	17. (*a*)	18. (*c*)	19. (*d*)	20. (*a*)
21. (*b*)	22. (*a*)	23. (*d*)	24. (*d*)						

Explanations

1. (b)

Explanation:



Clearly, U is standing to the left of S.

2. (b)

Explanation:

From Statement-III: T must be at left end because P is to the right of T

T _ P _ _ _ _ _ _ _ _

From statement-II: Y is between Q and P since T is at the end Q cannot be at first place and it has to be on the right side of P. Y is third to the left of V.

T _ P Y Q _ V _ _ _ _

From statement-I: S is immediate right of W who is 3rd to the right of X

Means there has to be 4 persons between S and X (S cannot be at the right end since S is sitting left of U)

T _ P Y Q X V _ W S _

From statement-IV: U is next right of S, R sits second to the left of S and the remaining one will be Z

The arrangement will be

T Z P Y Q X V R W S U

Clearly, W S U are sitting to the right of R.

3. (a)

Explanation:

Based on the given information the following seating arrangement is derived:

T Z P Y Q X V R W S U

Clearly, **immediate neighbors of Q are Y and X.**

4. (a)

Explanation:

Based on the given information the following seating arrangement is derived:

T Z P Y Q X V R W S U

Clearly, the center stage is occupied by X.

5. (d)

Explanation:

Since T is third to the left of V and V is at the corner means V is at the right corner

_ _ _ _ T _ _ V

U is sitting between S and V

_ _ _ _ T S U V

W is 3rd to the left of R (there has to be 2 persons between W and R)

W _ _ R T S U V

Q is sitting between W and P

∴ The Arrangement will be

W Q P R T S U V

Clearly, R is sitting between P and T.

6. (c)

Explanation:

Based on the given information the following seating arrangement is derived:

W Q P R T S U V

Clearly, S, U and V are sitting to the right of T.

7. (a)

Explanation:

Based on the given information the following seating arrangement is derived:

W Q P R T S U V

If W and V interchange their position, the arrangement becomes:

V Q P R T S U W

But the occupants of the center position are unaltered, therefore center position is occupied by R T.

8. (d)

Explanation:

Facing South

B is at the Center

_ _ B _ _

A is at the corner and sitting towards the right of B

A _ B _ _

E and C are sitting on one side of B means D has to be between A and B

A D B _ _

A and C have two persons sitting between them

∴ The arrangement will be

A D B C E

Clearly, D and C are immediate neighbours of B.

9. (c)

Explanation:

Based on the given information the following seating arrangement is derived:

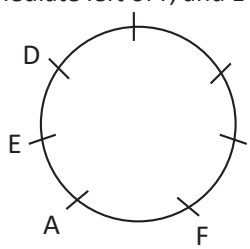
A D B C E

Clearly, D is sitting between A and B.

10. (c)

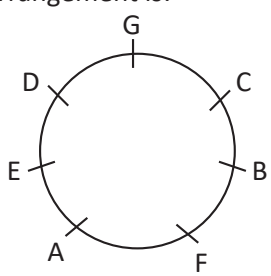
Explanation:

A is to the immediate left of F, and E is between A and D



G is not between F and C (there is one person between F and C which has to be B)

∴ The final arrangement is:

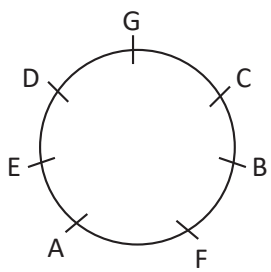


Clearly, in the above arrangement B and D are not sitting adjacent to each other.

11. (c)

Explanation:

Based on the given information the following seating arrangement is derived:

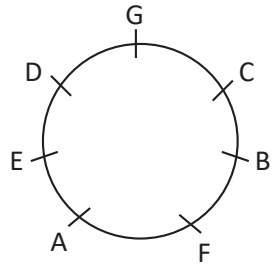


Clearly, in the above arrangement D is sitting immediately to the right of G.

12. (a)

Explanation:

Based on the given information the following seating arrangement is derived:

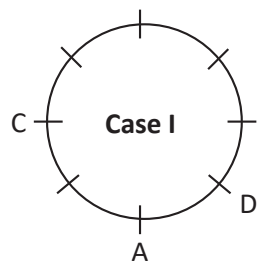


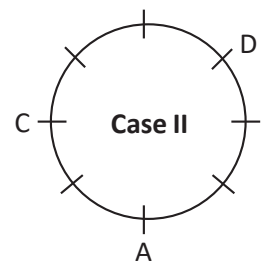
Clearly, in the above arrangement B is sitting **second to the left of G.**

13. (d)

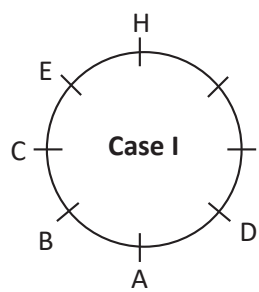
Explanation:

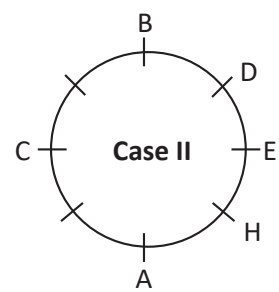
C sits second to the left of A and there are two persons between C and D.





E sits immediately to the right of H who neither sits adjacent to D nor sits second to the right of D. E sits second to the left of B.

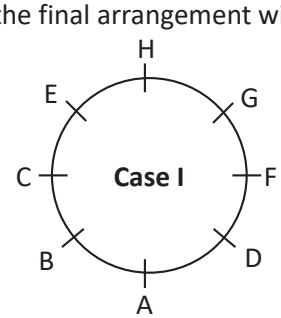




Only two persons sit between B and F. Both G and B are not immediate neighbors.

∴ Case-II will not be possible

Therefore, the final arrangement will be:

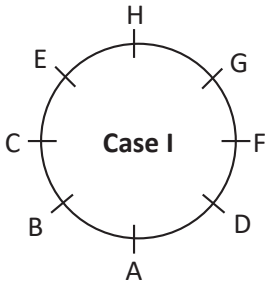


Clearly, the person sitting to the immediate left of G is F.

14. (d)

Explanation:

Based on the given information the following seating arrangement is derived:

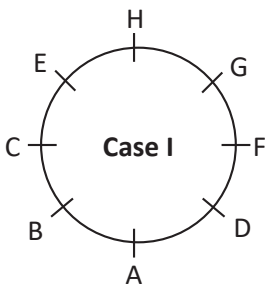


Clearly, person sitting opposite to C is the person who is sitting to the immediate right of D i.e. F.

15. (c)

Explanation:

Based on the given information the following seating arrangement is derived:

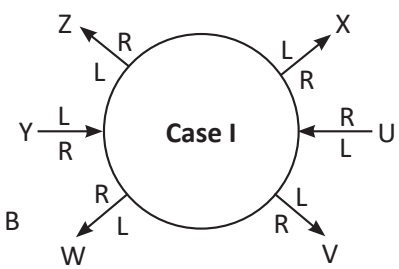


F is second to the right of A and E is second to the right of G and from the above arrangement we can see that C is second to the right of H.

16. (b)

Explanation:

Based on the given information the following seating arrangement is derived:

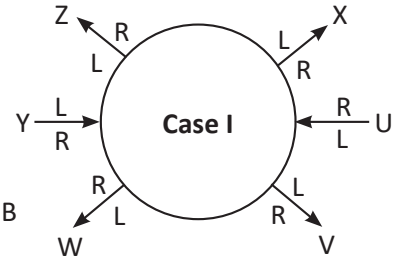


Clearly, we can see that two persons who are facing the center are Y and U.

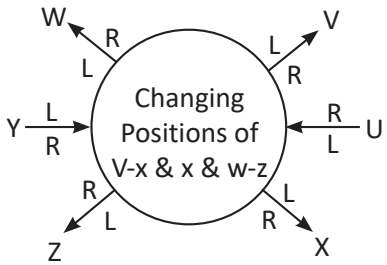
17. (a)

Explanation:

Based on the given information the following seating arrangement is derived:



But if positions of V & X and Z & W are interchanged then we get:

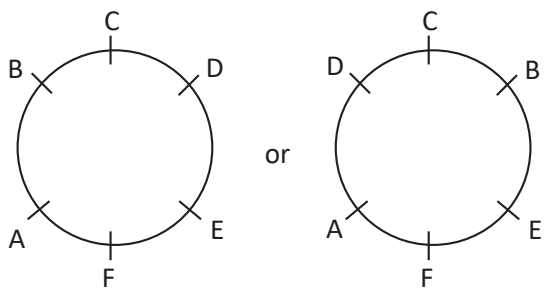


Clearly, the person sitting 2nd to the left to V is Y.

18. (c)

Explanation:

Based on the given information the following seating arrangement is derived:

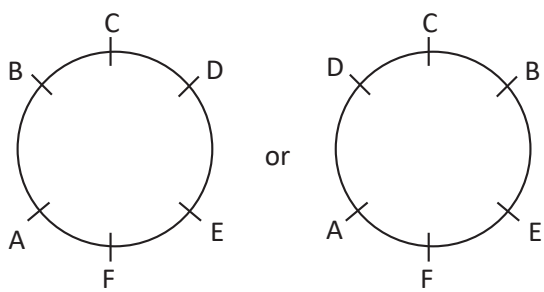


Clearly, C is second to the right of E.

19. (d)

Explanation:

Based on the given information the following seating arrangement is derived:



Clearly, E is to the immediate right of F.

20. (a)

Explanation:

Based on the given information the books of different subjects are arranged on various selves as follows:

Shelf Number	Books
6	History
5	Geography
4	Science
3	Environment
2	Economy
1	Polity

Clearly, the book on Polity is placed on the bottom shelf.

21. (b)

Explanation:

Based on the given information the books of different subjects are arranged on various selves as follows:

Shelf Number	Books
6	History
5	Geography
4	Science
3	Environment
2	Economy
1	Polity

Clearly, the book on Environment is placed on the 3rd shelf.

22. (a)

Explanation:

Based on the given information the books of different subjects are arranged on various selves as follows:

Shelf Number	Books
6	History
5	Geography
4	Science
3	Environment
2	Economy
1	Polity

We can see that there are 2 shelves between the books on Geography and Economy.

Hence, option (a) is correct.

23. (d)

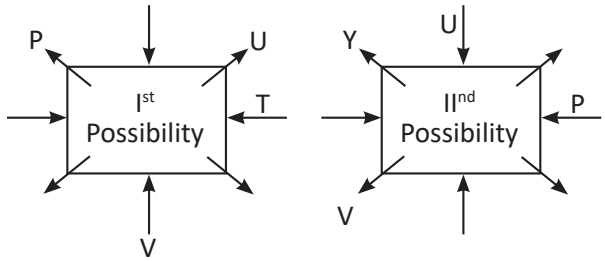
Explanation:

T, who sits second to the right of V and sits three places away from P

P is not an immediate neighbor of V

Two persons sit between V and U

(We get two possibilities based on Whether V is at the middle or at the corner)

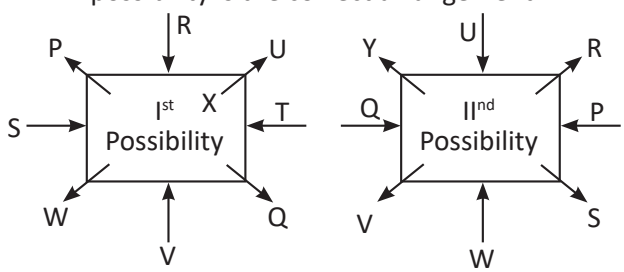


As many persons sit between S and Q as between Q and R, who sits adjacent to U.

W sits in the middle of the side

(If we start by taking R adjacent to U in each possibility, we get W at the corner in the first possibility which is not correct)

$\therefore$ 2nd possibility is the correct arrangement

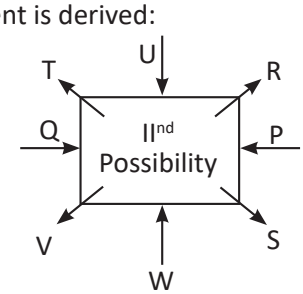


Clearly, the person sitting third to the left of W is the one who sits second to the right of V i.e., T.

24. (d)

Explanation:

Based on the given information the following seating arrangement is derived:



Clearly, W sits between V and S.

Blood Relations

8

TYPES OF BLOOD RELATIONS

Blood relations are a key part of our lives, showing how family members are connected. These connections can be close, like between parents and children, or more distant, like with uncles, aunts, and cousins. For the UPSC CSAT, it's important to understand these relations. Not only do they help us know about family ties, but also help us in solving blood relations reasoning questions. In these questions, candidates must figure out how family members are related based on certain clues. This makes blood relations an important topic to study and understand in depth for the exam.

BLOOD RELATIONS CAN BE MAINLY CATEGORIZED INTO TWO TYPES

- **Direct Relations:** These are straightforward relationships like father, mother, brother, sister, son, and daughter.
- **Indirect Relations:** These are relationships that are not direct but can be deduced from a combination of direct relationships. Examples include aunt, uncle, niece, nephew, cousin, and grandparents.

COMMON TERMINOLOGIES USED IN QUESTIONS

- **Sibling:** A brother or sister.
- **Spouse:** A husband or wife.
- **Ancestor:** A person from whom one is descended, e.g., parents, grandparents, and so on.
- **Descendant:** A person who is descended from another, e.g., children, grandchildren, and so on.
- **In-laws:** Relations by marriage, e.g., mother-in-law, son-in-law.
- **Maternal relations:** Relations from Mother's side
- **Paternal relations:** Relations from Father's side

COMMON RELATIONS

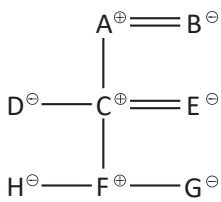
Relationship	Description	Symbol
Primary Relations		
Father (Pita)	A male parent.	F
Mother (Maa)	A female parent.	M
Son (Beta)	A male child.	S
Daughter (Beti)	A female child.	D
Brother (Bhai)	A male sibling.	B
Sister (Behen)	A female sibling.	Si
Secondary Relations		
Grandfather (Dada/Dadaji)	The father of one's father or mother.	GF
Grandmother (Dadi/Dadiji)	The mother of one's father or mother.	GM
Uncle (Chacha/Mama)	The brother of one's father (Chacha) or mother (Mama).	U
Aunt (Chachi/Mami)	The wife of one's Chacha (Chachi) or the sister of one's mother (Mami).	A
Nephew (Bhatija)	The son of one's brother or sister.	N
Niece (Bhatiji)	The daughter of one's brother or sister.	Ne
Cousin	The child of one's uncle or aunt.	C

In-Laws		
Father-in-law (Sasur)	The father of one's spouse.	FiL
Mother-in-law (Saas)	The mother of one's spouse.	MiL
Brother-in-law (Jija/Sala/Devar)	The husband of one's sister (Jija) or the brother of one's spouse (Sala/Devar).	BiL
Sister-in-law (Nanad/Bhabhi)	The sister of one's spouse (Nanad) or the wife of one's brother (Bhabhi).	SiL
Son-in-law (Damaad)	The husband of one's daughter.	SoL
Daughter-in-law (Bahu)	The wife of one's son.	DiL

TIPS FOR SOLVING BLOOD RELATION PROBLEMS:

- **Draw Family Tree:** Visual representation can simplify complex relationships.
- Use **'+' for male** members and **'-' for female** members in the family tree diagram.
- **Start with Direct Relations**: Identify and mark direct relations first, then move to indirect ones.
- Use a continuous **horizontal line to connect siblings**.
- Draw **parallel lines between a husband and wife** to indicate marriage.
- Draw a **vertical line to connect parents to their children**.
- All the family members of the upper generation are represented above in the family tree.
- All the family members of the same generation are represented in the middle of the family tree.
- All the family members of the next generation are represented below in the family tree.
- **Read the question Carefully**: Often, the **language can be tricky**, and missing out on a single word can lead to wrong conclusions.
- It may sometimes help to **imagine yourself in the position and deduce answers** based on your family tree.

EXAMPLE OF A FAMILY TREE:



- (A,B) and (C,E) are husband and wife pairs.
- (C,D) and (F,H,G) are sibling groups.
- A,C,F,G are male members of the family.
- B,D,E,H are female members of the family.
- (A,B) are 1st generation, (C,D,E) are 2nd generation and (F,G,H) are the 3rd generation.

TYPES OF QUESTIONS

TYPE 1: TALKING ABOUT A PERSON

These questions typically involve a person pointing to another person or a photograph and describing their relationship.

QUESTIONS

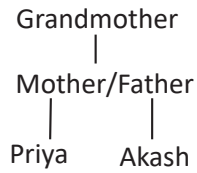
Q1. Pointing to Akash, Priya said, "He is the son of my grandmother's only child." How is Priya related to Akash?

(a) Sister (b) Mother
(c) Aunt (d) Cousin

Ans: (a)

Explanation:

Priya's grandmother's only child would be Priya's mother or father. So, Akash is the son of either Priya's mother or father. This makes Priya Akash's sister.



Q2. Arjun said to Nitish, " That boy playing football is the younger of the two brothers of the daughter of my father's wife." How is the boy playing football related to Arjun?

(a) Son (b) Brother
(c) Cousin (d) Nephew

Ans: (b)

Explanation:

Arjun's father's wife is his mother.

His mother's daughter is his sister.

It means his sister has two brothers. One is Arjun and the younger one is playing football.

So, the boy playing football is the brother of Arjun.

TYPE 2: PUZZLES

These are complex questions where multiple relationships are given, and you have to deduce the relationship between specific individuals.

QUESTIONS

Q3. A and B are a married couple. X and Y are brothers. X is the brother of A. How is Y related to B?

(a) Brother-in-law (b) Brother

(c) Cousin (d) Son

Ans: (a)

Explanation:

Y is the brother of A, and A is married to B. So, Y is the brother-in-law of B.

Q4. B is the mother of Q; A is the father of P. The sister of P and R is Q. Which of the following statements is definitely not true?

(a) B is the mother of R.

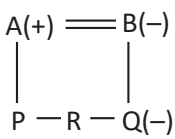
(b) P is the sister of R.

(c) Q is the son of A.

(d) B has one daughter.

Ans: (c)

Explanation:



It is clear that A and B are husband and wife and Q is the sister of P.

So, Q is definitely the daughter of A not the son of A.

Directions(Q5-Q6): Study the given information and answer the following questions.

There are nine members in the family. D is the brother of E. D is the only son of C. F is the father-in-law of E. G is the maternal grandfather of A, who is a male. B is the only son of F. F is the grandfather of H. I is the daughter of H.

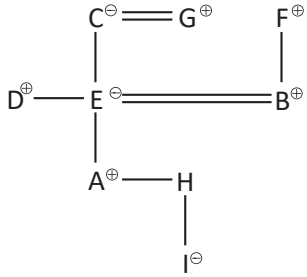
Q5. How is E related to I?

(a) Mother (b) Grandmother

(c) Grandfather (d) Father

Ans: (b)

Explanation:



Total members in a family – 9

We can clearly see that E is the mother of H.

I is the daughter of H.

So, E is the Grandmother of I.

Q6. How is A related to H?

(a) Mother (b) Son

(c) Brother (d) Father

Ans: (c)

Explanation:

It is clear that E is the wife of B and A is the son of B.

So, A is the brother of H.

Q7. P, Q, R, S, T and U are six members of a family. R is the spouse of Q, U is the mother of T and S is the daughter of U. P's daughter is T and R's son is P. There are two couples in the family. Which one of the following is correct? **(UPSC CSAT 2022)**

(a) Q is the grandfather of T

(b) Q is the grandmother of T

(c) R is the mother of P

(d) T is the granddaughter of Q

Ans: (d)

Explanation:

Information given: R is the spouse of Q (does not tell about gender of R and Q) ...(i)

U is the mother of T (U is a female) ...(ii)

S is the daughter of U (S is female) ...(iii)

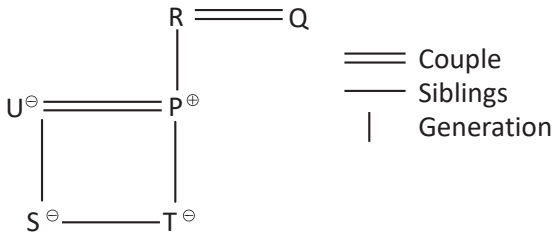
T is the daughter of P (T is female) ...(iv)

P is son of R (P is male) ...(v)

From statement (ii) and (iii) we can conclude: S and T are siblings.

From statements (iv) and (v) we can conclude that P is father of T and T is granddaughter of R.

By the above statements we can make a family tree as shown below



In the above family tree + indicate 'male' and – indicate 'female'

Now we can see that T is the granddaughter of Q.

Q8. A family of two generations consisting of six members P, Q, R, S, T and U has three males and three females. There are two married couples and two unmarried siblings. U is P's daughter and Q is R's mother-in-law. T is an unmarried male and S is a male. Which one of the following is correct? **(UPSC CSAT 2020)**

(a) R is U's husband. (b) R is S's wife.

(c) S is unmarried (d) None of the above

Ans: (b)

Explanation:

Information given in the question is: there is a two generation family.

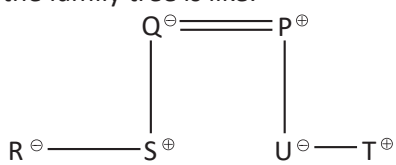
Total 6 members: 3 males (T, S and one more) and 3 female (U, Q and one more)

There are two couples and the other two are unmarried siblings. P, Q, R are definitely married.

T is definitely single. We do not know whether S and U are married or not.

U is P's daughter and Q is R's mother-in-law, it means that P and Q belong to the senior generation and U and R belong to the junior generation.

Hence the family tree is like:



U and T are the unmarried siblings. R is S's wife.

Q9. P, Q, R, S, T and U are six members of a family. R is the spouse of Q, U is the mother of T and S is the daughter of U. P's daughter is T and R's son is P. There are two couples in the family.

Which one of the following is correct?

(UPSC CSAT 2022)

(a) Q is the grandfather of T

(b) Q is the grandmother of T

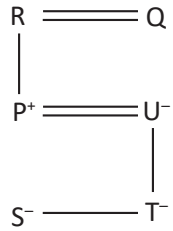
(c) R is the mother of P.

(d) T is the granddaughter of Q.

Ans: (d)

Explanation:

Based on the information given, we can construct the family tree as shown below



As the Gender of R and Q is not given we can not say anything about options a, b and c. and we can conclusively say that T is the grandaughter of Q.

Q10. A joint family consists of seven members A, B, C, D, E, F and G with three females. G is a widow and sister-in-law of D's father F. B and D are siblings and A is daughter of B. C is cousin of B. Who is E?

(UPSC CSAT 2019)

1. Wife of F
2. Grandmother of A
3. Aunt of C

Select the correct answer using the code given below:

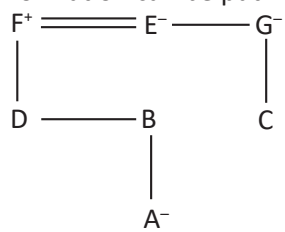
(a) 1 and 2 only (b) 2 and 3 only

(c) 1 and 3 only (d) 1, 2 and 3

Ans: (d)

Explanation:

The given information can be put in a family tree as



From the above diagram it is clear that all the given statements are correct.

TYPE 3: CODED RELATIONS:

In these questions, relationships are represented by codes, and you have to decode the relationship based on the given information.

QUESTIONS

Q11. If P + Q means P is the father of Q, and P - Q means P is the sister of Q, How is C related to A if C is female and A + B – C is true?

(a) Mother (b) Sister

(c) Daughter (d) None of the above.

Ans: (c)

Explanation:

A + B means A is the father of B.

B – C means B is the sister of C.

So, C is the daughter of A.

Q12. If P % Q means P is the son of Q, and P & R means P is the husband of R, then what does A % B & C signify?

(a) A is the son of B and B is the husband of C.

(b) A is the husband of B and B is the son of C.

(c) A is the son of B and C is the wife of B.

(d) A is the husband of B and C is the son of B.

Ans: (a)

Explanation:

A % B means A is the son of B.

B & C means B is the husband of C.

Q13. Consider the following:

I. A + B means A is neither smaller nor equal to B.

II. A – B means A is not greater than B.

III. A × B means A is not smaller than B.

IV. A ÷ B means A is neither greater nor equal to B.

V. A ± B means A is neither smaller nor greater than B.

Statement: P × Q, P – T, T ÷ R, R ± S

Conclusion-I: Q±T

Conclusion-II: S+Q

Which one of the following is correct in respect of the above Statement and the Conclusions?

(UPSC CSAT 2023)

(a) Only Conclusion-I follows from the Statement.

(b) Only Conclusion-II follows from the Statement.

(c) Both Conclusion-I and Conclusion-II follow from the Statement.

(d) Neither Conclusion-I nor Conclusion-II follows from the Statement.

Ans: (b)

Explanation:

It is given that

A + B means A > B

A – B means A ≤ B

A × B means A ≥ B

A ÷ B means A < B

A ± B means A = B

It's given that, P × Q, P – T, T ÷ R, R ± S

Or P ≥ Q, P ≤ T, T < R, R = S

Using this we get: S = R > T ≥ P ≥ Q

Conclusion-I: Q ± T or Q = T. This is not necessarily true.

Conclusion-II: S + Q or S > Q. This is true.

PRACTICE QUESTIONS

1. B is the mother of Q; A is the father of P. The sister of P and R is Q. Which of the following statements is definitely not true?

(a) B is the mother of R.
(b) P is the sister of R.
(c) Q is the son of A.
(d) B has one daughter.

2. Shivani is the niece of Ashok. Ashok's mother is Priyanka. Kamla is Priyanka's mother. Kamla's husband is Harish. Krishna is the mother-in-law of Harish. How is Shivani related to Harish?

(a) Daughter
(b) Great grand daughter
(c) Grand niece
(d) Great grandson's daughter

Directions (3-4): Study the given information and answer the following questions.

There are nine members in the family. D is the brother of E. D is the only son of C. F is the father-in-law of E. G is the maternal grandfather of A, who is a male. B is the only son of F. F is the grandfather of H. I is the daughter of H.

3. How is E related to I?

(a) Mother (b) Grandmother
(c) Grandfather (d) Father

4. How is A related to H?

(a) Mother (b) Son
(c) Brother (d) Father

5. Seven persons of three generations are living in a family. There are three married couples in the family. R is married to P, who is daughter-in-law of Q. O is grandmother of M. L is grand-daughter of Q. L is sister-in-law of S. P has only one son. How is R related to S?

(a) Daughter-in-law
(b) Father-in-law
(c) Mother-in-law
(d) Father

6. There are eight members of three generations living in a family. U is grandfather of V, who is child of P. Q and S are siblings of T, who is only son of U. W is only grandson of U. R is the spouse of Q, who has only one child. V is the child of S. How many female members are there in the family?

(a) Two (b) Three
(c) Four (d) Five

Directions (7-8): Study the given information and answer the following questions.

In a family, there are nine members P, Q, R, S, T, U, V, X and Y. Y is the wife of X. X has only three Sons. V is the cousin of U. U is the daughter of Q. Q is the brother of P and R. R is the son of Y. T is the mother of U. S is married to R. P is unmarried.

7. How is Y related to V?

(a) Grandson (b) Grandmother
(c) Father (d) Daughter

8. How is Q related to V?

(a) Uncle (b) Aunt
(c) Brother (d) Sister

Direction (9-10): Study the given information and answer the following questions.

i. A # B means A is the mother of B
ii. A + B means A is the brother of B
iii. A – B means A is the sister of B
iv. A $ B means A is the father of B

9. P $ Q – R # S, then how is P related to R?

(a) Father (b) Sister
(c) Mother (d) Brother

10. J # K – L + M, then how is J related to M?

(a) Father (b) Mother
(c) Brother (d) Aunt

Direction (11-12): Study the given information and answer the following questions.

In a family there are nine family members i.e. P, Q, J, K, L, O, Z, X and Y. There are three generations having three married couples. P has only three children in which one is a daughter and two sons. Q is the wife of P. S is the sister of R and T. R is unmarried. B is the son of D. A is the cousin of B. T is the son of P. D is the male member of the family. C is the sister-in-law of S, who is married to D. D has no siblings.

11. How is A related to T?

(a) Son
(b) Daughter
(c) Mother
(d) Cannot be determined

12. How is Q related to A?

(a) Grandfather (b) Grandmother
(c) Mother (d) Father

Direction (13-14): Study the given information and answer the following questions.

A, B, C, X, Y and Z are six family members. Y is the son of X, who is not the mother of Y. B is the brother of X. Z and X are a married couple. C is the daughter of Z, who is sister of A.

13. How is Y related to C?

(a) Father (b) Brother
(c) Sister (d) Mother

14. How many male members are there in the family?

(a) Three
(b) Four
(c) Two
(d) Cannot be determined.

Read the given instructions and answer the following question.

- E is father of F and G and husband of H.
- I is father of J and L is the mother of K.
- J and K are cousin sisters.
- F is the maternal uncle of J.
- E has only two children.

15. How is I related to H ?

(a) Son (b) Daughter
(c) Son-in-law (d) Cannot be determined

Direction (16-17): Study the given information and answer the following questions.

B is the father of A. B is married to T. T is the mother of X. T has only one daughter. X is married to U. U is the son of Z.

16. How is X related to Z?

(a) Daughter (b) Granddaughter
(c) Niece (d) Daughter-in-law

17. How is A related to U?

(a) Brother-in-law (b) Brother
(c) Sister (d) Sister-in-law

Read the given instructions and answer the following question.

- T is the sister of X. X is married to L. L is the son of M.
- T is the mother of K. Y is the father of W.
- Y has only one son and only one daughter.
- W is daughter of T. P is son of X.

18. How is K related to X?

(a) Son (b) Niece
(c) Son-in-law (d) Nephew

Direction (19-20): Study the given information and answer the following questions.

P is granddaughter of A, who is married to G. H is the brother-in-law of A, who has two daughters but no son. R is cousin of Y and brother of P. S and C are son-in-law of G. C has two daughters. F and J are the daughters of K. Also, D is the member of this family.

19. How is K related to R?

(a) Mother (b) Aunt
(c) Daughter (d) Cannot be determined

20. Which of the following is not a couple in the family?

(a) A and G (b) S and D
(c) K and C (d) F and J

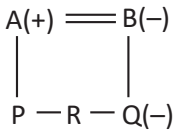
ANSWERS

1. (*c*)	2. (*b*)	3. (*b*)	4. (*c*)	5. (*b*)	6. (*b*)	7. (*b*)	8. (*a*)	9. (*a*)	10. (*b*)
11. (*d*)	12. (*b*)	13. (*b*)	14. (*d*)	15. (*c*)	16. (*d*)	17. (*a*)	18. (*d*)	19. (*b*)	20. (*d*)

EXPLANATIONS

1. (c)

Explanation:



It is clear that A and B are husband and wife and Q is the sister of P.

So, Q is definitely the daughter of A not the son of A.

2. (b)

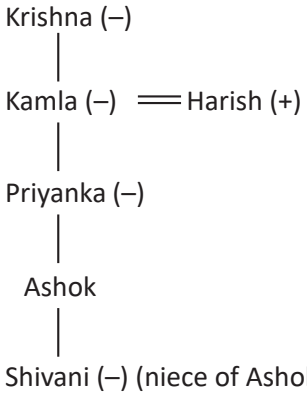
Explanation:

Shivani is the niece of Ashok. It means Ashok is the uncle of Shivani.

Priyanka is the mother of Ashok. It means Shivani is the granddaughter of Priyanka.

Harish is Kamla's husband and Priyanka is Kamla's daughter. It means Priyanka is the daughter of Harish.

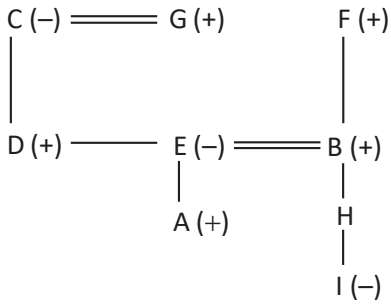
So, Shivani is the great granddaughter of Harish.



3. (b)

Explanation:

Total members in a family – 9



We can clearly see that E is the mother of H.

I is the daughter of H.

So, E is the Grandmother of I.

4. (c)

Explanation:

It is clear from the previous explanation that E is the wife of B and A is the son of B.

So, A is the brother of H.

5. (b)

Explanation:

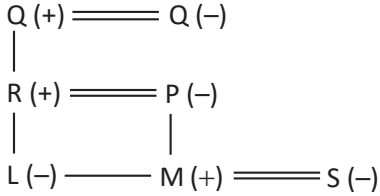
Total members in a family – 7

Married couples – 3

It is clear that Q and O; R and P and M and S are three married couples.

L is the sister of M who is the only son on P.

R is the father of M and S is the wife of M.



So, R is the father-in-law of S.

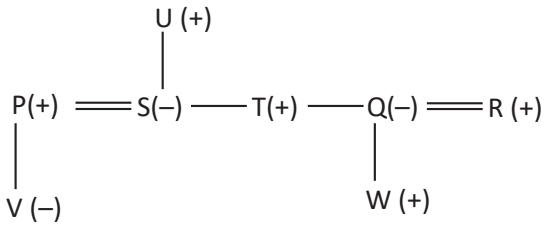
6. (b)

Explanation:

Total members in a family – 8

Total generations – 3

W is the only grandson of U. It means V is the granddaughter of U.



T is the only son of U. it means S and Q are daughters of U.

R is the spouse of Q. It means R is male.

Also, V is the child of both P and S. It is clear that P is the husband of S.

Males in the family – 5 i.e. U, P, T, R and W

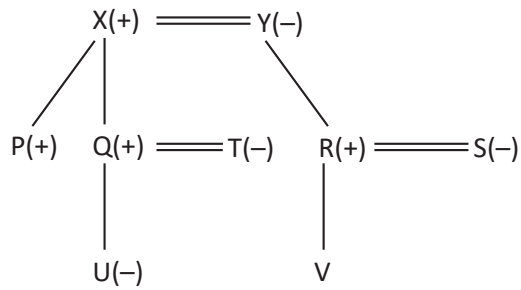
Females in the family – 3 i.e. S, Q and V

So, there are three females in the family.

7. (b)

Explanation:

Total members in a family – 9 i.e. P, Q, R, S, T, U, V, X and Y



We can clearly see that Y is the grandmother of V.

8. (a)

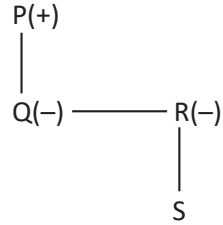
Explanation:

We can clearly see that **Q is the uncle of V.**

9. (a)

Explanation:

The given relationship P $ Q – R # S is shown as:



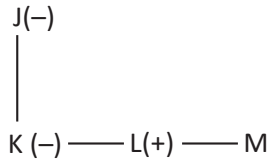
We can observe that Q and R are sisters and P is their father.

So, P is the father of R.

10. (b)

Explanation:

The given relationship J # K – L + M is shown as:

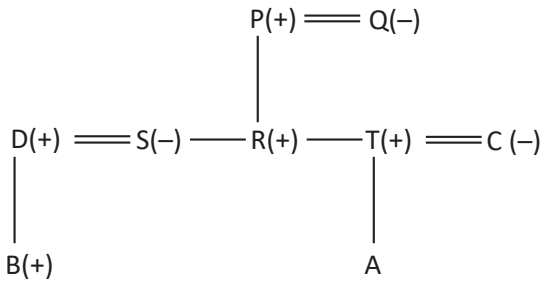


J is the mother of K, L and M.

11. (d)

Explanation:

Total family members – 9, number of generations – 3, number of married couple – 3



We can clearly see that C is the wife of T and A is their child.

The gender of A cannot be determined. A can be the son/daughter of T.

12. (b)

Explanation:

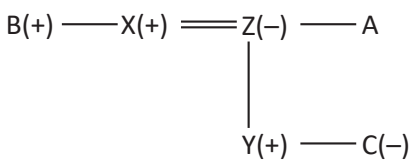
We can see that Q is the wife of P.

T is the son of Q and A is the child of T.

So, Q is the grandmother of A.

13. (b)

Explanation:



Total family members – 6 i.e. A, B, C, X, Y and Z

Y is the son of X and X is not the mother of Y. It means X is the father of Y.

Z and X are a married couple. It means Z is the wife of X.

C is the daughter of Z. It means C is the sister of Y.

Also, Z is the sister of A whereas A can be male or female.

We can clearly see that Y is the brother of C.

14. (d)

Explanation:

We can clearly see that,

Females – Z and C

Males – B, X and Y

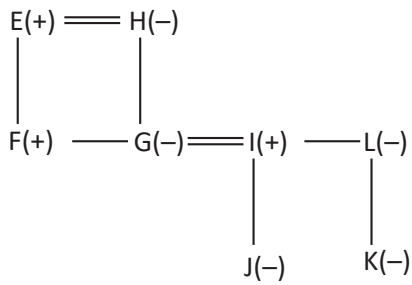
The gender of A cannot be determined.

So, the number of male members can be three or four based on the gender of A.

15. (c)

Explanation:

We can make the following relationship using the given instructions.



F and G are siblings and I and L are siblings.

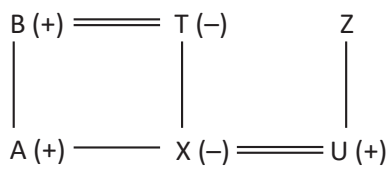
I is the husband of G, who is the daughter of H.

So, I is the son-in-law of H.

16. (d)

Explanation:

The given relationship is represented as:



It is given that U is the son of Z and X is married to U.

So, it means X is the only daughter of T and A is the son of B and T.

So, X is the daughter-in-law of Z.

17. (a)

Explanation:

It is clear that A is the brother of X and U is the husband of X.

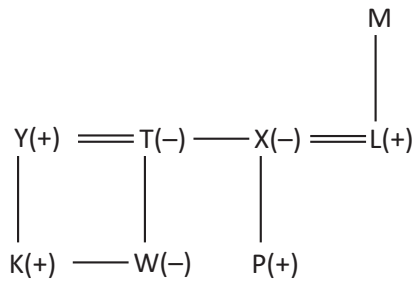
So, A is the brother-in-law of U.

18. (d)

Explanation:

Using the given information we can make the following relationship among the family members.

T and Y are a married couple and they have one daughter, W and one son, K.



X and L are a married couple and they have a child P.

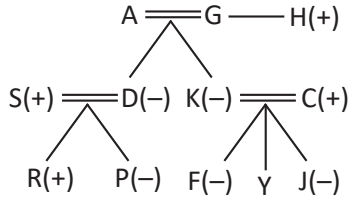
T and X are sisters.

So, K is the nephew of X.

19. (b)

Explanation:

Using the given information we can make the following family tree.



It is given that D is the family member. It is clear that D is the daughter of A and married to S and having two children i.e. R and P.

Also, D and K are sisters.

C has two daughters. F and J are the daughters of K. It means C is the husband of K.

So, K is the aunt of R.

20. (d)

Explanation:

There are three couples in the given family.

A and G

S and D

C and K

F and J are siblings not a couple.

Age Problems

9

INTRODUCTION

The chapter on Ages in logical reasoning and aptitude tests delves into solving problems that involve determining the ages of individuals, their age differences, and changes over time based on given conditions and relationships. This chapter is crucial for various competitive exams and tests your ability to understand and apply basic arithmetic concepts in real-world scenarios.

CONCEPTS USED IN AGE RELATED QUESTIONS

Concept	Description	Example
Before the Years (Past Age Calculation)	To find age in the past, subtract 'n' years from current age.	Kush is 28 now, so 7 years ago, he was 28−7=21 years old.
After the Years (Future Age Calculation)	To find future age, add 'n' years to current age.	Kush is 28 now, so in 7 years, he will be 28+7=35 years old.
Ratio of Ages	Compare ages of individuals, considering current, future, and past ratios.	Current ratio for ages X and Y is X:Y ; after 'n' years, it's X+n : Y+n ; 'n' years ago, it was X-n : Y-n
Age Differences	The difference in age between individuals remains constant over time.	If A is 5 years older than B now, this remains true in the future.
Average Ages	Average age is the sum of ages divided by the number of individuals. When group dynamics change (joining/leaving).	Average age of 4 people is 25 ; if a 20-year-old joins, the average becomes 24.
Sequential Aging	Understanding age progression over several time points.	If someone is X years old now, in 3 years, they will be X+3, in 6 years X+6, etc.

COMMON TECHNIQUES TO SOLVE AGE PROBLEMS

- **Setting Up Equations:** Turn what the problem says into math equations. **For example,** if the problem says "A is twice as old as B," you write it as A = 2B. This method is very helpful for questions where you have a clear age relationship.
- **Using Two Equations Together:** When you have more than one person in the problem and their ages are linked, you might need to solve two equations at the same time. For instance, if A is twice as old as B and their ages added together are 50 years, you can set up two equations based on this information to find each person's age.
- **Playing with Age Ratios:** Use the given ratios to solve age problems. This is useful when the question talks about how one person's age compares to another's. Suppose the question says A's age is three parts while B's age is two parts, you can use these ratios to find out their actual ages.

QUESTIONS

Q1. The age of Lakshmi is 11 times that of her daughter Anu. If the age of Anu is 3 year, then what is the age of Lakshmi?

(a) 33 years
(b) 36 years
(c) 29 years
(d) 42 years

Ans: (a)

Explanation:

Given that the age of Anu = 3 years

And age of Lakshmi = 3 × 11 = 33.

Q2. If the present ages of Nandu and Shobha are 16 year and 20 year respectively then find the ratio between the age of Nandu (before 4 year) and Shobha (after 4 year).

(a) 5 : 7

(b) 1 : 2

(c) 2 : 6

(d) 1 : 1

Ans: (b)

Explanation:

Current age of Nandu = 16 years

Current age of Shobha = 20 years

Now, Age of Shobha After 4 years = 20 + 4 = 24 years

Age of Nandu before 4 years = 16 - 4 = 12 years.

Hence the ratio of their age according to question = 12 : 24 = 1 : 2

Q3. The age of the Mother 4 years ago was 8 times the age of her Daughter. At present, the Mother's age is 4 times that of her Daughter. Find the present age of the Daughter.

(a) 9 year

(b) 7 year

(c) 14 year

(d) 18 year

Ans: (b)

Explanation:

Let present age of daughter = X year

Then, present age of mother = 4X year

Now, age of mother 4 year ago = (4X – 4) year

Age of daughter 4 year ago = (X – 4) year

According to the question, (4X – 4) = 8 (X – 4)

4X – 4 = 8X – 32

4X = 32 – 4 = 28 implies X = 7

Q4. Consider the Question and two Statements given below:

Question: What is the age of Manisha?

Statement-I: Manisha is 24 years younger than her mother.

Statement-II: 5 years later, the ages of Manisha and her mother will be in the ratio 3: 5.

Which one of the following is correct in respect of the Question and the Statement?

(UPSC CSAT 2022)

(a) Statement-I alone is sufficient to answer the Question

(b) Statement-II alone is sufficient to answer the question

(c) Both Statement-I and Statement-II are sufficient to answer the Question

(d) Both Statement-I and Statement-II are not sufficient to answer the Question

Ans: (c)

Explanation:

It is clear that neither of the statements alone is sufficient to answer the question.

Now, let's check both the statements.

Let the age of Manisha's mother is x and age of Manisha be y.

Using statement-I, y = x – 24 ...(i)

Using statement-II, 5 years later age of Manisha = y + 5 and age of Manisha's mother = x+ 5

y + 5 / x + 5 = 3/5

5(y + 5) = 3(x + 5)

5y + 25 = 3x + 15 ...(ii)

Using (i), (x = y + 24) equation (ii) becomes

5y + 25 = 3(y + 24) + 15

5y + 25 = 3y + 72 + 15

5y – 3y = 87 – 25 = 62

y = 31

So, age of Manisha = 31 years

Hence, both Statement-I and Statement-II are sufficient to answer the question.

PRACTICE QUESTIONS

1. **Aishwarya's age is one-third of her mother's age. After 10 years, the age of Aishwarya's mother will be twice the age of Raveena. If Raveena's 9th birthday was celebrated 4 years ago, then what is the present age of Aishwarya?**
   (a) 10 years (b) 8 years
   (c) 6 years (d) 12 years
2. **Prateek said to his son, "I was one-third of your present age when you were born". If the present age of Prateek is 60 years, find the present age of the son.**
   (a) 60 (b) 40
   (c) 50 (d) 45
3. **The ratio of Amar's age 5 years ago and Akbar's age after 5 years is 1: 1. Presently, the ratio of their ages is 5: 3. Find the ratio between Amar's age 5 years hence and Akbar's age 5 years ago.**
   (a) 3:1 (b) 30:11
   (c) 22:13 (d) 25:11
4. **Prakash was 40 years old when his daughter was born while his wife was 35 years old when their son was born who is four years younger than their daughter. What is the difference between the ages of Prakash and his wife?**
   (a) 4 years (b) 9 years
   (c) 6 years (d) 8 years
5. **At present, Guru is 60 years old and Gauri is 50 years old. How many years ago the ratio of their ages was 3:2?**
   (a) 20 years (b) 15 years
   (c) 25 years (d) 30 years
6. **The product of the ages of Amit and Vivek is 120. If twice the age of Vivek is 8 years more than Amit's age, find the age of Vivek 2 years ago.**
   (a) 15 years (b) 10 years
   (c) 12 years (d) 8 years
7. **Siddharth is 3 years older than Varun who is thrice as old as Alia. If the total ages of Siddharth, Varun and Alia be 45, then how old is Varun?**
   (a) 24 years (b) 22 years
   (c) 18 years (d) 25 years
8. **The present ages of three persons A, B and C are in proportions 2 : 3 : 4. Seven years ago, the sum of their ages was 69. Find the sum of the present ages of B and C.**
   (a) 50 years (b) 60 years
   (c) 70 years (d) 80 years
9. **If the age of kiran after 20 years will be 10 times her age 7 years ago, Find the age of Kiran after 5 years.**
   (a) 15 years (b) 20 years
   (c) 22 years (d) 25 years
10. **The ages of Vijay and Dhanush differ by 14 years. Seven years ago, Vijay was 3 times the age of Dhanush. What is the present age of Vijay?**
    (a) 24 years (b) 22 years
    (c) 28 years (d) 25 years
11. **At present, Arman is 8 years younger than Arijeet. Arijeet's age 18 years hence will be equal to thrice that of Arman's age 2 years ago. What will be the sum of their present ages?**
    (a) 40 years (b) 64 years
    (c) 56 years (d) 48 years
12. **At present, the ages of Shyam and Ram are in the ratio of 9:2. Eight years ago, the ratio of 1/4th of Shyams' age and 1/4th of Ram's age was 8:1. What will be the ratio of Shyam's age to Rams' age 8 years from now?**
    (a) 3:1 (b) 10:3
    (c) 5:13 (d) 13:5
13. **The present age of Aryan is 5/2 times his age at the time of his marriage. Present age of his son is 1/4th of his present age. If Aryan was married 24 years ago then find the present age of his Son.**
    (a) 10 years (b) 8 years
    (c) 6 years (d) 12 years
14. **The ratio of ages of Hema and Rekha 4 years ago was 4:3. The sum of present ages of Hema, Rekha and Jaya is 86 years. If present age of Jaya is equal to sum of present ages of Hema and Rekha. Find the present age of Jaya.**
    (a) 40 years (b) 52 years
    (c) 50 years (d) 43 years
15. **The ratio of the present ages of 'Virat' and 'Arshdeep' is 5:3. Twelve years later from now, the age of 'Arshdeep' will be 30 years. If the average of present ages of 'Virat', 'Arshdeep' and 'Sachin' is 30 years, then find the present age of 'Sachin'.**
    (a) 40 years (b) 42 years
    (c) 44 years (d) 38 years

ANSWERS

1. (*d*)	2. (*d*)	3. (*a*)	4. (*b*)	5. (*d*)	6. (*d*)	7. (*c*)	8. (*c*)	9. (*a*)	10. (*c*)
11. (*a*)	12. (*b*)	13. (*a*)	14. (*d*)	15. (*b*)					

EXPLANATIONS

1. (d)

Explanation:

Present age of Raveena = 9 + 4 = 13 years

After 10 years, the age of Raveena = 13 + 10 = 23 years

After 10 years, the age of Aishwarya's mother will be twice the age of Raveena

Age of Aishwarya's mother after 10 years

= 2 × 23 = 46

Present age of Aishwarya's mother = 46 – 10 = 36

Aishwarya's present age = 1/3rd of her mother's present age

Present age of Aishwarya = 36/3 = 12 years

2. (d)

Explanation:

Let the present age of the son be X

The age of Prateek when his son was born: (60 – X).

According to the question

$$(60 - X) = \frac{1}{3}x$$

$(60 – X) \times 3 = X$

$180 – 3X = X$

$180 = 4X$

$X = 45$

3. (a)

Explanation:

Let the present ages of Amar and Akbar are 5X and 3X respectively

Amar's age 5 years ago = 5X – 5

Akbar's age after 5 years = 3X + 5

According to question

$(5X – 5) = (3X + 5) \Rightarrow 2X = 10 \Rightarrow X = 5$

We are required to find the ratio between Amar's age 5 years hence and Akbar's age 5 years ago.

Amar's age 5 years hence = (5x + 5) = 5 × 5 + 5 = 30

Akbar's age 5 years ago = (3x – 5) = 3 × 5 – 5 = 10

Ratio will be 30: 10 i.e. 3 : 1

4. (b)

Explanation:

Age of his wife when their son was born = 35 years.

Prakash's age when their son was born = (40 + 4) years = 44 years.

Required difference = (44 – 35) years = 9 years.

5. (d)

Explanation:

Let the ratio of ages of Guru and Gauri X years ago was 3:2

X years ago: Guru's age = (60 – X) and Gauri's age = (50 – X)

$$\frac{60 - X}{50 - X} = \frac{3}{2} \text{ (given)}$$

$(60 – X)\ 2 = (50 – X)3$

$120 – 2X = 150 – 3X$

$X = 30$

6. (d)

Explanation:

Let the present age of Amit be X years.

Then, present age of Vivek = (120 / X)years

According to question

$$2 \times \left(\frac{120}{X}\right) - X = 8$$

$240 – X^2 = 8X$

$X^2 + 8X – 240 = 0$

$X^2 + 20\ X – 12X – 240 = 0$

$(X + 20)\ (X – 12) = 0$

$X = –20$ or $X = 12$

$X = 12$ {since age cannot be negative}

Vivek's present age = 120 / 12 = 10 years

Thus, Vivek's age 2 years ago = 10 – 2 = 8 years

7. (c)

Explanation:

Let the age of Alia be X

So, Varun's age = 3X

And Siddharth's age = 3X + 3

According to the question,

$X + 3X + 3 + 3X = 45$

$7X + 3 = 45 \Rightarrow 7X = 42 \Rightarrow X = 6$

So, Varun's age = 3 × 6 = 18 years

8. (c)

Explanation:

Let the present ages of A, B and C be 2X, 3X and 4X respectively

The Sum of their ages 7 years ago = 69 (given)

$(2X - 7) + (3X - 7) + (4X - 7) = 69$

$9X - 21 = 69 \Rightarrow 9X = 90 \Rightarrow X = 10$

The Sum of the present ages of B and C is $3X + 4X = 7X = 7 \times 10 = 70$ years

9. (a)

Explanation:

Let Kiran's present age be X

Kiran's age 7 years ago = X – 7

Kiran's age after 20 years = X + 20

As per the question

$(X + 20) = 10 (X - 7)$

$X + 20 = 10X - 70 \Rightarrow 9X = 90 \Rightarrow X = 10$

Kiran's age after 5 years = X + 5 = 10 + 5 = 15 years

10. (c)

Explanation:

Let the age of Dhanush 7 years ago be X years

Vijay's age 7 years ago will be 3X years

As per question

3X – X =14 years

$2X = 14 \Rightarrow X = 7$ years

The Present age of Vijay = $3X + 7 = 3 \times 7 + 7 = 28$ years

11. (a)

Explanation:

Let the present age of Arijeet be X years

Present age of Arman is (X – 8)

Arijeet's age 18 years hence = (X + 18)

Age of Arman 2 years ago =(X – 8 – 2) = (X – 10)

As per question

$(X + 18) = 3 \times (X - 10)$

$X + 18 = 3X - 30 \Rightarrow 2X = 48 \Rightarrow X = 24$

Arijeet's present age = 24

Arman's present age = 24 – 8 = 16

Sum of their ages = 24 + 16 = 40

12. (b)

Explanation:

Eight years ago, the ratio of $1/4^{th}$ of Shyams' age at that time and $1/4^{th}$ of Ram's age at that time was 8:1

That is Shyam's age/4 : Ram's age /4 = 8:1

Age of Shyam: Age of Ram = 8:1

Let the age of Ram 8 years ago be x

Age of Shyam 8 years ago will be 8x

$\frac{8X + 8}{X + 8} = \frac{9}{2}$ (given)

$(8X + 8) \times 2 = (X + 8) \times 9$

$16X + 16 = 9X + 72 \Rightarrow 7X = 56 \Rightarrow X = 8$

$\therefore$ Present age of Ram = X + 8 =16

Present age of Shyam = 8X + 8 =72

Age of Ram after 8 years = 16 + 8 = 24

Age of Shyam after 8 years = 72 + 8 = 80

Ratio will be 80 : 24 = 10:3

13. (a)

Explanation:

Let the age of Aryan at the time of his marriage be 'X' years

He was married 24 years ago

Aryan's present age = 'X + 24'

According to the question

$\therefore \frac{5}{2} X = X + 24$

$5X = 2X + 48 \Rightarrow X = 16$

Present age of Aryan = X + 24 = 16 + 24 = 40 years

Present age of Son = $1/4^{th}$ (present age of Aryan)

= 40/4 = 10 years

14. (d)

Explanation:

Let the ages of Hema and Rekha 4 years ago be 4X and 3X respectively

Present age of Hema = 4X + 4 and present age of Rekha = 3X + 4

Present age of Jaya = sum of present ages of Hema and Rekha = (4X + 4) + (3X + 4) = 7X + 8

Sum of ages of Hema, Rekha and Jaya = 86 (given)

i.e. (4X + 4) + (3X + 4) +(7X + 8) = 86

14X + 16 = 86

14X =70 $\Rightarrow$ X = 5

Present age of Jaya = 7X + 8 = 43 years

15. (b)

Explanation:

Let the present ages of Virat and Arshdeep be 5x and 3x

Age of Arshdeep after 12 years = $3X + 12 = 30 \Rightarrow X = 6$

Present Age of Virat = $5X = 5 \times 6 = 30$ years

Present Age of Arshdeep = $3X = 3 \times 6 = 18$ years

Let the present age of Sachin be 'S' years

Average of present ages of Virat, Arshdeep and Sachin = 30

i.e., $\frac{30 + 18 + S}{3} = 30$

$30 + 18 + S = 90$

$S = 42$

Present age of Sachin is 42 years

Ranking Test

10

INTRODUCTION

This chapter delves into various ranking and sequencing challenges. It includes tasks like figuring out a person's or object's place in a line or sequence, ordering them by height, weight, grades, etc., and solving puzzles about days and dates.

THIS CHAPTER ADDRESSES THE FOLLOWING CATEGORIES OF QUESTIONS

Category	Description	Example
Sequential Order of Arrangement	Arranging items or events based on specific rules or criteria.	Alphabetically arrange: Apple, Banana, Orange, Grape.
Position Test	Determining the position of an element within a sequence.	John is 5th from the left and 8th from the right in a line. Find his position from the right.
Time Sequence Test	Arranging events or actions in the order they occurred.	Order the events: World War I, French Revolution, Moon Landing, Renaissance.

TYPE 1: SEQUENTIAL ORDER OF ARRANGEMENT

Ranking is about figuring out the order of people or things by looking at things like how old they are, how tall they are, their scores, how much they earn, how much they weigh, how long or big they are, and so on. When you get ranking questions, they usually give you mixed-up information. Your job is to put everything in order – like who's the oldest, tallest, or got the highest score.

To Do This, You Use Symbols To Compare Things

Symbol	Meaning	Usage in Ranking
>	Greater Than	Used to indicate one individual/item is larger or higher in rank than another.
<	Smaller Than	Used to indicate one individual/item is smaller or lower in rank than another.
=	Equal To	Used when two individuals/ items share the same rank or value.
≥	Greater Than or Equal To	Indicates an individual/item is either greater than or equal in rank to another.
≤	Less Than or Equal To	Indicates an individual/item is either smaller than or equal in rank to another.

QUESTIONS

Q1. Aman is taller than Anshika, Anshika is taller than Arun, Akash is taller than Amit and Amit is taller than Aman. Who is the shortest in the group?

(a) Akash (b) Amit

(c) Anshika (d) Arun

Ans: (d)

Explanation:

Aman > Anshika

Anshika > Arun

Akash > Amit

Amit > Aman

On arranging the above data, we get

Akash > Amit > Aman > Anshika > Arun

Clearly, Arun is the shortest.

Q2. In a group of five people, Mohit is the tallest while Anu is the shortest. Kusum is shorter than Mohit but taller than Geeta and Rahul. Rahul is the second shortest person in the group. Who is the third tallest?

(a) Geeta (b) Kusum
(c) Rahul (d) Anu

Ans: (a)

Explanation:

Mohit Tallest and Anu Shortest

Mohit > Kusum > Geeta and Rahul

On arranging the above data, we get

Mohit > Kusum > Geeta > Rahul > Anu

Clearly, Geeta is the third tallest.

Q3. Consider that

I. A is taller than B.
II. C is taller than A.
III. D is taller than C.
IV. E is tallest of all.

If they are made to sit in the above order of their height, then who will occupy the mid position?

(UPSC CSAT 2014)

(a) A (b) B
(c) C (d) D

Ans: (c)

Explanation:

By statement-II and II we get: B < A < C

Now D is taller than C and E is tallest which gives us the clear picture about the order that is:

B < A < C < D < E.

C occupies the middle position.

Q4. Ajit is elder than Virat but younger than Arti, Ansh is younger than Sachin but elder than Virat. If Arti is younger than Sachin, then who is the eldest?

(a) Virat (b) Ajit
(c) Arti (d) Sachin

Ans: (d)

Explanation:

According to the question,

Arti > Ajit > Virat

Sachin > Ansh > Virat

Sachin> Arti

On arranging the above data, we get

Sachin > Arti > Ajit > Ansh > Virat

Clearly, Sachin is the eldest.

Q5. Examine The Following Statements:

I. Either A and B are of the same age or A is older than B.
II. Either C and D are of the same age or D is older than C.
III. B is older than C.

Which one of the following conclusions can be drawn from the above statements? **(UPSC CSAT 2013)**

(a) A is older than B.
(b) B and D are of the same age.
(c) D is older than C.
(d) A is older than C.

Ans: (d)

Explanation:

We can interpret from statement-I that : $A \geq B$

We can interpret from statement-II that: $D \geq C$

We can interpret from statement-III that: $B > C$

Now from statement-I and Statement-III we can conclude that $A > C$.

Q6. Geeta is older than her cousin Meena, Meena's brother Bipin is older than Geeta. When Meena and Bipin visit Geeta's house, they like to play chess. Meena wins the game more often than Geeta. Based on the above information, four conclusions as given below have been made. Which one of these logically follows from the information given above? **(UPSC CSAT 2015)**

(a) While playing chess with Geeta and Meena, Bipin often loses
(b) Geeta is the oldest among the three
(c) Geeta hates to lose the game
(d) Meena is the youngest of the three

Ans: (d)

Explanation:

According to the question:

Geeta is older than her cousin Meena implies that: G>M.

Meena's brother Bipin is older than Geeta implies that: B > G.

So, the correct age sequence is : B > G > M

Hence Meena is youngest of these three.

Q7. Sandeep is heavier than Lalit but not as heavier as Rakesh, Lalit is heavier than Narender. Mayank is heavier than Sandeep but not as heavier as Rakesh. Who is the heaviest?

(a) Sandeep (b) Lalit
(c) Rakesh (d) Mayank

Ans: (c)

Explanation:

According to the question,

Rakesh > Sandeep > Lalit

Lalit > Narender

Rakesh > Mayank > Sandeep

On arranging the above data, we get

Rakesh > Mayank > Sandeep > Lalit > Narender

Clearly, Rakesh is the heaviest.

Q8. Rajiv is more competent than Lakshay, Shankar is less competent than Vijay but more competent than Lakshay. Rajiv is less competent than Shankar. Who is the most competent in the group?

(a) Vijay (b) Lakshay

(c) Rajiv (d) Shankar

Ans: (a)

Explanation:

According to the question,

Rajiv > Lakshay

Vijay > Shankar > Lakshay

Shankar > Rajiv

On arranging the above data, we get

Vijay> Shankar> Rajiv > Lakshay

Clearly, Vijay is the most competent in the group.

Q9. Six students A, B, C, D, E and F appeared in several tests. Either C or F scores the highest. Whenever C scores the highest, then E scores the least. Whenever F scores the highest, B scores the least. In all the tests they got different marks: D scores higher than A, but they are close competitors; A scores higher than B ; C score higher than A. If F stands second in the ranking, then the position of B is

(a) Third (b) Fourth

(c) Fifth (d) Sixth

Ans: (c)

Explanation:

Case1. f score the highest

This case is eliminated as according to the question F stood second.

Case 2. C score the highest

Then E scores the least.

And according to the question D scores higher than A, but they are close competitors; A scores higher than B ; C scores higher than A.

So, C > D> A > B

So the possibility is: C > D > A > B > E

Now F is stood second then correct sequence is:

C > F > D > A > B > E.

Now clearly the position of B is fifth.

Q10. Examine The Following Statements:

I. Rama scored more than Rani.

II. Rani scored less than Ratna.

III. Ratna scored more than Padma.

IV. Padma scored more than Rama but less than Ratna

Who scored the highest?

(a) Rama (b) Padma

(c) Rani (d) Ratna

Ans: (d)

Explanation:

Rama > Rani, (by statement-I)

Ratna > Rani, (by statement-II)

Ratna > Rama and (by statement-III)

Ratna > Padma > Rama (by statement-IV)

By combining all the statements:

$\Rightarrow$ Ratna > Padma > Rama > Rani

So, Ratna scored the highest.

Q11. Usha runs faster than Kamala, Priti runs slower than Swati, Swati runs slower than Kamala. Who is the slowest runner? **(UPSC CSAT 2017)**

(a) Kamala (b) Priti

(c) Swati (d) Usha

Ans: (b)

Explanation:

According to the question:

Usha runs faster than Kamala: U > K

Priti runs slower than Swati : P < S

Swati runs slower than Kamala : S < K

So we can conclude that: U > K > S > P.

So the slowest runner is Priti.

Q12. If A runs less fast than B, and B runs as fast but not faster than C, then as compared to A, C runs **(UPSC CSAT 2015)**

(a) slower than A

(b) faster than A

(c) with same speed as A

(d) given data is not sufficient to determine

Ans: (b)

Explanation:

We can interpret the data given in the question as:

C > B > A

So, clearly C runs faster than A.

TYPE 2: POSITION TEST

In this kind of question, you get information about where people are standing or sitting in a line or row. You might know someone's place from the start or end of the line. The task is to figure out things like how many people are in the whole line or how many are to the left or right (or above or below) of a certain person. Sometimes, these questions are like puzzles where people switch places with each other. There are many different types of these position tests, and they help you get really good at understanding these kinds of puzzles.

TO SOLVE THE POSITION TEST PROBLEMS, YOU CAN USE THESE FORMULAS

Calculation	Formula	Explanation
Rank from Left/Top	Position from Left/ Top = Total - Rank from Right/Bottom + 1	To find rank from the left or top, subtract the rank from the right or bottom from the total and add 1.
Rank from Right/ Bottom	Position from Right/Bottom = Total - Rank from Left/Top + 1	To find rank from the right or bottom, subtract the rank from the left or top from the total and add 1.
Total Number in Queue/Row	Total = Position from Left + Position from Right - 1	To find the total number of people or objects in a line, add the person's positions from both ends and subtract 1.
Number Between Two Positions	Total Between = New Position - Old Position - 1	To find how many people or objects are between two positions in a line, subtract the old position from the new position and then subtract 1.
Maximum Number in Row	Max Total = (Position of Person 1 from Left/Top) + (Position of Person 2 from Right/ Bottom) + (Middle Places)	To find the maximum number in the row, add both persons' positions plus the number of places in the middle.
Minimum Number in Row	Min Total = (Position of Person 1 from Left/Top) + (Position of Person 2 from Right/ Bottom) - (Middle Places) - 2	To calculate the minimum number, add the positions of both persons, subtract the middle places, and then subtract 2.

QUESTIONS

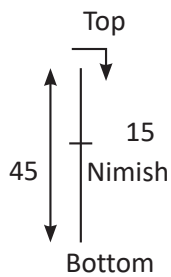
Q13. In class of 45 students rank of Nimish is 15 from top, then rank of Nimish from bottom is

(a) 30 (b) 32

(c) 31 (d) 35

Ans: (c)

Explanation:



Nimish's rank from the bottom = Total number of students - Rank of Nimish from top + 1 = 45 – 15 + 1 = 31

Q14. In a row of 50 girls, when Manju was shifted to her left by 4 places, her place from the left end of the row became 10. What is the position of Neha from the right end of the row, if Neha was three places to the right of Manju's original position?

(a) 34 (b) 32

(c) 25 (d) 35

Ans: (a)

Explanation:

On shifting 4 places to the left, Manju is 10^{th} from the left end of the row. Thus, Manju's original position was 14^{th} from the left end.

Neha is 3 places to the right of Manju's original position.

Clearly, Neha is 17^{th} from the left end.

Neha's position from right = Total number of girls in the row – Neha's position from left + 1 = 50 – 17 + 1 = 34

Q15. There are seven persons up on a ladder, A, B, C, D, E, F and G (not in that order). A is further up than E but is lower than C. B is in the middle. G is between A and B. E is between B and F. If F is between E and D, the person on the bottom step of the ladder will be **(UPSC CSAT 2016)**

(a) B (b) F

(c) D (d) E

Ans: (c)

Explanation:

According to the question the positions of 7 persons on ladder is shown below:

C
A
G
B
E
F
D

Clearly, D is on the bottom step of the ladder.

Q16. In a class of students, Sunil is 28th from top and 32nd from bottom in a class, then total number of students in the class is

(a) 59 (b) 50

(c) 57 (d) 58

Ans: (a)

Explanation:

The information given in the question can be represented as shown below.

Top

28th

Sunil

32nd

Bottom

Total students in a class (Rank of Sunil from top Rank of Sandeep from bottom – 1) = 28 + 32 – 1 = 59

Q17. In a queue, Sonu is 15th from left and 25th from right. How many people are in the queue?

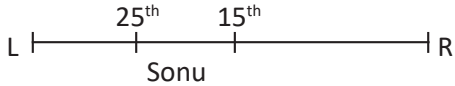
(a) 38 (b) 37

(c) 39 (d) 40

Ans: (c)

Explanation:

Total persons in the queue = (Sum of positions of Sonu from both ends) – 1



(15 + 25) – 1 = 40 – 1= 39

Q18. Jaya's position from the left in a row of students is 12th and Rekha's position from the right is 20th. After interchanging their positions, Jaya becomes 22nd from the left. How many students were there in a row? **(UPSC CSAT 2015)**

(a) 30 (b) 31

(c) 41 (d) 34

Ans: (c)

Explanation:

Here, the position of Rekha is 20th from right, which is occupied by Jaya after interchanging the places and becoming 22nd from the left.

Hence total number of students in the class

= 22 + 20 – 1 = 41.

Q19. In a row, A is in the 11th position from the left and B is in the 10th position from the right. If A and B interchange, then A becomes 18th from the left. How many persons are there in the row other than A and B. **(UPSC CSAT 2014)**

(a) 27 (b) 26

(c) 25 (d) 24

Ans: (c)

Explanation:

Before interchanging A is in the 11th position from the left and B is in the 10th position from the right.

Then row is: (10)———(A)———(x)———(B)———(9)

(x = no. of persons between A and B)

After interchanging of position: A becomes 18th from the left

Then Row is: (10)———(B)———(x)———(A)——(9)

So, 10 + 1 + x = 17 implies x = 6

Number of persons between A and B = 6

Total number of persons = 10 + 1 + 6 + 1 + 9 = 27

Total number of persons except A and B = 27 – 2 = 25

Q20. A is 16th from the left end in a row of boys and V is 18th from the right end. G is 11th from A towards the right and 3rd from V towards the right end. How many boys are there in the row? **(UPSC CSAT 2020)**

(a) 40

(b) 41

(c) 42

(d) Cannot be determined due to insufficient data

Ans: (b)

Explanation:

A's position: 16th from left end

V' position: 18th from right end

G' position: 11th from A towards the right and 3rd from V towards the right.

Now, there are two possible cases with respect to position of A:

Case I: A is right to V

it is given that G is 11th right from A.

If A is to the right of V and G is 11 more positions right of A, then G must be at least 12 positions to the right of V. But as per the question G is only three positions to the right from V.

Hence this case is impossible.

Case II: A is left to V

G is 3rd from V towards the right, so position of G = 18 – 3 = 15th from right end.

G is 11th from A towards the right, so position of G = 16 + 11 = 27th from left end.

Hence, total number of boys in the row = 27 + 15 – 1 = 41 (because G is counted twice)

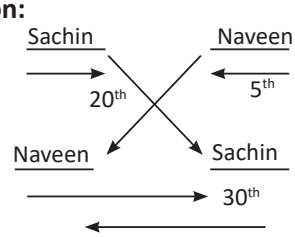
Q21. In a queue of boys, Sachin is 20th from left and Naveen is 5th from right. The places of Sachin and Naveen are interchanged. If the new position of Sachin is 30th from left, then the new position of Naveen from right is

(a) 15th (b) 10th

(c) 13th (d) 14th

Ans: (a)

Explanation:



New position of Naveen from right end = [Difference of the two positions of Sachin] + [Initial position of Naveen) = (30 – 20) + 5 = 10 + 5 = 15th position

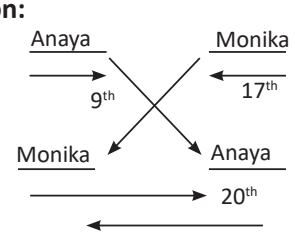
Q22. In a queue of girls, Ananya is 9th from left and Monika is 17th from right. If the positions of Anaya and Monika are interchanged, then the new position of Anaya is 20th from left. Find the number of girls between Monika and Anaya?

(a) 11 (b) 8

(c) 9 (d) 10

Ans: (d)

Explanation:



Total number of persons between Monika and Ananya = 20 – 9 – 1 = 10

Q23. In a queue, Mr. X is fourteenth from the front and Mr. Y is seventeenth from the end, while Mr. Z is exactly in between Mr. X and Mr. Y. If Mr. X is ahead of Mr. Y and there are 48 persons in the queue, how many persons are there between Mr. X and Mr. Z?

(a) 6 (b) 7

(c) 8 (d) 9

Ans: (c)

Explanation:

Total no. of person = 48

Position of X = 14th from the front

Position of Y = 17th from end

No. of persons between X and Y = 48 – 17 – 14 = 17.

Now it is given that Z is exactly in between Mr. X and Mr. Y.

So there must be 8 persons between X and Z and 8 persons between Y and Z.

Q24. At a ticket counter there are 19 people in a queue. If every second person in the queue is a female and also in the starting and at the end there is a female, then the total number of males in the queue is

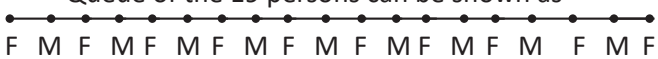
(a) 7 (b) 10

(c) 9 (d) 8

Ans: (c)

Explanation:

Queue of the 19 persons can be shown as



Total number of males in the queue = 19 – 10 = 9

Q25. If in a row, Roy is 20th from left and Manish is 15th from right and there are four persons in between Roy and Manish, then find the maximum and minimum number of persons in the row.

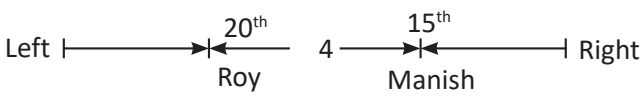
(a) 39, 18 (b) 39, 29

(c) 35, 15 (d) 30, 29

Ans: (b)

Explanation:

For maximum number of persons, arrangement in the row will be as follows



For maximum number of persons = Sum of positions of both persons + Number of places in the middle = 20 + 15 + 4 = 39

For minimum number of persons = Sum of positions of both persons - Number of places in the middle – 2 = 20 + 15 – 4 – 2 = 29

TYPE 3: TIME SEQUENCE TEST

The Time Sequence Test is a logical reasoning challenge that tests your ability to understand and organize sequences of both days and time. This involves interpreting and arranging information about days of the week, specific dates, and times of day. The key is to logically deduce the sequence and timing of events based on the given clues. This might include figuring out the day of the week on a particular date, understanding the order of events within a day, or calculating the time elapsed between two events. Essential skills for these tests include a good grasp of the calendar, understanding the concept of time intervals (such as hours and minutes), and the ability to perform simple arithmetic calculations.

QUESTIONS

Q26. Kamaljeet remembers that his brother Dinesh's birthday falls after 20th May but before 27th May, while Gargi remembers that Dinesh's birthday falls before 22nd May but after 15th May. On what date Dinesh's birthday falls?

(a) 22nd May (b) 21st May

(c) 25th May (d) None of these

Ans: (b)

Explanation:

According to Kamaljeet, Dinesh's birthday falls on one of the days - 21st, 22nd, 23rd, 24th, 25th or 26th May.

According to Gargi, Dinesh's birthday falls on one of the days - 16th, 17th, 18th, 19th, 20th or 21st May.

The common date in both the group of dates = 21st May

Clearly, Dinesh's birthday falls on 21st May.

Q27. Kavita remembers that her father's birthday is after the 18th but before the 21st of March, while her brother Suresh remembers that his father's birthday is before the 24th but after 19th of March. On which date is the birthday of their father?

(a) 19th (b) 23th

(c) 21th (d) 20th

Ans: (d)

Explanation:

According to Kavita, her father's birthday falls on one of the days - 19th or 20th March.

According to Suresh, his father's birthday falls on one of the days - 20th, 21th, 22th or 23rd March.

Here, 20th is common to both Kavita and Suresh.

So, their father's birthday is on 20th March

Q28. The bus driver told the passenger at a bus station, "The bus departs at regular intervals of 30 minutes. The last bus left 10 minutes ago." If the next bus is scheduled to depart at 3:00 PM, at what time did the bus driver share this information with the passenger?

(a) 2:30 PM (b) 2:40 PM

(c) 3:10 PM (d) 3:20 PM

Ans: (b)

Explanation:

The bus departs every 30 minutes and the next bus is scheduled at 3:00 PM, which means the bus left at 3:00 PM – 30 minutes = 2:30 PM.

At the time of communication 10 minutes passed after the last bus left.

So, the time of communication was

2:30 PM + 10 minutes = 2:40 PM.

Q29. A train departs from a station every 45 minutes. A passenger arrives at the station and is told by the stationmaster that the last train left 15 minutes ago, and the next train will depart at 2:30 PM. At what time did the stationmaster give this information to the passenger?

(a) 2:00 PM (b) 2:10 PM

(c) 2:15 PM (d) 2:20 PM

Ans: (a)

Explanation:

Since the train departs every 45 minutes and the next train is scheduled at 2:30PM, the last train left the station at 2:30 PM - 45 minutes = 1:45PM.

The stationmaster said the last train left 15 minutes ago, So the time of information exchange was 1:45 PM + 15 minutes = 2:00PM Therefore, the stationmaster gave this information to the passenger at 2:00PM.

PRACTICE QUESTIONS

1. **In a row of students Praful is 15th from top Raju is 32nd from bottom, if we interchange their positions, Praful becomes 30th from top. What is the total number of students?**
   (a) 47 (b) 61
   (c) 58 (d) 49

2. **In a class, Vaibhav is 32nd from top, and Uday is 17th from bottom. If there are 5 boys between Vaibhav and Uday, then what is the minimum strength of the class?**
   (a) 42
   (b) 54
   (c) 52
   (d) Cannot be determined

3. **In a class of 120, where boys are twice the number of girls, a girl Aliya ranked 18th from the top. If there are 10 Boys ahead of Aliya, then how many girls are there after her rank?**
   (a) 28 (b) 72
   (c) 32 (d) 74

4. **In a class of 60 students, a boy is ranked 25th From the top. When 4 boys joined,his rank dropped by 2. What is his new rank from the end?**
   (a) 38 (b) 37
   (c) 29 (d) 39

5. **In a row of boys, if Ashwin is 18th from left and Rishabh is 12th from the right, and if they interchange their positions, Ashwin becomes 24th from the left. How many boys are there in the row other than Ashwin and Rishabh?**
   (a) 34 (b) 35
   (c) 33 (d) 29

6. **Manoj is standing on the 3rd Step from the bottom of the ladder. If he has to climb 6 more steps to reach exactly the middle step, how many steps does the ladder has?**
   (a) 13 (b) 17
   (c) 19 (d) 15

7. **Chetan is 15th from the left end in a row of boys and David is 15th from the right end. Eshwar is 15th from Chetan towards the right and 5th from David towards the right end. How many boys are there in the row?**
   (a) 39 (b) 40
   (c) 41 (d) Cannot be determined

8. **P is sitting 5th from the left and Q is sitting 10th from the right. If R is 13th after P towards right of P and also R is at the middle of P and Q, then how many persons are sitting in the row?**
   (a) 28 (b) 38
   (c) 37 (d) 40

9. **In a calendar, the months of 31 days are arranged vertically in alphabetical order. then the 4th month from the top is?**
   (a) May (b) July
   (c) March (d) December

10. **Sohan is taller than Ishita, Ishita is taller than Kartik, Vidya is taller than Sohan, Nitin is shorter than Kartik, then who among them is the shortest?**
    (a) Kartik (b) Sohan
    (c) Nitin (d) Vidya

11. **In a school assembly line, Arjun is taller than Rohit but shorter than Nikhil. Deepak is taller than Sameer but shorter than Rohit. Vishal is the tallest. If Nikhil is not the shortest, who is the third tallest?**
    (a) Arjun (b) Rohit
    (c) Nikhil (d) Deepak

12. **In a college group, Priya is heavier than Anjali but lighter than Kavya. Ritu is the lightest and shortest. Varun is taller than Kavya but lighter than Anjali. Who is the second heaviest?**
    (a) Priya (b) Anjali
    (c) Kavya (d) Varun

13. **In a university, five students—Arav, Bhavesh, Chetan, Divya, and Esha—are ranked based on their academic performance. Bhavesh ranks higher than Arav but not as high as Esha. Divya ranks lower than Chetan and Divya ranks lowest. what Is Chetan's rank?**
    (a) First (b) forth
    (c) Third (d) can't be determined

14. **In the Kapoor family, the father is taller than the mother. The son is younger but taller than the daughter. The mother is older but shorter than the son. Who is the tallest in the family?**
    (a) Father (b) Mother
    (c) Son (d) Can't be determined

15. In a cricket team, Rahul is heavier than Manish but lighter than Ajay. Varun is the lightest. Sanjay is heavier than Manish but lighter than Rahul. Who is the second lightest?

(a) Manish (b) Rahul

(c) Sanjay (d) Varun

16. Ram reached the movie theater 10 minutes before 8:30 pm, and he noticed he was 20 minutes earlier than Shyam, who arrived 35 minutes late. When was the movie supposed to start?

(a) 8.05 pm (b) 8.55 pm

(c) 8.15 pm (d) 9.15 pm

17. Students of a class are planning a birthday party for their class teacher. Amar Correctly remembers that their class teacher's birthday is before 22nd April but after 17th April. Akbar correctly remembers that their teacher's birthday is after 19th April but before 24th April an Anthony correctly remembers that their teacher's birthday is not on an odd date. On which April is definitely their teacher's birthday?

(a) 18th April (b) 20th April

(c) 22nd April (d) Cannot be determined

Direction (Q.18-Q19): Study the following information carefully and answer the following questions.

Arbaz Khan is available at the office from 1 PM to 5 PM on Monday, Wednesday and Saturday. His younger brother Sohail khan is available at office on Sunday, Wednesday, Thursday and Saturday between 11 AM to 3 PM. The eldest brother Salman Khan is available at the office between 10 AM to 1PM on Sunday, Tuesday, Wednesday and 3PM to 5PM on Thursday, Friday and Saturday.

18. On which days do all three brothers go to the office?

(a) Saturday & Sunday

(b) Wednesday & Saturday

(c) Wednesday & Thursday

(d) Cannot be determined

19. On how many days 2 brothers are present in the office between 1PM and 3PM?

(a) One (b) Two

(c) Three (d) Four

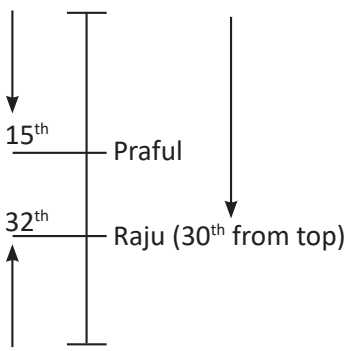
ANSWERS

1. (*b*)	2. (*a*)	3. (*c*)	4. (*a*)	5. (*c*)	6. (*b*)	7. (*a*)	8. (*d*)	9. (*b*)	10. (*c*)
11. (*a*)	12. (*a*)	13. (*d*)	14. (*d*)	15. (*a*)	16. (*a*)	17. (*b*)	18. (*b*)	19. (*b*)	

EXPLANATIONS

1. (b)

Explanation:

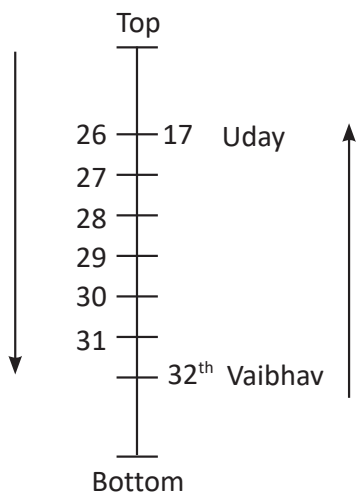


Position of Raju from Bottom = 32 (given) Position of Raju from Top =30 (i.e., position of Praful after interchanging the positions)

∴ Total = Top + Bottom -1 = 30+32-1 =61

2. (a)

Explanation:



Uday's Position from Top =26 Uday's position from Bottom = 17 Total = Top + Bottom -1

Total = 26 + 17-1

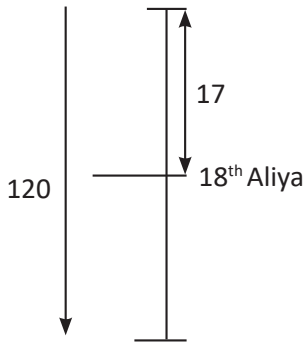
Total = 42

3. (c)

Explanation:

Number of Boys and Girls are in the ratio 2: 1

There are 120 students, so number of boys and girls will be 80 and 40 respectively



Number of persons ahead of Aliya are 17 Number of Boys in the top 17 ranks =10 (given)

Number of girls among the top 18 will be 8 (including Alia)

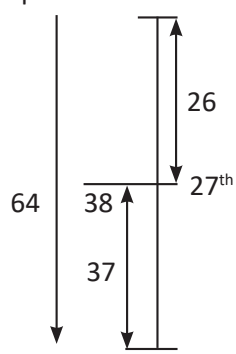
Number of girls after Alia's rank will be 40 -8 = 32

4. (a)

Explanation:

After arrival of 4 students the new strength of the class will be 64.

his rank dropped by two means his present rank is 27th from the top



His rank from the bottom will be 38 (from figure)

Or

Total = Top + Bottom -1

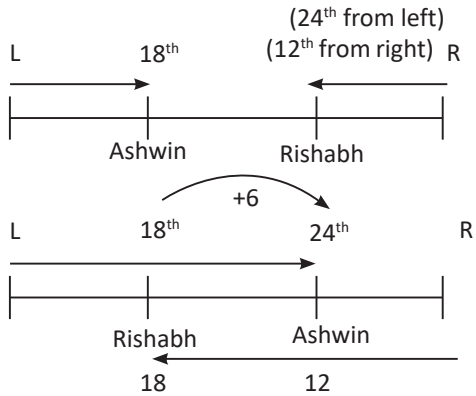
64 = 27 + B – 1

64 – 27 + 1 = B

B = 38

5. (c)

Explanation:



When they interchange the positions, Ashwin's position changed from 18th from left to 24th from left

Rishab's Position from Left = 24 (Ashwin's position after interchanging) Rishabh's Position from right = 12 (given) Total = Left + Right -1 = 24 + 12 – 1 = 35 Total number of students = 35

Number of students excluding Ashwin and Rishab = 35 – 2 =33

6. (b)

Explanation:

To reach the middle step he has to climb 6 steps from the 3rd step

3 + 6 = 9

9th step is the middle step

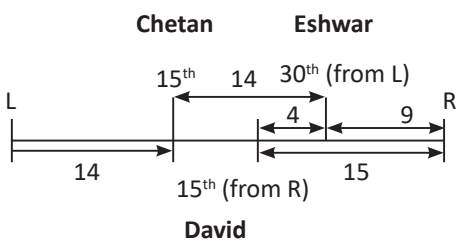
Means it has 8 steps below and 8 steps above the middle step

∴ Number of steps will be(8+middle step+ 8)

= 8 + 1 + 8 = 17

7. (a)

Explanation:



Chetan is 15th from the left

Eshwar is 15th from Chetan towards right

Eshwar's place from left = 15 + 15 = 30th

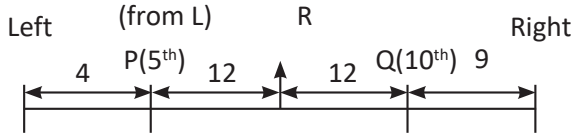
David is 15th from right and 5th towards left of Eshwar

Number of persons towards right of Eshwar will be (15 – 5 – 1 = 9)

∴ Number of persons in the row will be 30 + 9 = 39

8. (d)

Explanation:



P is 5th from the left

R is 13th from P (12 persons between P and R)

R is at the middle of P and Q (12 persons between R and Q)

Therefore, total number of persons will be

4 + P + 12 + R + 12 + Q + 9 = 40

9. (b)

Explanation:

Months having 31 days are

January, March, May, July, August, October, December

Arranging them Alphabetically

August December January July March May October

July is 4th month from the top

10. (c)

Explanation:

The decreasing order of heights is

Vidya

Sohan

Ishita

Kartik

Nitin

So the shortest among them is **Nitin.**

11. (a)

Explanation:

Arjun is taller than Rohit but shorter than Nikhil: N > A > R

Deepak is taller than Sameer but shorter than Rohit: R > D > S and vishal is tallest then

Sequence is: V > N > A > R > D > S

So the third tallest is Arjun.

12. (a)

Explanation:

Priya is heavier than Anjali but lighter than Kavya: K > P > A

Varun is lighter than anjali: A > V and ritu is shortest then correct sequence is: K > P > A > V > R

So, Priya is 2nd heaviest

13. (d)

Explanation:

Chetan ranks can't be determined.

14. (d)

Explanation:

the father is taller than the mother : F > M son is younger but taller than the daughter: S > D mother is older but shorter than the son : S > M But no information is given about the comparison of height between father and son.

So we can not conclude who is tallest.

15. (a)

Explanation:

Rahul is heavier than Manish but lighter than Ajay: A > R > M

Sanjay is heavier than Manish but lighter than Rahul: R > S > M and Varun is lightest then

Final order is: A > R > S > M > V.

Manish is second lightest

16. (a)

Explanation:

Ram arrived 10 minutes before 8:30 pm.

It means his arrival time was 8:30 pm - 10 minutes = 8:20 pm.

Ram noticed he was 20 minutes earlier than Shyam. So, Shyam arrived 20 minutes after Ram.

Shyam also arrived 35 minutes late, which means his arrival time was 35 minutes after the scheduled time.

Shyam's arrival time = Ram's arrival time + 20 minutes = 8:20 pm + 20 minutes = 8:40 pm.

Shyam's arrival time was 35 minutes late, so we can subtract 35 minutes from his arrival time to find the scheduled time of movie to start:

Scheduled time = Shyam's arrival time - 35 minutes = 8:40 pm - 35 minutes = 8:05 pm.

Therefore, the movie was scheduled to start at 8:05 pm.

17. (b)

Explanation:

Amar Correctly remembers that their class teacher's birthday is before 22nd April but after 17th April- So, possible dates are 18th, 19th, 20th and 21st of April.

Akbar correctly remembers that their teacher's birthday is after 19th April but before 24th April

- So, possible dates are 20th, 21st, 22nd and 23rd of April.

The common dates between Amar and Akbar are 20th and 21st April.

But, Anthony correctly remembers that their teacher's birthday is not an odd date.

So the only date possible is 20th of April.

18. (b)

Explanation:

We can make the following table from the given information:

Time	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
10AM-11AM	Salman		Salman	Salman			
11AM-1PM	Salman, Sohail		Salman	Salman, Sohail	Sohail		Sohail
1PM-3PM	Sohail	Arbaz		Sohail, Arbaz	Sohail		Sohail, Arbaz
3PM-5PM		Arbaz		Arbaz	Salman	Salman	Salman, Arbaz

From the table we can see all three brothers got to the office **on Wednesday and Saturday.**

19. (b)

Explanation:

We can see from the above table that in the time slot 1PM to 3PM, two brothers are available on Wesnesday and Saturday. **So, correct answer is two days**

Puzzles

11

INTRODUCTION

A puzzle is like a game or challenge that checks how well someone can use logic to put information together in the right way to solve it.

In this chapter, we're going to learn about puzzles. Puzzles are like brain teasers that check how good you are at using your logic to find answers. We'll look at puzzles with a set number of things, like people or objects. The main goal is to understand the information given, arrange it properly, and then answer questions based on it. These puzzles can ask you to group things, put them in order, compare them, or understand family connections.

Puzzles in reasoning tests are tricky because there's no fixed way to solve them. You have to use your smart thinking and logical skills. These problems usually come in the form of puzzles. Since there's no one way to solve these, practicing a lot is the best way to get good at them.

From looking at old question papers, we see that puzzles are really important. Every year, 4-5 questions come from this chapter. So, it's important to understand this chapter well.

Several types of questions based on puzzles are asked in various competitive exams Based on the diversity of questions asked, we have classified them into following types:

TYPES OF QUESTIONS

TYPE 1: ANALYTICAL PUZZLE

In Analytical Puzzles, you have to think carefully about the information given and sort it out in your mind. These puzzles test how well you can handle different kinds of information like who is sitting where, who is taller than whom, or what comes first in a sequence.

These puzzles can have different things to figure out. You might have to classify things into groups, compare items, understand sitting arrangements, or sort through mixed-up information. Sometimes, you'll get clues about how things or people are connected, or not connected, to each other.

A good way to solve these puzzles is to make a table with the information. This helps you see everything clearly and find the answers more easily. After you make sense of all the instructions and information, you'll have to answer questions based on what you've understood.

QUESTIONS

Direction (Q1-Q2): Ravinder and Kumar are good at Hockey and Volleyball. Rachin and Ravinder are good at Hockey and Baseball. Guri and Kumar are good at Cricket and Volleyball. Rachin, Guri and Michael are good in Football and Baseball.

Q1. Who is good In Hockey, Cricket and Volleyball?

(a) Rachin (b) Kumar

(c) Ravinder (d) Guri

Ans: (b)

Explanation:

Information given in question can be put in a table form as given in the table below:

Player	Sports
Rachin	Hockey, Football, Baseball
Ravinder	Hockey, Volleyball, Baseball
Guri	Cricket, Football, Baseball, Volleyball
Kumar	Hockey, Volleyball, Cricket
Michael	Football, Baseball

Now according to the table:

Kumar is good In Hockey, Cricket and Volleyball.

Q2. Who Is good at baseball, Cricket , volleyball and football?

(a) Rachin (b) Kumar

(c) Ravinder (d) Guri

Ans: (d)

Explanation:

Guri Is good at baseball, Cricket , volleyball and football.

Q3. A,B, C, D and E belong to five different cities P, Q, R, S and T (not necessarily in that order). Each one of them comes from a different city. Further it is given that,

1. **B and C do not belong to Q.**
2. **B and E do not belong to P and R.**
3. **A and C do not belong to R, S and T.**
4. **D and E do not belong to Q and T.**

Which one of the following statements is not correct? **(UPSC CSAT 2013)**

(a) C belongs to P (b) D belongs to R

(c) A belongs to Q (d) B belongs to S

Ans: (d)

Explanation:

Cities	Persons Who Do Not Live In The City	Person Who Live In The City
P	B, E	C
Q	B, C, D, E	A
R	B, E, A, C	D
S	A, C	E
T	A, C, D, E	B

Information in the question can be arranged in as table form as shown above:

From the table it is very clear that B belongs to city T not S.

Q4. Four political parties W, X, Y and Z decided to set up a joint candidate for the coming parliamentary elections. The formula agreed by them was the acceptance of a candidate by most of the parties. Four aspiring candidates A, B, C and D approached the parties for their tickets.

1. **A was acceptable to W but not to Z.**
2. **B was acceptable to Y but not to X.**
3. **C was acceptable to W and Y.**
4. **D was acceptable to W and X.**

When candidate B was preferred by W and Z, candidate C was preferred by X and Z, and candidate A was acceptable to X not to Y, who got the ticket? **(UPSC CSAT 2012)**

(a) A (b) B

(c) C (d) D

Ans: (c)

Explanation:

Following table can be drawn by using data in question:

Candidate Political party	W	X	Y	Z
A	✓			×
B		×	✓	
C	✓		✓	
D	✓	✓		

Now, when candidate B was preferred by W and Z, candidate C was preferred by X and Z and candidate A was acceptable to X but not Y, then

Candidate Political Party	W	X	Y	Z	Total Number of Acceptance
A	✓	✓	×	×	2
B	✓	×	✓	✓	3
C	✓	✓	✓	✓	4
D	✓	✓			2

Now, it is clear that all parties accept candidate C.

TYPE 2. PUZZLES BASED ON GROUPINGS, TEAM FORMATION AND CONDITIONS

In these puzzles, you get a story that's all mixed up. Your job is to put the story in the right order and make sense of it. The story might tell you about choosing people or things, but with specific rules. For instance, it might say "If A is picked, then B can't be." This helps you figure out who or what should be in or out.

The trick here is to sort out the information and follow the given conditions. It's like unscrambling a puzzle and using the rules to find out who or what fits best.

Note: In these types of questions it will be difficult to get the result by following the whole process, that's why we will check the options one by one and will try to eliminate the options as shown in the examples below.

QUESTIONS

Q5. From a group of six men M, N, O, P, Qand R and five women G, H, I, J and K a team of six is to be selected Some of the criteria of selection are as follows:

- **I. M and J go together.**
- **II. O cannot be placed with N.**
- **III. I cannot go with J.**
- **IV. N goes with H.**
- **V. P and Q have to be together.**
- **VI. K and R go together.**

if the team consists of two girls and I is one of them, the other members are

(a) GMRPO (b) KOPQR

(c) HNOPQ (d) KRMNP

Ans: (b)

Explanation:

Option (a) is incorrect: M and J will go together but in option (a) M is there but J is not there.

Option (c) is incorrect: According to the condition II O and N can not be together.

Option (d) is incorrect: According to condition IV N goes with H but in option (d) H is not with N.

Option (b) satisfies all the conditions given in the question.

Q6. Two men, Anil and David, and two women, Shabnam and Rekha are in a sales group. Only two speak Tamil. The other two speak Marathi. Only one man and one woman can drive a car. Shabnam speaks Marathi. Anil speaks Tamil. Both Rekha and David can drive. Which of the following statements is true? **(UPSC CSAT 2015)**

(a) Both the Tamil speakers can drive a car

(b) Both the Marathi speakers can drive a car

(c) Both of those who can drive a car speak Marathi

(d) One of those who can drive a car speaks Tamil

Ans: (d)

Explanation:

Option (a) is incorrect: as Rekha and David only can drive. And Anil speaks Tamil who cannot drive.

Option (b) is incorrect: as Rekha and David only can drive. And Shabnam speaks

Marathi who cannot drive.

Option (c) is incorrect: as Rekha and David only can drive. And Shabnam speaks Marathi who cannot drive.

Option (d) is correct: as Rekha and David only can drive. And Anil speaks Tamil so one of Rekha and David speak Tamil.

Q7. A combination of three colours is being chosen to paint a classroom. The colour must be chosen from a group of seven colours-A. B,C, D, E, F and G according to the following conditions.

I. If B is chosen then A must be chosen , but D is not chosen.

II. C and D cannot be chosen together.

III. Either C or A or both must be chosen.

Which of the following combinations of colours confirms the conditions?

(a) A, C, D (b) A, E, F

(c) B, C, G (d) D, E, G

Ans: (b)

Explanation:

Let's check the options one by one:

(a) A, C, D: This option violates condition II as C and D are chosen together. Hence, this option is not valid.

(b) A, E, F: This option satisfies all three conditions. Hence, this option is valid.

(c) B, C, G: This option violates condition I as B is chosen but A is not. Hence, this option is not valid.

(d) D, E, G: This option violates condition III as neither A nor C is chosen. Hence, this option is not valid.

Therefore, the correct combination of colours that satisfies all three conditions is (b) A, E,F.

TYPE 3.PUZZLES BASED ON PLACING AND COMPARISON

These questions involve putting things in order, arranging them, or comparing them. Your job is to carefully look at all the information provided, and then arrange the items in ascending (from the smallest to the largest) or descending (from the largest to the smallest) sequences as needed.

Once you've arranged everything correctly, answer the questions based on this sequence. A smart tip is to use signs like ">" (means greater than), "<" (means less than), and "=" (means equal to) as per the conditions in the puzzle. This makes it easier to understand the puzzle and find the answers quickly.

QUESTIONS

Direction(Q8 - Q9): Read the following information given below to answer these questions that follow

(i) Ritika is older than Soniya.

(ii) Kushi is elder than Ritika but younger than Manish.

(iii) Manish is elder than Soniya.

(iv) Soniya is younger than Kushi

(v) Gargi is the eldest

Q8. Who is the youngest?

(a) Manish (b) Ritika

(c) Kushi (d) Soniya

Ans: (d)

Explanation:

According to the statements,

(i) Ritika > Soniya

(ii) Manish > Kushi > Ritika

(iii) Manish >Soniya

(iv) Kushi > Soniya

(v) Gargi is the eldest of all.

Gargi > Manish > Kushi> Ritika > Soniya.

Clearly, Soniya is the youngest.

Q9. Age Wise, who is in the middle?

(a) Manish (b) Ritika

(c) Kushi (d) Soniya

Ans: (c)

Explanation:

Gargi > Manish > Kushi> Ritika > Soniya.

Kushi is in the middle of order.

Q10. In five flats, one above the other, live five professionals. The professor has to go up to meet his IAS officer friend. The doctor is equally friendly to all and has to go up as frequently go down. The engineer has to go up to meet his MLA friend above whose flat lives the professor's friend.

From the ground floor to the top floor, in what order do the five professionals live?

(UPSC CSAT 2012)

(a) Engineer, professor, doctor, IAS officer, MLA

(b) Professor, engineer, doctor, IAS officer, MLA

(c) IAS officer, engineer, doctor, professor, MLA

(d) Professor, engineer, doctor, MLA, IAS officer

Ans: (d)

Explanation:

We will summarise the information given in the question:

IAS > ... > Professor

The doctor is equally friendly to all and goes up and down equally i.e.

doctor is at the centre.

IAS > MLA > ... > Engineer

$\Rightarrow$ The order should be IAS > MLA >

Doctor > Engineer/Professor

Either Professor or Engineer is at the bottom. So, we will go by the options.

The only option satisfying this order is (d).

Directions (Q11-Q13): Examine the information given in the following paragraph and answer the items that follow.

Guest lectures on five subjects viz. Economics, History. Statistics. English and Mathematics have to be arranged in a week from Monday to Friday. Only one lecture can be arranged on each day. Economics cannot be scheduled on Tuesday. Guest faculty for History is available only on Tuesday. Mathematics lecture has to be scheduled immediately after the day of Economics lectures, English lecture has to be scheduled immediately before the day of Economics lecture. **(UPSC CSAT 2012)**

Q11. Which lecture is scheduled on Monday?

(a) History (b) Economics

(c) Mathematics (d) Statistics

Ans: (d)

Explanation:

5 subjects: Economics, History, Statistics, English and Mathematics.

5 days: Monday, Tuesday, Wednesday, Thursday and Friday.

Economics $\neq$ Tuesday

History = Tuesday

Mathematics lecture is scheduled immediately after Economics and English lecture is scheduled immediately before Economics. So, the order is English, Economics and Mathematics.

So, they will hold on Wednesday, Thursday and Friday respectively.

Monday and Statistics lecture is left. So they are combined together.

Now, the order of lectures and days is given in the table as below:

Lectures	Statistics	History	English	Economics	Mathematics
Days	Monday	Tuesday	Wednesday	Thursday	Friday

Q12. Which lecture is scheduled between Statistics and English?

(a) Economics (b) History

(c) Mathematics (d) No lecture

Ans: (b)

Explanation:

Lectures	Statistics	History	English	Economics	Mathematics
Days	Monday	Tuesday	Wednesday	Thursday	Friday

Q13. Which lecture is the last one in the week?

(a) History (b) English

(c) Mathematics (d) Economics

Ans: (c)

Explanation:

Lectures	Statistics	History	English	Economics	Mathematics
Days	Monday	Tuesday	Wednesday	Thursday	Friday

Q14. Seven men A, B, C, D, E, F and G are standing in a queue in that order. Each one is wearing a cap of a different colour like violet, indigo, blue, green, yellow, orange and red. D is able to see in front of him green and blue but not violet. E can see violet and yellow, but not red. G can see caps of all colours other than orange. If E is wearing an indigo coloured cap, then the colour of the cap worn by F is (UPSC CSAT 2013)

(a) Blue (b) Violet

(c) Red (d) Orange

Ans: (c)

Explanation:

We can sum up the above data by using as table as shown below:

Person	Cap
A/B/C	Green/blue/yellow
D	Violet
E	Indigo
F	Red
G	Orange

From the table we can clearly see that F is wearing a Red hat.

TYPE 4: FAMILY BASED PROBLEMS

In these puzzles, we explore more than just basic family ties. They are a step up from the regular 'Blood Relation' problems. In these scenarios, you're not just figuring out who is related to whom. You also need to consider additional layers of information like what jobs family members have, their personal traits, what they wear, their likes and dislikes, and other such specifics.

How to Approach These Puzzles:

- Use Relationship Symbols and Diagrams: Just like in the 'Blood Relation' chapter, symbols and diagrams are invaluable. They help you visually map out complex family relationships and keep track of additional details.
- Absorb Every Detail: Read the given information very carefully. Every bit could be a clue to solve the puzzle.
- Link Relationships with Personal Details: Merge your understanding of who is related to whom with their individual characteristics and preferences.
- Draw and Redraw: As new information gets integrated, you might need to adjust your family diagrams. Keep them flexible.

QUESTIONS

Direction (Q15 - Q16): Read the following information carefully and answer the given questions.

A, B, C, D, E, F and G are the seven members of a family. There are three female members, each of them has a different profession-Lawyer, Chartered Accountant (CA), Engineer, Teacher, Doctor, Architect and Pharmacist. No lady is either Pharmacist or Chartered Accountant.

Each of them has a different monthly income. The Chartered Accountant earns the most. D (Engineer), earns less than F (Doctor). C, the Teacher, earns more than A and less than D. G's wife earns the least. E is an unmarried lady Lawyer and she earns less than A and more than only B. The Pharmacist's income is not the lowest.

Q15. Who earns the least?

(a) A (b) B

(c) D (d) C

Ans: (b)

Explanation:

Based on the information given in the question we can make the following table:

Person	Sex	Profession	Salary
A	M	Pharmacist	3rd lowest
B	F	Architect	Lowest
C	M/F	Teacher	4th highest
D	M/F	Engineer	3rd highest
E	F	Lawyer	2nd lowest
F	M/F	Doctor	2nd highest
G	M	Chartered accountant	Highest

B earns the least.

Q16. What is A's profession?

(a) Pharmacist

(b) Lawyer

(c) Teacher

(d) Cannot be determine

Ans: (a)

Explanation:

Profession of A is Pharmacist.

Direction (Q17-Q18) Read the passage given below and answer the question that follows.

A, B, C, D, E, F, are members of a family. They are engineer, stenographer, doctor, draughtsman, lawyer and judge (not in order). A, the engineer is married to the lady stenographer.

The judge is married to the lawyer. F, the draughtsman is the son of B and brother of E. C, the lawyer is the daughter-in-law of D.E is the unmarried doctor. D is the grandmother of F. There are two married couples in the family **(UPSC CSAT 2014)**

Q17. What is the profession of B?

(a) Judge (b) Lawyer

(c) Draughtsman (d) Cannot be determined

Ans: (a)

Explanation:

Statement-I: A, the engineer is married to the lady stenographer.

Implies that A is male and an engineer and stenographer is female.

Statement-II: The judge is married to the lawyer.

Implies that the judge and lawyer are married to each other.

Statement-III: F, the draughtsman is the son of B and brother of E

Implies that F is male and draughtsman.

Statement-IV: C, the lawyer is the daughter-in-law of D.

Implies that C is lawyer and female also by 2nd statement judge is male and also son of D.

Statement-V: D is the grandmother of F

Implies that D is female and F is the son/daughter of a judge.

Hence the final relationship chart of family is:

First Generation: A (Male - Engineer) – D (Female-Stenographer)

Second Generation: B (Male - judge) – C (Female – Lawyer)

Third Generation: F (Male – Draughtsman) & E (Male/Female – Doctor)

Now clearly profession B is a judge.

Q18. Which of the following is/are a couple /couples?

(a) Only AD (b) Only BC

(c) AD and BC (d) AC and BD

Ans: (c)

Explanation:

AD and BC are a couple.

Directions (Q19-Q21): Read the following passage and answer the 3 (three) items that follow.

A, B, C, D and E are members of the same family. There are two fathers, two sons, two wives, three males and two females. The teacher was the wife of a lawyer who was the son of a doctor. E is not a male and also a wife of a professional. C is the youngest person in the family and D is the eldest. B is a male. **(UPSC CSAT 2011)**

Q19. How is D related to E?

(a) Husband (b) Son

(c) Father (d) Wife

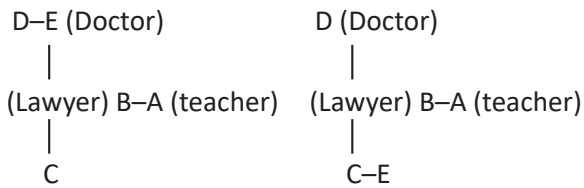
Ans: (a)

Explanation:

From the statement it is very clear that family has 3 generations.

Family has 3 males and 2 females

Now there are 2 possibilities as shown in figure below:



Now lets solve the questions one by one:

Now from 1st arrangement it is very clear that D is husband of E.

From 2nd arrangement it is clear that E is grandchild of E but it is not given in options

So D is the husband of E.

Q20. Who are the females in the group?

(a) C and E (b) C and D

(c) E and A (d) D and E

Ans. (c)

Explanation:

E and A are females.

Q21. Whose wife is the teacher?

(a) C (b) D

(c) A (d) B

Ans. (d)

Explanation:

Wife of B is a teacher.

PRACTICE QUESTIONS

Directions (Q1 – Q3): Read the given information and answer the following questions.

Five persons Prem, Qasim, Rohit, Sahil and Tony were born in five consecutive years ending in 2000. Sahil was born in the even number year. Only one person was born between Sahil and Tony. Rohit was born after Prem. Tony was born immediately after Qasim. Rohit was not born in the year 1999. Only one person was born between Qasim and Rohit.

1. **Who among the following person was born in 1999?**
   (a) Qasim (b) Prem
   (c) Sahil (d) Tony
2. **How many persons are older than Sahil?**
   (a) One (b) Two
   (c) Three (d) Four
3. **Rohit was born in which of the following year?**
   (a) 1999 (b) 2000
   (c) 1997 (d) 1996

Directions (Q4 –Q 5): Read the given information and answer the following questions.

Five students appear in a competitive exam. Sachin gets more marks than Sumit. Sahil gets more marks than Shyam but less marks than Shivam. A student who gets 2nd highest marks gets 45 marks. Shivam gets more marks than Sachin. Shyam doesn't get lowest marks. Sachin gets more marks than Shyam and less marks than Sahil.

4. **Who among the following gets 3rd highest marks?**
   (a) Sachin (b) Shyam
   (c) Shivam (d) Sumit
5. **Which of the following may be the marks that Shivam gets?**
   (a) 30 (b) 35
   (c) 45 (d) 47

Directions (Q6 – Q10): Read the given information and answer the following questions.

Six boxes U, V, W, X, Y and Z come in USA from different countries i.e. India, Pakistan, France, Brazil, Bhutan and UAE. All boxes are placed from top to bottom but not necessarily in the same order. Bottommost box is numbered as 1 and so on till the topmost box is numbered as 6. The box from France is placed just above the box X. One box is placed between the box U and box Z. One box is placed between the box from UAE and the box from India. Box V is from Brazil. Box Y is placed just above the box W, which is from Pakistan. Box Z not from UAE but placed below the box which is from Brazil. More than one box placed between box W and box X. Box Z is placed above the box which is from Bhutan. Box X is neither from UAE nor from India. The box from India is placed below the box W.

6. **Which of the following box is from UAE?**
   (a) U (b) W
   (c) V (d) Y
7. **Find the one who does not belong to the group?**
   (a) V – Y
   (b) W – Z
   (c) U – X
   (d) The box from India and the box from Brazil
8. **Which of the following is the correct combination?**
   (a) Pakistan – Box W (b) India – Box Z
   (c) UAE – Box U (d) France – Box X
9. **How many boxes are there in between the box W and box Z?**
   (a) Two (b) One
   (c) Four (d) Three
10. **If box W and box Y interchange their positions then, which of the following box is placed just below the box Y?**
    (a) V (b) X
    (c) Z (d) U

Directions (Q11 – Q15): Read the given information and answer the following questions.

There are eight floors named as P, Q, R, S, T, U, V and W but not necessarily in the same order. Only two floors are between floor U and T. Only one floor is between floor T and R. Only two floors are between floor R and V. Floor V is below floor R. Three floors are in between S and Q floor, both floor S and Q are above floor T. Floor W is below floor V. Not more than one floor is between floor S and P.

11. **Which of the floor is immediately above floor Q?**
    (a) W (b) U
    (c) R (d) T

12. How many floors are there in between floor T and S?

(a) One (b) Two

(c) Three (d) Four

13. Which of the following floor is at the bottom?

(a) W (b) U

(c) R (d) T

14. Which of the following floor is immediately below floor P?

(a) W (b) U

(c) R (d) T

15. How many floors are there in between floor W and R?

(a) One (b) Two

(c) Three (d) Four

ANSWERS

1. (*a*) 2. (*b*) 3. (*c*) 4. (*a*) 5. (*d*) 6. (*d*) 7. (*d*) 8. (*a*) 9. (*a*) 10. (*d*)
11. (*c*) 12. (*d*) 13. (*a*) 14. (*b*) 15. (*c*)

EXPLANATIONS

1. (a)

Explanation:

5 persons – Prem, Qasim, Rohit, Sahil and Tony

5 birth years – 1996, 1997, 1998, 1999 and 2000.

Using the given information,

- Sahil was born in the even number year.
- Only one person was born between Sahil and Tony.
- Rohit was born after Prem.
- Tony was born immediately after Qasim.
- Rohit was not born in the year 1999.
- Only one person was born between Qasim and Rohit.
- Three cases arise on the basis of Sahil's even birth year i.e. year 1996, 1998 and 2000.

Year	Case – 1	Case – 2	Case – 3
1996	Sahil		
1997	Qasim		Qasim
1998	Tony	Sahil	Tony
1999		Qasim	
2000		Tony	Sahil

In case 1 – If Rohit was born after Prem, then there will be two persons between Qasim and Rohit. Hence, this option is eliminated.

In case 3 – If Rohit was not born in year 1999 and only one person was born between Qasim and Rohit. So, this case is eliminated.

The final arrangement is as follows:

Person	Prem	Rohit	Sahil	Qasim	Tony
Year	1996	1997	1998	1999	2000

So, we can clearly see that Qasim was born in the year 1999.

2. (b)

Explanation:

From the above explanation, we can see that two persons i.e. Prem and Rohit are older than Sahil.

3. (c)

Explanation:

From the above explanation, we can say that Rohit was born in 1997.

4. (a)

Explanation:

5 students – Sachin, Sahil, Sumit, Shivam and Shyam.

The given information is as follows:

- Sachin gets more marks than Sumit. $\Rightarrow$ Sachin > Sumit
- Sahil gets more marks than Shyam but less marks than Shivam. $\Rightarrow$ Shivam > Sahil > Shyam
- A student who gets 2nd highest marks gets 45 marks.
- Shivam gets more marks than Sachin. $\Rightarrow$ Shivam > Sachin
- Shyam doesn't get lowest marks.
- Sachin gets more marks than Shyam and less mark than Sahil. $\Rightarrow$ Sahil > Sachin > Shyam

So, the final arrangement is Shivam > Sahil > Sachin > Shyam > Sumit

$\therefore$ Sachin gets 3rd highest marks.

5. (d)

Explanation:

From the above explanation, Shivam gets the highest marks and Sahil has 2nd highest marks i.e. 45.

So, Shivam gets marks more than 45.

6. (d)

Explanation:

6 boxes – U, V, W, X, Y and Z

6 countries – India, Pakistan, France, Brazil, Bhutan and UAE

- The box from France is placed just above the box X.
- One box is placed between the box U and box Z.
- One box is placed between the box from UAE and the box from India.
- Box V is from Brazil.
- Box Y is placed just above the box W, which is from Pakistan.
- Box Z not from UAE but placed below the box which is from Brazil.
- More than one box placed between box W and box X.
- Box Z is placed above the box which is from Bhutan.
- Box X is neither from UAE nor from India.
- The box from India is placed below the box W.

So, the final arrangement is as given below:

Boxes	Countries
Y	UAE
W	Pakistan
U	India
V	Brazil
Z	France
X	Bhutan

We can clearly see that box Y is from UAE.

7. (d)

Explanation:

The final arrangement is as given below:

Boxes	Countries
Y	UAE
W	Pakistan
U	India
V	Brazil
Z	France
X	Bhutan

We can clearly see that each group has two boxes in between them.

But in case of the box from India and the box from Brazil, there is no box in between them.

8. (a)

Explanation:

The final arrangement is as given below:

Boxes	Countries
Y	UAE
W	Pakistan
U	India
V	Brazil
Z	France
X	Bhutan

We can clearly see that Pakistan – Box W is the correct combination. Rest pairs are not correctly matched.

9. (a)

Explanation:

The final arrangement is as given below:

Boxes	Countries
Y	UAE
W	Pakistan
U	India
V	Brazil
Z	France
X	Bhutan

We can clearly see that two boxes i.e. U and V are there in between box W and box Z.

10. (d)

Explanation:

The final arrangement is as given below:

Boxes
Y
W
U
V
Z
X

But if box W and box Y interchange their positions then the arrangement becomes:

Boxes
W
Y
U
V
Z
X

So, box U is just below box Y.

11. (c)

Explanation:

Using the given information, we can make the following arrangement.

1. Only two floors are between floor U and T.
2. Only one floor is between floor T and R.
3. Only two floors are between floor R and V.
4. Floor V is below floor R.
5. Three floors are in between S and Q floor
6. Both floor S and Q are above floor T.
7. Floor W is below floor V.
8. Not more than one floor is between floor S and P. It means there can be 0 or 1 floor between floor S and P.

1	2	3 and 4	5	6	7	8	
U/T	T/R	R	S/Q	S/Q	V	S/P	S/P
				above	W	S/P	----
	T/R			T			S/P
U/T		V					
			S/Q				

So, the final arrangement is as follows:

S
P
U
R
Q
T
V
W

We can clearly see that floor R is immediately above Q.

12. (d)

Explanation:

As the final arrangement is as follows:

S
P
U
R
Q
T
V
W

We can clearly see from the final arrangement that there are four floors between floor T and S. These are P, U, R and Q.

13. (a)

Explanation:

We can clearly see from the table that floor W is at the bottom.

14. (b)

Explanation:

As the final arrangement is as follows:

S
P
U
R
Q
T
V
W

We can clearly see that floor U is immediately below floor P.

15. (c)

Explanation:

As, the final arrangement is as follows:

S
P
U
R
Q
T
V
W

We can clearly see that three floors are in between floor W and R. These are Q, T and V.

Venn Diagram

12

INTRODUCTION

The logical Venn diagram is a tool used to assess a candidate's ability to understand and relate to a given group of items or concepts.

Venn Diagrams are a simple way to show how different groups have things in common. They were created by John Venn and are used a lot in maths, statistics, and to solve problems.A Venn Diagram is a graphical illustration of mathematical or logical relationships. It uses shapes, usually circles, to represent sets. The position and overlap of these circles demonstrate how the sets intersect and relate to one another.

Main Parts of Venn Diagrams:

- **Sets:** Circles in the diagram. Each set is a group of things that have something in common.
- **Universal Set:** The big box that holds all the sets. It has all the items we are interested in.
- **Intersection:** Where circles overlap. It shows items that are in both groups.
- **Union:** All the space in the circles together. It covers all items in any of the sets.
- **Complement:** The space outside a circle but inside the rectangle. It shows items not in that set.

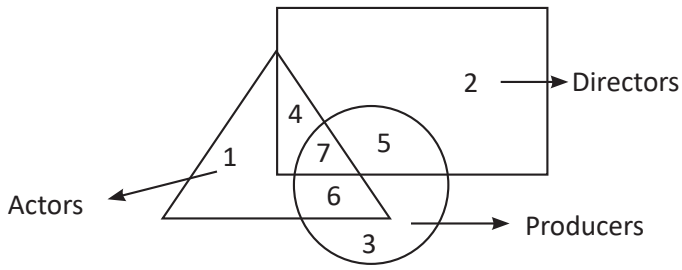
Different types of questions are as follows:

1. Analysis-Based on Venn Diagram
2. Identification of Venn Diagram Based on Relations

TYPE 1: ANALYSIS-BASED ON VENN DIAGRAM

These questions involve interpreting and analysing given Venn Diagrams to extract information or solve problems. The diagrams provided typically depict relationships between different sets, represented by circles or other shapes. Our task is to carefully examine and analyse the figures in the diagram and then respond to the provided questions based on our observations.

Let's understand this by an example:



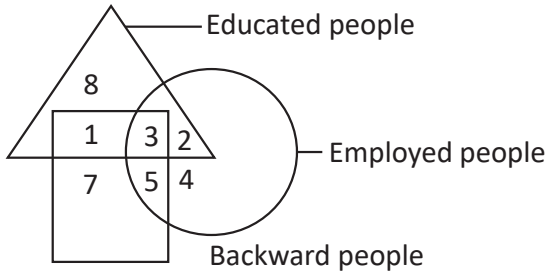
In this diagram, there are 3 groups: Actors, Directors and Producers which are depicted by Triangle, Rectangle and Circle respectively.

There are 7 regions in the diagram numbered from 1 to 7 and the table below tells us about what each region represents:

Region	Description
1	Only Actors
2	Only Directors
3	Only Producers
4	Actors and Directors, but not Producers
5	Directors and Producers, but not Actors
6	Producers and Actors, but not Directors
7	Actors, Directors, and Producers (overlap of all three roles)

QUESTIONS

Directions (Q1 – Q2): Study the following figure and Answer the questions given below:



Q1. How many educated people are backward people?

(a) 4 (b) 6

(c) 5 (d) 7

Ans: (a)

Explanation:

Triangle shows the number of Educated people and rectangle represents the backward people where circle represents employed people.

Number of people which are educated and backward is the intersection of triangle and rectangle

Hence, the number of people who are educated and backward = 1 + 3 = 4.

Q2. How many backward people are not employed?

(a) 7 (b) 8

(c) 13 (d) 14

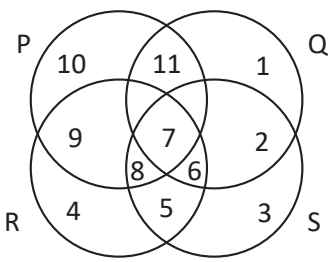
Ans: (b)

Explanation:

No. of backward people who are not employed = numbers which are in rectangle but not in circle.

Hence, the No. of backward people who are not employed = 1 + 7 = 8

Q3.



In the above figure, circle P represents hard working people, circle Q represents intelligent people, Circle R represents truthful people and circle S represents honest people. Which region represents the people who are intelligent, honest and truthful but not hardworking? **(UPSC CSAT 2012)**

(a) 6 (b) 7

(c) 8 (d) 11

Ans: (a)

Explanation:

P – Hardworking people, Q – Intelligent people

R – Truthful people, S – Honest people

We have to find the region that represents the people who are intelligent, honest and truthful but not hardworking i.e. the region includes Q, R and S but excludes P.

That is 6 people.

Q4. Out of a total of 120 musicians in a club, 5% can play all three instruments, guitar, violin and flute. It so happens that the number of musicians who can play any and only two of the above instruments is 30. The number of musicians who can play guitar alone is 40. What is the total number of those who can play violin alone and flute alone?

(UPSC CSAT 2014)

(a) 45 (b) 44

(c) 38 (d) 30

Ans: (b)

Explanation:

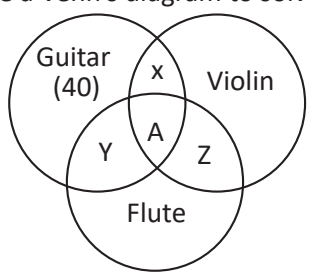
Total no. of musicians = 120

Number of musicians who can play all 3 instruments = 5% of 120 = 6

Number of musicians who can play guitar alone = 40

The number of musicians who can play any and only two of the above instruments = 30

We can use a Venn's diagram to solve this:



In the Above Venn's diagram, A = 6

X + Y + Z (who play only two) = 30

G + V + F + (X + Y + Z + A) = 120 (G, V, F are the people who can play only guitar, violin or flute)

By putting all data, we have

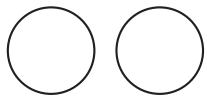
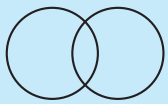
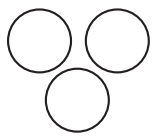
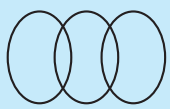
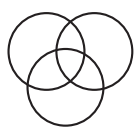
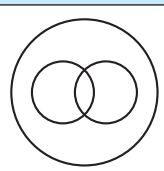
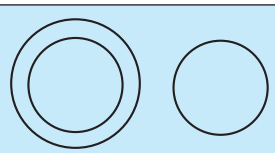
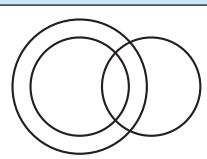
40 + V + F + 30 + 6 = 120

OR, V + F = 44

TYPE2: IDENTIFICATION OF VENN DIAGRAM BASED ON RELATIONS

In this type of Venn Diagram question, the challenge is to correctly identify how relationships among various groups or categories are visually represented in a diagram. These questions typically involve descriptions of relationships between different classes or elements, and the task is to select the Venn Diagram that accurately reflects these connections. This tests our ability to interpret and understand classes within diagrams, evaluating our visual and analytical skills.

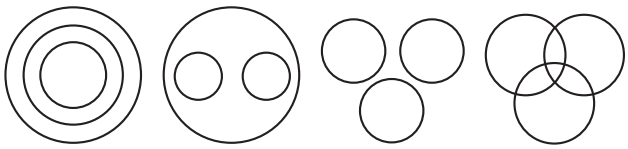
Let's understand various types of relation and their Venn diagram by the following table:

S. no.	Venn Diagram	Relationship
1.		This diagram shows that a group is totally inserted into other but are not equal For e.g. the relationship between tree and banyan tree.
2.		This diagram indicates that two groups have no connection, and there are no shared elements between them. For e.g relationship between trees and animals.
3.		This diagram illustrates that no single group is completely within another, but they are connected to each other to some extent. For e.g teachers and authors.
4.		This diagram illustrates that three groups have no connection, and there are no shared elements between them. For eg. men, animal and birds
5.		This diagram illustrates that two groups are somewhat connected to the third group but are independent of each other. For eg. employed, graduate and unemployed
6.		This diagram shows three separate groups partly related to each other. For eg. persons who speak hindi, english and punjabi.
7.		This diagram demonstrates that two distinct things are both part of a larger group. For eg. human, doctors and Engineers
8.		This diagram indicates that two sets are part of a larger group, and there are shared items between these two sets within the larger group. For eg. human, graduate and employed
9.		If one group is inside another group, and a third group is completely separate from the first two, you can illustrate this relationship with a diagram. For eg. male, boys and female
10.		When one group is part of another group, and a third group is related to both of them to some extent, you can represent this relationship with this diagram. For eg. triangle, right angle triangle and isosceles triangle.

As we approach the questions, remember to look for key indicators of relationships such as intersection, union, mutual exclusivity, or subset dynamics. Pay attention to details and nuances in the descriptions, as they can significantly influence the structure of the corresponding Venn Diagram.

QUESTIONS

Q5. Which of the following represent Aluminium, Leaves and Petrol?



(a) (b) (c) (d)

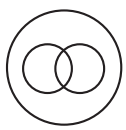
Ans: (c)

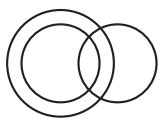
Explanation:

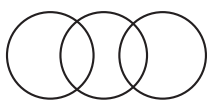
Aluminium, Leaves and Petrol are three different classes and there is nothing common between them.

Q6. Which of the following represent Human, Asian and Athletes?

(a) 

(b) 

(c) 

(d) 

Ans: (b)

Explanation:

Asian and Athletes are human and some Athletes are from Asia and some are from outside Asia.

Q7. In a group of persons travelling in a bus, 6 persons can speak Tamil, 15 can speak Hindi and 6 can speak Gujarati. In that group, none can speak any other language. If 2 persons in the group can speak two languages and one person can speak all the three languages, then how many persons are there in the group? **(UPSC CSAT –2015)**

(a) 21 (b) 22

(c) 23 (d) 24

Ans: (c)

Explanation:

People can speak Tamil, Hindi and Gujrati

Tamil speakers are persons who can speak tamil is 6.Lets assume 2 people speak tamil and hindi.

Only Tamil speakers are 6 – 2 – 1 = 3

Hindi speakers are persons who can speak is 15.

Only Hindi speakers are 15 – 2 – 1 = 12

Gujarati speakers are persons who can speak is 6

Only Gujarati speakers are 6 – 1 = 5

Thus the number of persons who can speak only one language is 3 + 12 + 5 = 20

Number of persons who can speak two languages = 2

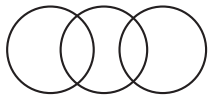
Number of person who can speak all the languages = 1

Total number of persons = 23.

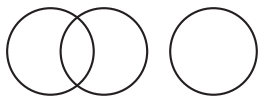
PRACTICE QUESTIONS

1. Choose from the given options which best shows the relationship amongst furniture, table and chair.

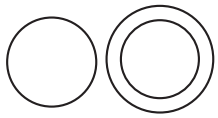
(a) 

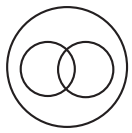
(b) 

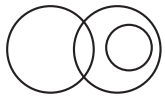
(c) 

(d) 

2. Choose from the given options which best shows the relationship amongst Sportsperson, Cricketer and People.

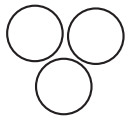
(a) 

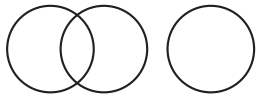
(b) 

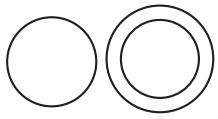
(c) 

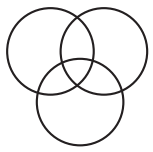
(d) 

3. Choose from the given options which best shows the relationship amongst Reptiles, Snakes and Elephants.

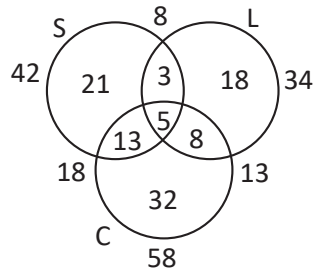
(a) 

(b) 

(c) 

(d) 

Directions (Q4-Q5): In the figure given below, circle S represents students studying sociology, circle C represents students studying chemistry and circle L represents students studying language paper:



4. How many students study language or chemistry but not sociology?

(a) 79 (b) 42

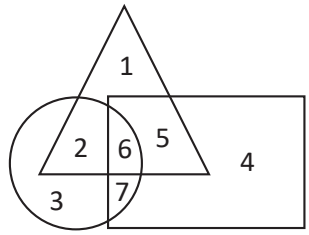
(c) 74 (d) 58

5. How many students study at least two subjects?

(a) 29 (b) 71

(c) 24 (d) 5

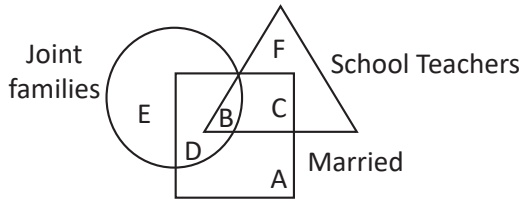
6. In the given diagram, the rectangle represents scientists, the circle represents women, and the triangle represents individuals with a Ph.D. What is the specific region of the figure that denotes women scientists with a Ph.D.?



(a) 7 (b) 5

(c) 6 (d) 2

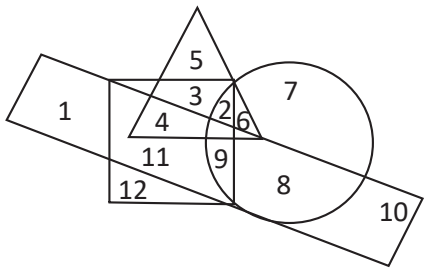
7. In the given diagram, the circle represents persons living in joint families, square represents married persons and triangle represents school teachers. What is the specific region of the figure that represents school teachers who are married but do not live in joint families?



(a) C (b) B

(c) D (d) A

8. In the given diagram, the circle stands for literate, square stands for taxpayers, triangle stands for employed and rectangle for senior citizens. The different regions of the diagram are numbered from 1 to 12.



Which of the following can be concluded from the above figure?

(a) All those who are literate are employed.

(b) Some senior citizens are taxpayers.

(c) Literate persons who are not employed do not pay tax.

(d) None of the above

Directions (Q9-Q10): Out of 90 students in a class, 6 students failed in all the three subjects Physics, Chemistry and Maths. Only 72 students pass in only one subject and 8 students pass in only two subjects.

9. How many of the students passed in at least two subjects ?

(a) 18 (b) 15

(c) 12 (d) 24

10. How many of the students passed in at most in two subjects but atleast in one subject?

(a) 80

(b) 76

(c) 12

(d) None of the above

11. In a group of 100 people, 70 can speak German and 50 can speak French. If all the people speak at least one of the two languages then how many can speak exactly one language?

(a) 80 (b) 60

(c) 75 (d) 20

12. In an exam, 60% of the candidates passed in Science and 70% candidates passed in History and 10% candidates failed in both the subjects. If 30 candidates passed in both the subjects then what is the total number of candidates who appeared in the exam, if they took the test in only two subjects viz – Science and History.

(a) 85 (b) 60

(c) 75 (d) 100

13. In a city 45% of the people read The Hindu and Bhaskar newspapers. 15% read only Indian Express newspaper and 75% read Bhaskar newspaper. If nobody reads all the three newspapers and everybody reads at least one newspaper out of The Hindu, Bhaskar and Indian Express newspapers, how many read Indian Express newspaper?

(a) Max 45% (b) Max. 55%

(c) Min 25% (d) Min 30%

Directions (Q14-Q15): Read the following information carefully:

There are 300 workers who work for a company, out of which 125 are women.

Also:

(i) 140 workers are married

(ii) 130 workers are graduates

(iii) 100 married workers are graduates of which 45 are men

(iv) 75 men are graduates

(v) 75 men are married.

14. How many unmarried women are graduates?

(a) 100 (b) 40

(c) 0 (d) Can't be determined

15. How many unmarried women work in the company?

(a) 55 (b) 60

(c) 45 (d) None of these

16. Find the number of positive integers between 10 and 100 which are not divisible by any 2, 3 and 5?

(a) 22 (b) 23

(c) 24 (d) 25

ANSWERS

1. (*a*) 2. (*d*) 3. (*c*) 4. (*d*) 5. (*a*) 6. (*c*) 7. (*a*) 8. (*b*) 9. (*c*) 10. (*a*)
11. (*a*) 12. (*c*) 13. (*b*) 14. (*c*) 15. (*b*) 16. (*c*)

EXPLANATIONS

1. (a)

Explanation:

Table and chair are two different items of the class furniture.

2. (d)

Explanation:

All the sports persons and cricketers are people, all cricketers are sports person but all sports persons may not play cricket.

3. (c)

Explanation:

All the snakes are reptiles.

While reptiles and elephants are both part of the animal kingdom, they belong to different classes within that kingdom.

4. (d)

Explanation:

Students who study language or chemistry but not sociology will be at the intersection of the circles L and C without the part which covers the circle S.

Thus, required number of students = 18 + 8 + 32 = 58

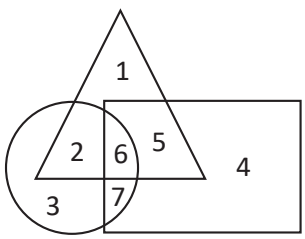
5. (a)

Explanation:

Students who study at least two subjects will be at the intersection of all the three circles. Thus, required number of students = 3 + 8 + 13 + 5 = 29

6. (c)

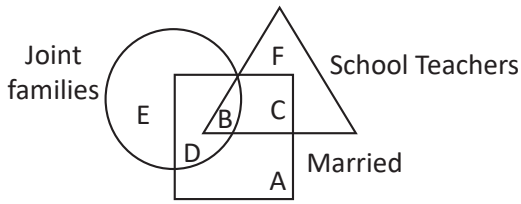
Explanation:



Region of the figure that denotes women scientists with a Ph.D. will be the region which is common to circle, triangle and rectangle all three which is denoted by region 6.

7. (a)

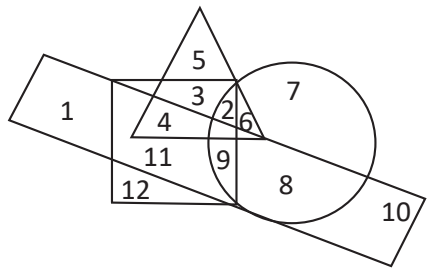
Explanation:



Region of the figure that denotes school teachers who are married but do not live in joint families will be the region which is common to triangle and rectangle but excluding the region containing the circle.

8. (b)

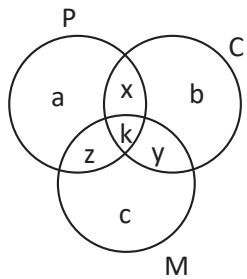
Explanation:



Clearly, there are some senior citizens who are paying taxes as depicted by regions 4, 9 and 11.

9. (c)

Explanation:



Total number of students who passed in at least one of the subjetcs = 90 – 6 = 84

Number of students who passed in only one subject = a + b + c = 72

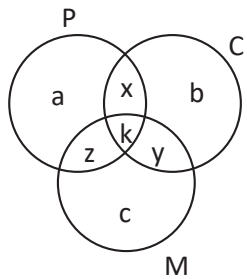
Number of students who passed in only two subjects = x + y + z = 8

Number of students who passed in all the three subjects = k = 84 – 72 – 8 = 4

Number of students who passed in at least two subjects = x + y + z + k = 8 + 4 = 12

10. (a)

Explanation:



Number of students who passed in only subject

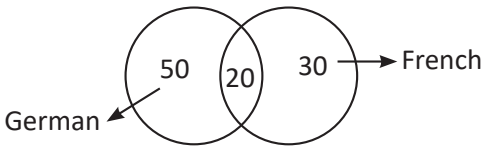
= a + b + c = 72

Number of students who passed in only two subjects = x + y + z = 8

Number of students who passed in at most in two subjects but atleast in one subject = 72 + 8 = 80

11. (a)

Explanation:



Number of people who speak German = 70

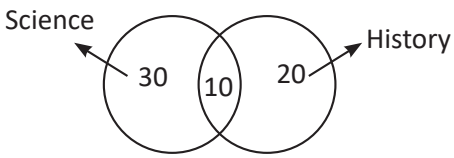
Number of people who speak French = 50

Number of people who speak both languages

Now, Number of people who speak exactly one language = 100 – 20 = 80.

12. (c)

Explanation:



Failed number of candidates

Percentage of candidates failed in Science = 40 %

Percentage of candidates failed in History = 30%

Percentage of candidates failed in both subjects = 10%

Percentage of candidates failed in at least 1 subject = 30 + 10 + 20 = 60% (from above diagram)

Hence Percentage of candidates not failed in any subjects = 100 – 60 = 40 %

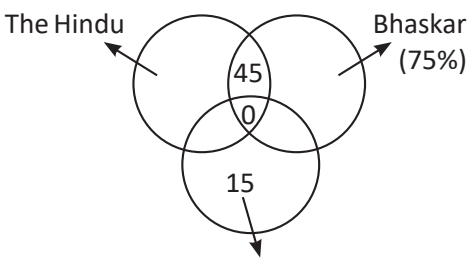
Let the no. of total student = x

40 % of x = 30

$40x/100 = 30 \Rightarrow x = 75$

13. (b)

Explanation:



45% of the people read The Hindu and Bhaskar newspapers.

If nobody reads all the three newspapers and everybody read at least one newspaper out of The Hindu, Bhaskar and Indian Express newspapers.

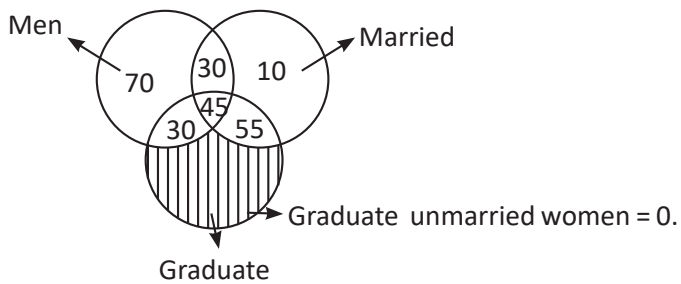
So, it is clear that 45% people cannot read Indian Express newspaper.

Besides them all of them can read Indian Express newspaper.

So, at maximum (100 – 45) % = 55% people can read Indian Express newspaper.

14. (c)

Explanation:



Total number of workers = 300

Number of women = 125

So, number of men = 300 – 125 = 175

Total number of married workers = 140

Number of married men = 75

So, number of married women = 140 – 75 = 65

Total number of graduate workers = 130

Number of graduate men = 75

So, number of graduate women = 130 – 75 = 55 ...(1)

Number of married graduates = 100 out of which 45 are men.

So, number of married graduate women workers = 100 – 45 = 55 ...(2)

From (1) and (2), no unmarried woman is graduate.

15. (b)

Explanation:

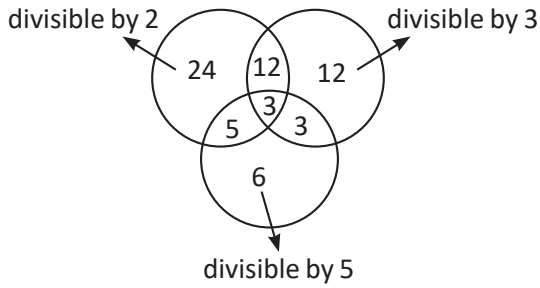
Number of unmarried women workers in the company

=300 – (70 + 30 + 10 + 30 + 45 + 55)

= 300 – 240 = 60

16. (c)

Explanation:



Total numbers between 10 and 100 = 89

Numbers divisible by 2 = 44

Numbers divisible by 3 = 30

Numbers divisible by 5 = 17

Numbers divisible by both 2 and 3 i.e. 6 = 15

Numbers divisible by both 3 and 5 i.e. 15 = 6

Numbers divisible by both 2 and 5 i.e. 10 = 8

Numbers divisible by 2, 3 and 5 i.e. 30 = 3

Total numbers between 10 and 100 which are divisible by at least one of 2, 3 and 5 = 24 + 12 + 5 + 3 + 12 + 3+ 6 = 65

So, the total numbers between 10 and 100 which are not divisible by any of 2, 3 and 5 = 89 – 65 = 24

Syllogism

13

INTRODUCTION

A syllogism is like a special way of using words and sentences to show clear and logical thinking. It's a very important skill, especially when you need to think logically and make good arguments.

In this chapter, we'll see how syllogism is used in questions where you have to figure out what's true just based on certain statements. The key here is to stick to what the statements say and not add anything from your side.

We'll learn how to take the information given in these statements and use it to reach conclusions, step by step. This process is all about thinking carefully and making sure your conclusions really come from the information you've been given.

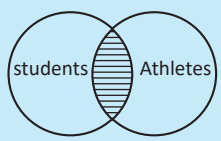
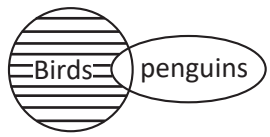
SOME BASIC CONCEPTS

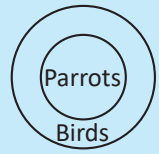
- **Proposition:** A proposition is a statement in which you express a fact or opinion about something. It's like making a claim about two things, saying whether it's true or false.
- Every proposition has three main parts:
  - **Subject(S):** This is what or who the statement is about. It's the main focus of the proposition.
  - **Predicate(P):** This part tells something about the subject. It's the information or opinion about the subject.
  - **Linking Word:** This is the word that joins the subject and predicate. It helps to make the sentence make sense and connects the two main parts.
  - **Quantifier:** Words which specify a quantity are called quantifiers. E.g. some, all, no etc

For example:

Quantifier	Subject	Linking word	Predicate
All	Men	Are	Boys
No	Criminal	Is	Innocent

COMMON PHRASES USED IN QUESTIONS AND THEIR MEANING

Common Phrase in Questions	Phrase Meaning	Example	Visual Representation
All A are B	Every member of A is also a member of B	All cats are animals.	
No A is B	No member of A is a member of B	No dogs are cats.	
Some A are B	At least one member of A is also in B	Some students are athletes.	
Some A are not B	At least one member of A is not in B	Some birds are not penguins.	

Only A are B	All members of B are A, but not all A are B	Only birds are parrots (among the given).	
A is the same as B	A and B have the same members	The set of bachelors is the same as unmarried men.	

CLASSIFICATIONS OF PROPOSITION

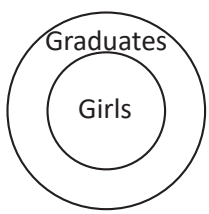
A. Categorical Proposition:

In a categorical proposition, there exists a relationship between the subject and the predicate without any condition. It means predicate is either affirmation or denial of the subject unconditionally. For eg. all cat are animal

This can be further classified in 4 types as given below with their Venn Diagram representation:

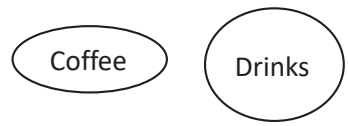
1. Universal Affirmative Proposition (A)

- Also known as **"All S are P"** propositions.
- These propositions affirm something about every member of the subject class.
- **For example,** when we say **"All girls are graduates,"** this is a universal affirmative proposition. But the opposite, which would be "All graduates are girls," is not true.



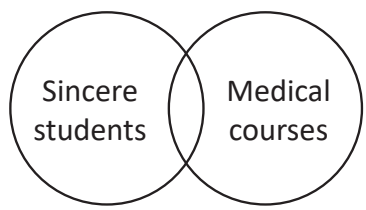
2. Universal Negative Proposition (E)

- Also known as **"No S are P"** propositions.
- These propositions deny something about every member of the subject class.
- For instance, when we say, **"No coffee is drinkable,"** it means that the category of **"drinkable"** does not apply to any type of **"coffee."**



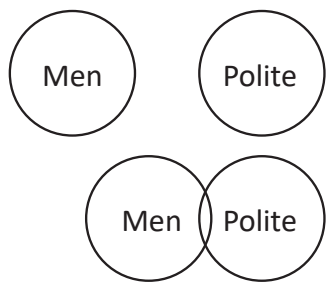
3. Particular Affirmative Proposition (I)

- Also known as **"Some S are P"** propositions.
- These propositions affirm something about at least one member of the subject class.
- **For example, "some sincere students are pursuing medical courses"**. The ***opposite of this proposition is also possible***. As some students who are pursuing medical courses are sincere students.



4. Particular Negative Proposition (O)

- Also known as **"Some S are not P"** propositions.
- These propositions deny something about at least one member of the subject class.
- **For example: Some men are not polite. This also tells us that some men are polite.**



COMMON PREMISES AND THEIR LOGICAL CONCLUSIONS:

Type of Syllogism	Major Premise	Minor Premise	Logical Conclusion
Universal Affirmative	All A are B	All B are C	All A are C
Universal Negative	No A is B	All B are C	Some C are not A
Particular Affirmative	Some A are B	All B are C	Some A are C
Particular Negative	Some A are not B	All B are C	Cannot determine a conclusion
Mixed Affirmative	All A are B	Some B are C	Some A are C
Mixed Negative	No A is B	Some B are C	Some C may not be A
Existential	Some A are B	Some B are not C	Cannot determine a conclusion

TYPES OF QUESTIONS:

There are five types of questions that are generally asked from this chapter in the exam:

TYPE 1: TWO PREMISE ARGUMENTS.

Two Premise Arguments represent the most fundamental form of syllogism problems. In these cases, we work with two given premises to derive a conclusion that logically aligns with the information presented in the premises.

QUESTIONS

Directions (Q1-Q3): Two statements are given in each of the following questions, followed by two conclusions numbered I and II. You have to take the given two statements to be true, even if they seem to be at variance from commonly known facts. Read the conclusions and then decide which of the given conclusions logically follows from the two disregarding known facts.

Q1. Statements:

Some registers are books.

All books are files

Conclusion:

I. Some registers are files

II. No file is register

(a) Only conclusion-I follows

(b) Only conclusion-II follows

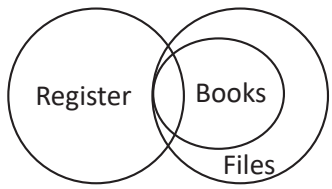
(c) Either conclusion-I or II follows

(d) Neither I nor II follows

Ans: (a)

Explanation:

According to the statements we can draw the following diagram,



Hence, some registers are files.

Q2. Statements:

All greens are vegetables

No vegetable is fruit.

Conclusion:

I. All fruits are vegetables.

II. Some fruits are vegetables.

(a) Only conclusion-I follows

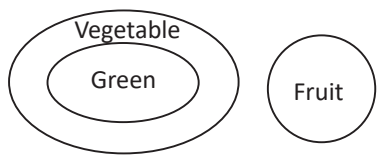
(b) Only conclusion-II follows

(c) Either conclusion-I or II follows

(d) Neither I nor II follows

Ans: (d)

Explanation:



Therefore, none of the given conclusions follow.

Q3. Statements:

All houses are bunglows

All bungalows are palaces.

Conclusion:

I. Some palaces are houses.

II. Some palaces are bunglows

(a) Only conclusion-I follows

(b) Only conclusion-II follows

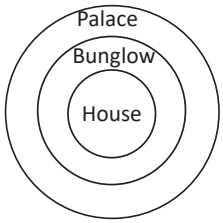
(c) Neither I nor II follows

(d) Both conclusion I and II follow

Ans: (d)

Explanation:

This is the case of the universal affirmative proposition. So,



Clearly, some palaces are houses as well as some palaces are bunglow. So, both conclusions follow.

TYPE 2 : MORE THAN TWO PREMISE ARGUMENTS

More Than Two Premise Arguments involve syllogisms with more than two statements. These questions are a bit more complex, as they lead to several conclusions. The key here is to carefully untangle the relationships between all the statements to find logical conclusions. This type requires more attention and logical thinking to solve.

QUESTIONS

Directions (Q4-Q5) Three statements are given in each of the following questions, followed by three conclusions numbered I, II and III. You have to take the given two statements to be true, even if they seem to be at variance from commonly known facts. Read the conclusions and then decide which of the given conclusions logically follows from the two disregarding known facts.

Q4. Statements:

Some eye drops are medicines.

All eye drops are liquids.

Some liquids are drinkable.

Conclusion:

I. Some eye drops are drinkable.

II. Some medicines are drinkable.

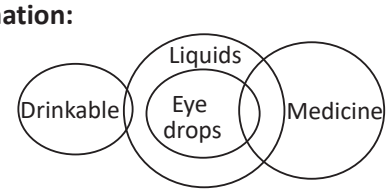
III. All liquids are eye drops

(a) I and II follow (b) II and III follow

(c) All follow (d) None follows

Ans: (d)

Explanation:



Therefore, none of the given conclusions follow.

Q5. Statements:

Lipstick is a cosmetic.

No cosmetics are liquid.

Some liquids are medicine

Conclusion:

I. Some liquids are cosmetics.

II. Some medicines are lipsticks.

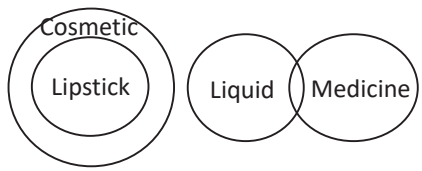
III. Some cosmetics are lipsticks.

(a) Only I follows (b) Only II follows

(c) Only III follows (d) None follows

Ans: (c)

Explanation:



Clearly, only some cosmetics are lipsticks.

Q6. Examine the following statements:

1. **Only those who have a pair of binoculars can become the members of birdwatcher's club.**
2. **Some members of the birdwatcher's club have cameras.**
3. **Those members who have cameras can take part in photo-contests.**

Which of the following conclusions can be drawn from the above statements? **(UPSC CSAT 2012)**

(a) All those who have a pair of binoculars are members of the birdwatcher's club.

(b) All members of the birdwatcher's club have a pair of binoculars.

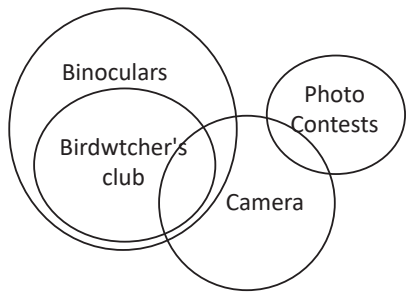
(c) All those who take part in photo-contests are members of the birdwatcher's club.

(d) No conclusion can be drawn.

Ans: (b)

Explanation:

The given statements can be represented using Venn diagram:



Now, using the Venn diagram we will see which of the conclusions follows,

CONCLUSION-I: All those who have a pair of binoculars are members of the birdwatcher's club.

This is not correct. Only some of those who have binoculars are members of the birdwatcher's club.

CONCLUSION-II: All members of the birdwatcher's club have a pair of binoculars.

This conclusion is correct.

CONCLUSION-III: All those who take part in photo-contests are members of the Birdwatcher's Club.

This is not correct. The members who take part in photo-contest may or may not be members of the birdwatcher's club.

Q7. Consider the following Statements and Conclusions:

Statements:

1. **Some rats are cats.**
2. **Some cats are dogs.**
3. **No dog is a cow.**

Conclusions:

I. **No cow is a cat.**

II. **No dog is a rat.**

III. **Some cats are rats.**

Which of the above conclusions is/are drawn from the statements? **(UPSC CSAT 2019)**

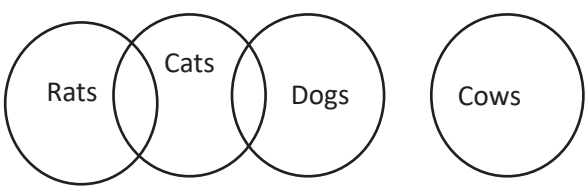
(a) I, II and III (b) Only I and II

(c) Only III (d) Only II and III

Ans: (c)

Explanation:

The given information can be depicted in Venn Diagram as:



Conclusion-I is false as there is no direct link given between Cow and Cat.

Conclusion-II is false as there is no direct link between Dog and Rat.

Conclusion-III is true.

Q8. Two Statements are given followed by two Conclusions:

Statements:

All cats are dogs.

All cats are black.

Conclusion-I: All dogs are black.

Conclusion-II: Some dogs are not black.

Which of the above Conclusions logically follows/ follow from the two given Statements, disregarding commonly known facts? **(UPSC CSAT 2020)**

(a) Only Conclusion-I

(b) Only Conclusion-II

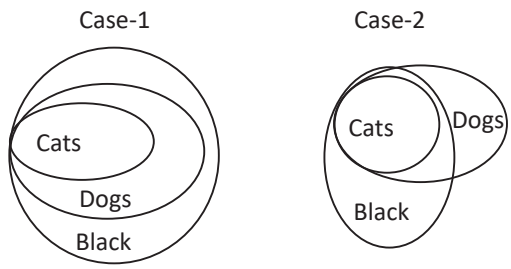
(c) Neither Conclusion-I nor Conclusion-II

(d) Both Conclusion-I and Conclusion-II

Ans: (c)

Explanation:

The given two statements can be presented in venn diagram as:



Considering the above two cases,

Neither Conclusion I nor Conclusion II follows.

Q9. A Statement followed by Conclusion-I and Conclusion-II is given below. You have to take the Statement to be true even if it seems to be at variance from the commonly known facts. Read all Conclusions and then decide which of the given Conclusion(s) logically follows/follow from the Statement, disregarding the commonly known facts.

Statement:

Some radios are mobiles. All mobiles are computers. Some computers are watches.

Conclusion-I: Certainly some radios are watches.

Conclusion-II: Certainly some mobiles are watches.

Which one of the following is correct?

(UPSC CSAT 2021)

(a) Only Conclusion-I

(b) Only Conclusion-II

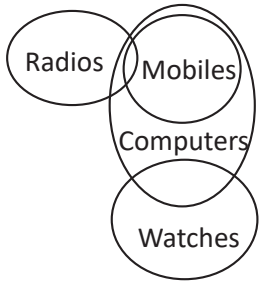
(c) Both Conclusion-I and Conclusion-II

(d) Neither Conclusion-I nor Conclusion-II

Ans: (d)

Explanation:

The given statements can be depicted in Venn Diagram as below:



From the above diagram we can say that **Neither Conclusion-I nor Conclusion-II follow.**

TYPE 3 : EVALUATE THE ACCURACY OF THE STATEMENTS

Checking Statement Accuracy involves identifying two statements out of four where both can't be true at the same time, but both could be false. You need to closely look at each statement and find the pair that fits this rule. This type tests your ability to spot contradictions and analyze logical connections between statements.

QUESTIONS

Direction: (Q.10-11): The following items consists of four statements of these four statements, two cannot both be true, but both can be false, Study the statements carefully and identify the two that satisfy the above condition, Select the correct answer using the codes given below each set of statements:

Q10. Examine the following statements

1. **All fan are van.**
2. **Some fan are not van.**
3. **Fan are not van.**
4. **Some fan are van.**

Which of the following two statements cannot both be true?

(a) 1 and 2 (b) 2 and 3

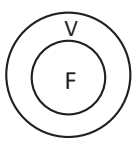
(c) 1 and 3 (d) 3 and 4

Ans: (c)

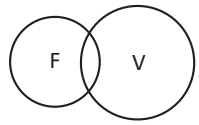
Explanation:

The statement can be understood as follows

1. All fans are van.

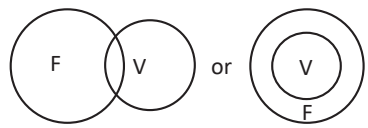


2. Some fan are not van or at least one of the fan is a van



3. Fan are not van.

4. Some fan are van.



So, from above four statements only Statements 1 and 3 cannot be true together.

Q11. Examine the following statements:

1. **All animals are carnivorous.**
2. **Some animals are not carnivorous.**
3. **Animals are not carnivorous.**
4. **Some animals are carnivorous.**

(UPSC CSAT –2011)

(a) 1 and 3 (b) 1 and 2

(c) 2 and 3 (d) 3 and 4

Ans: (a)

Explanation:

Check options one by one:

Option (a) is correct: statement-I: All animals are carnivorous

Statement-III: Animals are not carnivorous.

Now these statements cannot be true together because statement-I is negation of statement-III.

But both statements can be false because if some animals are carnivorous then both the statements are false.

TYPE 4: SELECTING STATEMENTS THAT ARE LOGICALLY CONNECTED

Choosing Logically Linked Statements involves picking out the correct statements from a group of statements. You'll be given different combinations to choose from, and your job is to identify the one where the last statement makes logical sense based on the initial two. This type tests your ability to recognize logical sequences and connections within a set of statements.

QUESTIONS

Q12. The following question contains six statements followed by four sets of combinations of three. Choose the set in which the third statement is a logical conclusion of the first two.

1. **Men are batsmen.**
2. **Boys are fielders.**
3. **Boys are not batsmen.**
4. **Some batsmen are bowlers.**
5. **Boys are not bowlers.**
6. **Some men are bowlers.**

(a) 123 (b) 143

(c) 231 (d) 164

Ans: (d)

Explanation:

Here, note that a given statement can be looked at as a premise as well as conclusion. In such questions, consider each answer option at a time and verify where the third statement given in the option logically follows from the first two. Based on the outcome, mark or eliminate the answer options. Taking each answer option at a time, observe that only in option (d) the third statement follows the first two. All men are batsmen and some men are bowlers. Hence, the men who are bowlers are also batsmen. So, there are some batsmen who are also bowlers

TYPE 5 : EVALUATING THE ACCURACY OF A SET OF STATEMENTS.

In these questions, you get a few sets of statements. Your job is to pick the set where the third statement makes sense based on the first two statements.

QUESTIONS

Q13. In this question, there are three sets of statements given. Select the set that is most logical i.e., the third statement can be concluded from the first two statements.

1. **All watermelons are green. All greens are healthy. All watermelons are healthy.**
2. **All men have a business. Mohan has a business. Mohan is a man.**
3. **All roses are fragrant. All flowers are fragrant. All flowers are roses.**

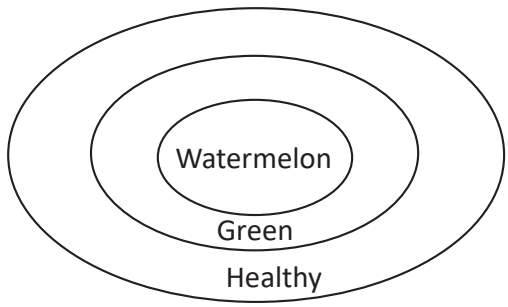
(a) Only 2 follows (b) 1 and 3 follow

(c) 1 and 2 follow (d) Only 1 follows

Ans: (d)

Explanation:

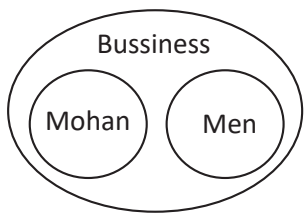
Consider Set-1



Thus, the set of watermelons is a subset of these to healthy objects.

Therefore, all watermelons are healthy.

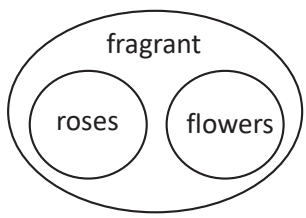
Consider Set-2



Mohan may or may be a part of the set of men.

Thus, the conclusion does not follow.

Consider Set-3



Using the same logic as for set 2,the set of flowers and roses may or may not overlap.

Thus only 1 follows.

PRACTICE QUESTIONS

1. Consider the following statements.

1. Some dogs are cat.
2. Some cats are cow.

Conclusion-I: Some cats are dog.

Conclusion-II: Some cows are cat.

Which of the following option is correct?

(a) Only Conclusion – I follows.
(b) Only Conclusion – II follows.
(c) Both Conclusion – I and Conclusion – II follows.
(d) Neither Conclusion – I nor Conclusion – II follows.

2. Consider the following statements.

1. All Augusts are September.
2. No September is October.
3. All Octobers are November.
4. Some Septembers are July.

Conclusion – I: All July can be August.

Conclusion – II: Some Novembers are July.

Which of the following option is correct?

(a) Only Conclusion – I follows.
(b) Only Conclusion – II follows.
(c) Both Conclusion – I and Conclusion – II follows.
(d) Neither Conclusion – I nor Conclusion – II follows.

3. Consider the following statements.

1. Some Rains are Sky.
2. All Roads are Plain.
3. Some Plain are Sky.

Conclusion – I: Some Rains are not Plain.

Conclusion – II: Some Sky can be Road.

Which of the following options is correct?

(a) Only Conclusion – I follows.
(b) Only Conclusion – II follows.
(c) Both Conclusion – I and Conclusion – II follows.
(d) Neither Conclusion – I nor Conclusion – II follows.

4. Consider the following statements.

1. All Cricket are Bat.
2. All Bat are Ball.
3. Some Pens are Bat.

Conclusion–I: Some Pen can be Cricket.

Conclusion–II: All Ball are definitely Cricket.

Which of the following options is correct?

(a) Only Conclusion – I follows.
(b) Only Conclusion – II follows.
(c) Both Conclusion – I and Conclusion – II follows.
(d) Neither Conclusion – I nor Conclusion – II follows.

5. Consider the following statements:

1. Some flowers are leaves.
2. No leaf is fruit.
3. Some fruits are stems.
4. Some stems are branches.

Conclusions:

I. Some flowers are branches.
II. All flowers are either branches or fruits.
III. All branches are either stems or fruits.

Select the correct option given below:

(a) Only I follows
(b) Only II and III follows
(c) Only III follows
(d) None of the conclusions follow.

6. Statements:

1. Some shirts are caps.
2. Some caps are umbrellas.
3. All umbrellas are jackets.
4. All jackets are raincoats.

Conclusions:

I. All umbrellas are shirts.
II. Some jackets are caps.
III. All umbrellas are raincoats.

Select the correct option given below:

(a) Only I and II follows
(b) Only II and III follows
(c) Only I and III follows
(d) None of them

7. Statements:

All Sun are Star.

No Earth is Sun.

No sky is Earth.

Conclusions:

I. All Sun can be Sky.
II. All Star being Earth is a possibility.

Select the correct option given below.

(a) Both I and II follows
(b) Either I or II follows
(c) Only II follows
(d) Only I follows

8. Statements:

All erasers are sharpeners.

All sharpeners are keys.

Some keys are blades.

Some blades are staplers.

Conclusions:

I. Some staplers are erasers

II. All erasers are keys.

III. Some staplers are keys.

Select the correct option given below:

(a) Only I follows

(b) Only I and II follows

(c) Only II follows

(d) All follow

9. Statements:

All mountains are high.

No mountain is valley.

All valleys are peak.

Only a few valleys are landscapes.

Conclusion:

I. Some landscape being a mountain is a possibility

II. No height is a peak.

III. At least some landscapes are peaks.

Select the correct option given below.

(a) Only I follows (b) Both I and III follows

(c) Only III follows (d) Both I and II follows

10. Statements:

Only a few novels are books.

All books are tables.

Only a few books are chairs.

All chairs are fans.

Conclusions:

I. Some chairs are definitely not novels.

II. All books are fans.

Select the correct option given below:

(a) Only I follow (b) Both I and II follow

(c) Only II follow (d) Neither I nor II follow

11. Statements:

Only a few student is class

No class is tree

Only a few trees are small.

Which of the following conclusion is true?

(a) Some class can never be student.

(b) Some small can never be tree

(c) All student can be tree

(d) All tree cannot be small.

12. Statements:

All circle is sphere.

No square is rectangle.

Only a few rectangle is circle

Conclusions:

I. No sphere is square.

II. Some square is sphere.

Select the correct option given below:

(a) Only conclusion-I follows

(b) Only conclusion-II follows

(c) Both conclusion-I and II follows.

(d) Either conclusion-I or II follows

13. Consider the following statements:

1. All pens are pencils.
2. No pencil is book.

Conclusion – I: No pen is book.

Conclusion – II: At least some pens are books.

Which of the following options is correct?

(a) Only Conclusion – I follows.

(b) Only Conclusion – II follows.

(c) Both Conclusion – I and Conclusion – II follows.

(d) Neither Conclusion – I nor Conclusion –II follows.

14. Consider the following statements.

1. Some Snakes are Lion.
2. All Lions are Wolf.
3. Some Rabbits are Wolf.

Conclusion – I: Some Snakes are Rabbit.

Conclusion – II: No Lion is Rabbit.

Which of the following options is correct?

(a) Only Conclusion – I follows.

(b) Only Conclusion – II follows.

(c) Both Conclusion – I and Conclusion – II follows.

(d) Neither Conclusion – I nor Conclusion –II follows.

15. Consider the following statements:

1. Some Movies are Marvel.
2. All Marvel are Bollywood.
3. No Avenger is Marvel.

Conclusion–I: All Movies are Bollywood is a possibility.

Conclusion – II: Some Avengers are not Movies.

Which of the following options is correct?

(a) Only Conclusion – I follows.

(b) Only Conclusion – II follows.

(c) Both Conclusion – I and Conclusion – II follows.

(d) Neither Conclusion – I nor Conclusion –II follows

Answers

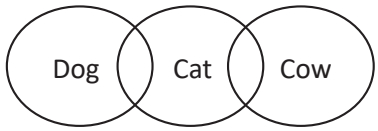
1. (*c*)	2. (*a*)	3. (*b*)	4. (*a*)	5. (*d*)	6. (*b*)	7. (*d*)	8. (*c*)	9. (*b*)	10. (*d*)
11. (*d*)	12. (*d*)	13. (*a*)	14. (*d*)	15. (*a*)					

Explanations

1. (c)

Explanation:

Using the given statements we can make the following Venn diagram.

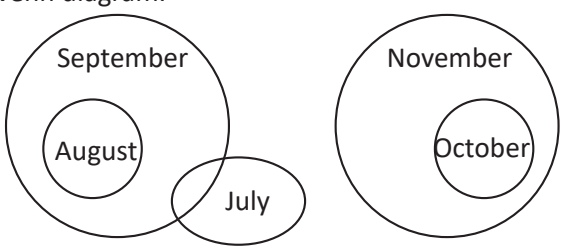


We can see that both the conclusion follows. Some cats are dog and some cows are cat.

2. (a)

Explanation:

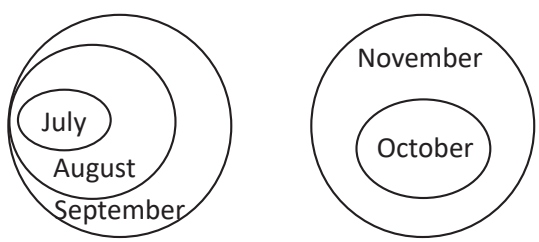
Using the given statements we can make the following Venn diagram.



We can clearly see from the Venn diagram that No November is July.

So conclusion – II is not correct.

There is a possibility that All July can be August.

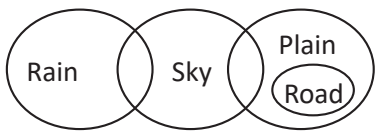


So, Conclusion – I is true.

3. (b)

Explanation:

Using the following statements we can make the following Venn diagram.



We can observe that Some Rain can be Plain.

So, Conclusion – I is not true.

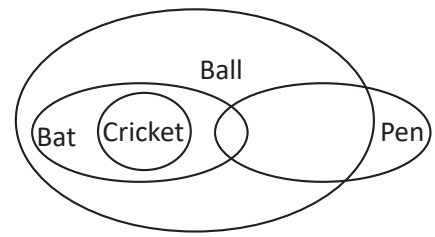
Also, some Sky can be Road.

So, Conclusion – II follows.

4. (a)

Explanation:

Using the following statements we can make the following Venn diagram.



It is a possibility that Some Pen can be Cricket.

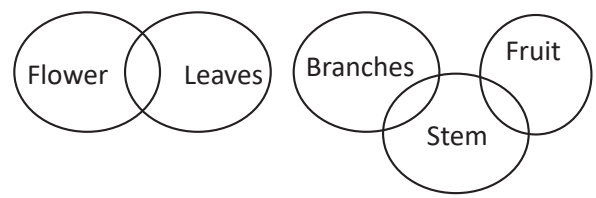
But All Ball are definitely Cricket is certainly not possible.

So, only Conclusion – I follows.

5. (d)

Explanation:

We can make the following Venn diagram using the given statements.



We can clearly interpret that,

Conclusion–I: Some flowers are branches.

This is incorrect.

Conclusion–II: All flowers are either branches or fruits.

This conclusion is also incorrect.

Conclusion–III: All branches are either stems or fruits.

Here, some branches are neither stems nor fruits. So,

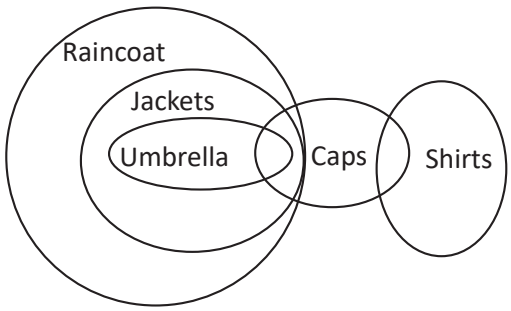
this conclusion is also incorrect.

So, none of the conclusions are valid.

6. (b)

Explanation:

We can make the following Venn diagram using the given statements.



Conclusion – I: All umbrellas are shirts.

There is a possibility that some umbrellas are not shirt. So, this conclusion is incorrect.

II. Some jackets are caps. It is certain that some jackets are caps.

So, this conclusion is correct.

III. All umbrellas are raincoats. It is also certain that all umbrellas are raincoats.

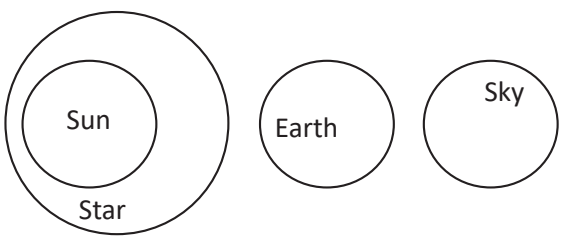
So, this Conclusion is also correct.

∴ Only Conclusion – II and III follows.

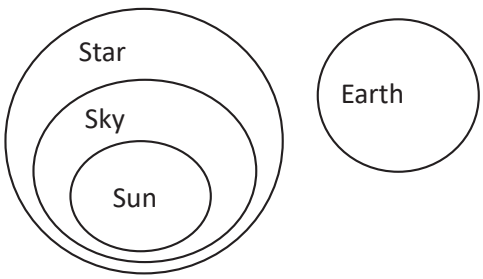
7. (d)

Explanation:

We can make the following Venn diagram using the given statements.



We have given no earth is Sun and no sky is earth. So all sun can be sky and the given statements hold.



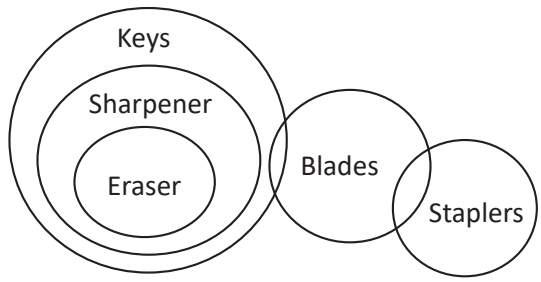
So, Conclusion – I is correct.

All star cannot be Earth because no earth is sun. So, Conclusion – II is incorrect.

8. (c)

Explanation:

We can make the following Venn diagram using the given statements.



I. Some staplers are erasers. There is a possibility that no stapler is eraser.

So, this conclusion is incorrect.

II. All erasers are keys. It is true that all erasers are keys.

So, this conclusion is correct.

III. Some staplers are keys. There is a possibility that no stapler is a key.

So, this conclusion is incorrect.

∴ Only conclusion – II follows.

9. (b)

Explanation:

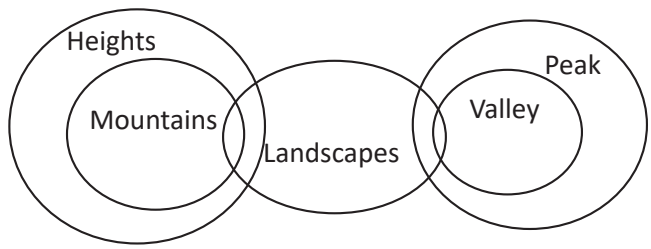
Using the given statements we can make the following Venn diagram.

I. Some landscape being a mountain is a possibility. This conclusion is correct.

II. No height is a peak. There is a possibility that some height is peak.

So, this conclusion is not correct.

III. At least some landscapes are peaks. This conclusion is definitely correct.



So, Conclusion – I and III follows.

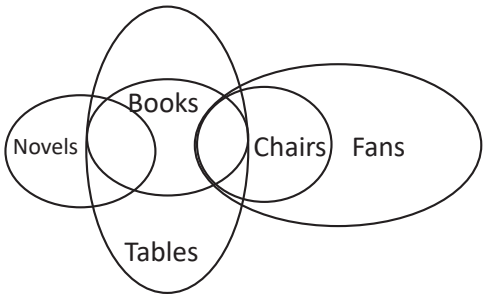
10. (d)

Explanation:

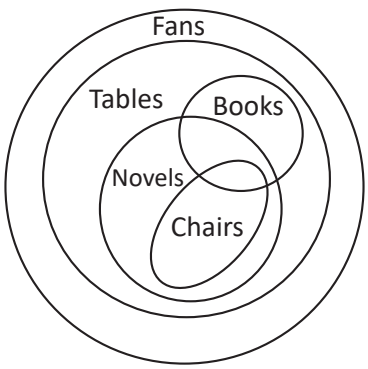
Using the given statements we can make the following Venn diagram.

Conclusion – II: All books are fans. This is definitely incorrect. Only some books can be fans.

Possibility 1:



Possibility 2:



Conclusion – I: Some chairs are definitely not novels.

We can see that there is possibility that all chairs are novels. So this Conclusion is not correct.

So, neither Conclusion – I nor II follows.

11. (d)

Explanation:

We can make the following Venn diagram using the given statements.

Option (a): Some class can never be student.

This is incorrect. Some class is always student.

Option (b): Some small can never be tree.

This is incorrect as some small is always tree.

Option (c): All student can be tree.

This is incorrect as some students can never be tree.

Option (d): All tree cannot be small.

This is correct as only a few tree is small.

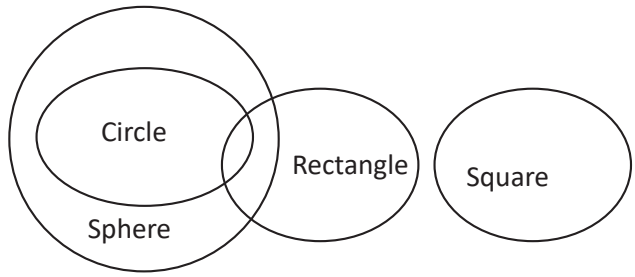
12. (d)

Explanation:

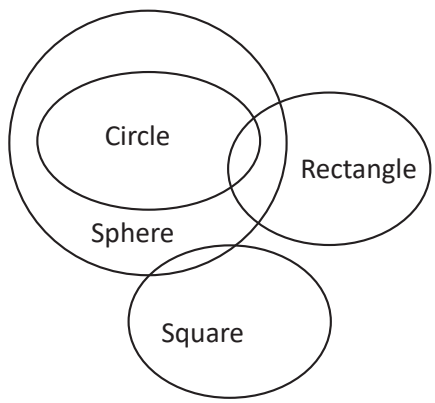
We can make the following Venn diagram

Possibility – 1: No sphere is square

Possibility 1:



Possibility 2:



Some square is sphere.

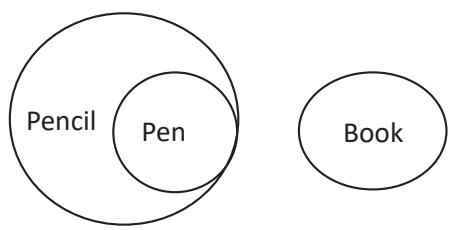
So, either Conclusion-I or II follows.

Hence, option (d) is correct.

13. (a)

Explanation:

Using the given statements, we can make the following Venn diagram:



We can clearly see that no pencil is book and no pen is book.

So, Conclusion-I follows.

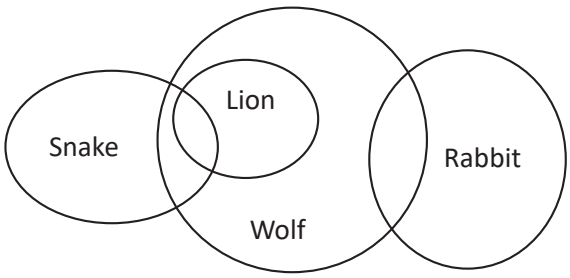
Conclusion-II doesn't follows.

Hence, option (a) is correct.

14. (d)

Explanation:

Using the given statements, we can make the following Venn diagram.



We can clearly see that there is a possibility that no snake is Rabbit.

So, Conclusion – I is not true.

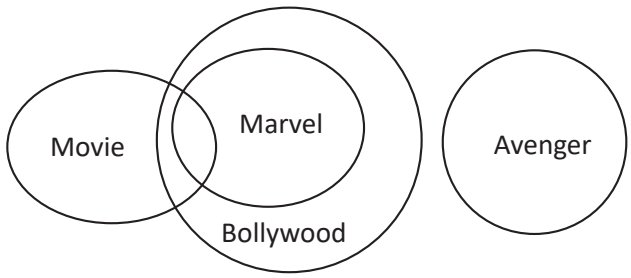
But there is a possibility that some Lion can be Rabbit.

So, Conclusion – II is also not true.

15. (a)

Explanation:

Using the following statements, we can make the following Venn diagram.



It is given that No Avenger is Marvel but there is a possibility that some Avenger can be Movie.

So, Conclusion – II is not true.

There is a possibility that All Movies are Bollywood.

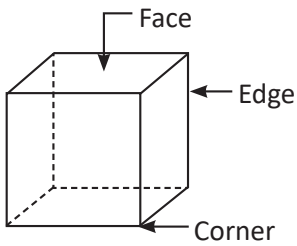
So, Conclusion – I is true.

Cubes & Dice

14

INTRODUCTION

A cube is a shape with six square sides, all the same size. It's like a box that's the same all around. We will learn about different questions on cubes and cuboids (which are like stretched cubes). We'll see how to cut them into smaller pieces, count these pieces, and learn about painting and then cutting a big cube or cuboid into smaller ones. This will help us understand how these shapes work in an easy and fun way.



CUBE

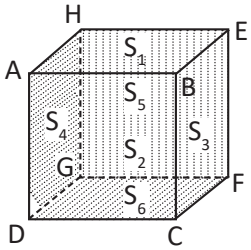
Cube is a 3-D shape having:

- 6 surface/faces
- 8 corners
- 12 edges

In a cube, Length = Breadth = Height (L = B = H)

SURFACE/FACES

The figure alongside consists of six faces denoted by ABCD, BCFE, ABEH, ADGH, EFGH, and CDGF. At any given moment, a maximum of three faces are visible.



Visible Faces: ABEH ⇒ S1, ABCD ⇒ S2, BCEF ⇒ S3

Invisible Faces: ADGH ⇒ S4, EFGH ⇒ S5, CDGF ⇒ S6

Face opposite to each other:

ABCD ⇒ Front Face ⇒ S2 and EFGH ⇒ Back Face ⇒ S5

ABEH ⇒ Upper Face ⇒ S1 and CDGF ⇒ Lower Face ⇒ S6

BCEF ⇒ Right Face ⇒ S3 and ADGH ⇒ Left Face ⇒ S4

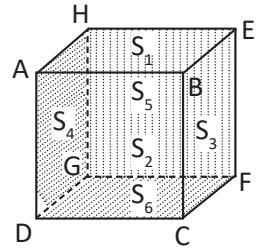
From The Provided Information, we can Conclude The Following

(i) Each face is adjacent to four other faces.

(ii) Two neighbouring faces intersect along a single edge and three faces adjacent to one another converge at a single vertex.

EDGES AND CORNERS

A cube consists of 12 edges and 8 corners. Maximum 9 edges and 7 corners are visible at a time and the rest edges and corners are not visible.



Visible Edge - AB, BC, CD, DA, AH, BE, CF, HE and EF

Visible Corner - A, B, C, D, E, F and H

Invisible Edge- GD, GH and GF

Invisible Corner- G

CUBOID

A cuboid is like a box and is a three-dimensional shape, similar to a cube. The main difference is that in a cuboid, the lengths of the sides can be different. When you look at a cuboid, you usually see three of its faces at a time.

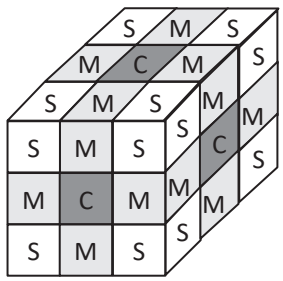
A cuboid has eight corners, but typically, you'll see only seven of these at once. It also has 12 edges, but at any moment, only nine of these edges are visible. The key thing about a cuboid is its sides which can have different lengths, widths, and heights, making it a versatile shape.

Several types of questions based on cubes are asked in exam. Based on their divergent nature, we have classified these into following types:

TYPE 1: CUTTING OF A CUBE OR CUBOID

Identification of smaller cubes when a larger cube is cut into smaller cubes

After cutting a cube, the following types of smaller cubes are obtained



Corner cubes = S (exist at each corner)

Middle cubes = M (exist at the middle of each edge)

Central cubes = C (exist at the middle of each face)

Nuclear cube/Inner central cube = N (hidden and exist at the centre of the larger cube)

Finding number of cubes when a larger cube is cut into smaller cubes

If a larger cube is cut into smaller cubes of equal volume so that **each edge is divided into n parts(n-1 cuts)**, then we can use the following formulas to find different types of smaller cubes.

Type of Smaller Cubes	Description	Formula	Explanation
Total Cubes	Total number of smaller cubes	n^3	n = edge of larger cube/edge of smaller cube
Inner/Nucleus cubes(N)	Cubes inside, not touching any outer face	$(n-2)^3$	These are completely inside, away from any face
Central cubes(C)	Cubes on the faces, but not on edges or corners	$6(n-2)^2$	Found on each face, excluding edges and corners
Middle cubes(M)	Cubes on the edges, not at corners	$12(n-2)$	Found in a line along the edges, excluding corners
Corner cubes(S)	Cubes at the corners of the cube	8	Always 8 corners in a cube

For example if a larger cube of 12 cm edge is cut into smaller cubes of equal volumes having each edge of 2 cm, then

n = Edge of larger cube/Edge of smaller cube

n = 12/2=6

Number of smaller cubes = $n^3 = 6^3 = 216$

Number of inner central/nucleus cubes = $(n-2)^3 = (6-2)^3 = 4^3 = 64$

Number of central cubes (C) = $6 \times (n-2)^2 = 6 \times (6-2)^2 = 6 \times 16 = 96$

Number of middle cubes (M) = $12\ (n-2) = 12 \times (6-2) = 12 \times 4 = 48$

Number of corner cubes (S) = 8

QUESTIONS

Q1. A cube has each side 6 cm. How many smaller cubes of each side 2 cm can be divided?

(a) 36 (b) 64

(c) 27 (d) 216

Ans: (c)

Explanation:

n = Edge of larger cube/Edge of smaller cube n = 6/2 = 3

Number of smaller cubes = $n^3 = 3^3 = 27$

Q2. A cube having 24 cm side is divided into 216 smaller cubes of equal volume. Find the side of smaller cubes?

(a) 5 cm (b) 6 cm

(c) 3 cm (d) 4 cm

Ans: (d)

Explanation:

Here, number of smaller cubes (n) = 216 $\Rightarrow \sqrt[3]{216} = 6$

n = Side of bigger cube/ Side of smaller cube

6 = 24/side of smaller cube

Side of smaller cube = 24/6 = 4 cm

Q3. If a cube of 12 cm side is divided into smaller cubes of 4 cm side, then

(i) find the total number of smaller cubes.

(a) 16 (b) 64

(c) 27 (d) 32

(ii) find the total number of corner cubes.

(a) 16 (b) 12

(c) 4 (d) 8

(iii) what is the total number of middle cubes?

(a) 16 (b) 12

(c) 32 (d) 4

(iv) what is the total number of central cubes?

(a) 6 **(b) 9**

(c) 20 **(d) 16**

(v) find the total number of inner central cubes?

(a) 18 **(b) 9**

(c) 1 **(d) 81**

Ans: (i): (c)

Explanation:

n = Side of bigger cube/Side of smaller cube

n =12/4 = 3

$n^3 = 3^3 = 27$

(ii): (d)

Explanation:

As total number of corner cubes is always 8

(iii): (b)

Explanation:

Number of middle cubes = 12(n – 2) = 12(3 – 2) = 12 x 1 = 12

(iv): (a)

Explanation:

Total number of central cubes = $6 \times (n-2)^2 = 6 \times (3-2)^2 = 6 \times 1^2 = 6$

(v): (c)

Explanation:

Total number of inner central cubes = $(n-2)^3 = (3-2)^3 = 1$

CUTTING OF A CUBOID

When a cuboid is cut into smaller cubes of equal volume, then

Total number of cubes = Volume of cuboid/Volume of smaller cube

$$\frac{\text{volume of cuboid}}{\text{volume of smaller cube}} = \frac{\text{length} \times \text{breadth} \times \text{height (cuboid)}}{(\text{side of smaller cube})^3}$$

For example In a cuboid, Length = 5 cm, Breadth = 3 cm, Height = 4 cm

Then, total number of smaller cubes each having 1 cm side = $(5 \times 3 \times 4) \div 1^3 = 60$

QUESTIONS

Q4. If a cuboid with length = 9 cm, breadth = 9 cm and height = 18 cm is cut into smaller cubes of edge 3 cm each, then find the number of smaller cubes.

(a) 60 (b) 80

(c) 54 (d) 96

Ans: (c)

Explanation:

Total number of cubes = $\frac{\text{Length} \times \text{Breadth} \times \text{Height}}{(\text{Side of smaller cube})^3}$

$= \frac{9 \times 9 \times 18}{(3)^3} = 54$

TYPE 2: A LARGER CUBE/CUBOID IS PAINTED AND CUT

In some cases, you might encounter questions about painted cubes or cuboids. In these questions, a larger cube or cuboid is painted with one, two, three, four, five, or a maximum of six different colours. This larger cube or cuboid is then cut into smaller cubes of the same or different dimensions, and you are asked to determine the number of smaller cubes with one or more surfaces painted with the same or different colours.

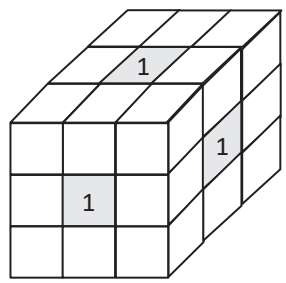
I. LARGER CUBE PAINTED WITH A SINGLE COLOUR

In this type of question, a larger cube is painted with a single colour, and then it is cut into smaller cubes. The following formulas will help you solve these problems.

Number of Painted Faces	Description of Cube's Position	Formula
0 (No painted faces)	Inside the cube, not touching any outer face	$(n-2)^3$
1 (One painted face)	On the faces, but not on the edges	$6 \times (n-2)^2$
2 (Two painted faces)	Along the edges, but not at the corners	$12 \times (n-2)$
3 (Three painted faces)	At the corners of the original cube	8 (constant, as a cube always has 8 corners)

SMALLER CUBES WITH ONE PAINTED FACE

If a cube is made up of n^3 smaller cubes, the formula to find the number of smaller cubes with one face painted on each surface layer of the cube is $(n-2)^2$.



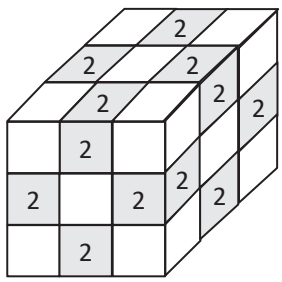
As a cube has 6 surfaces, therefore number of such smaller cubes = $6(n-2)^2$

For Example, Each side of a larger cube = 3 cm and each side of the smaller cube = 1 cm

Then, n = Side of larger cube/Side of smaller cubes= 3/1=3

Number of smaller cubes having one surface painted = $6(n-2)^2 = 6(3-2)^2 = 6$

SMALLER CUBES WITH TWO PAINTED FACES



A cube has 12 edges, the number of smaller cubes with 2 surfaces painted in a larger cube is $12(n-2)$.

For example, If a larger cube is cut twice and horizontally to make smaller cubes of equal dimensions. Then n = 3 and the number of smaller cubes with two painted faces is $12(3-2) = 12 \times 1 = 12$.

QUESTIONS

Q5. A solid cube of 3 cm side, painted on all its faces, is cut up into small cubes of 1 cm side. How many of the small cubes will have exactly two painted faces? **(UPSC CSAT 2018)**

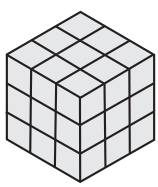
(a) 12 (b) 8

(c) 6 (d) 4

Ans: (a)

Explanation:

A solid cube of 3 cm side, painted on all its faces, is cut up into small cubes of 1 cm side.



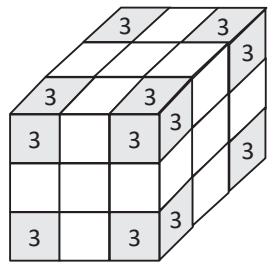
On the top layer, 4 (middle) cubes are there whose two faces are painted.

On the middle layer, 4 (corner) cubes are there whose two faces are painted.

On the bottom layer, 4 (middle) cubes are there whose two faces are painted.

So, there are 4 + 4 + 4 = 12 cubes which have exactly two faces painted.

SMALLER CUBES WITH THREE PAINTED SURFACES



Since a cube has 8 corners, the number of smaller cubes with 3 faces painted is always 8. In simpler terms, the number of smaller cubes with three surfaces painted is always 8

SMALLER CUBES WITH NO PAINTED SURFACES

Cubes with no painted surfaces, known as inner central or nucleus cubes, are not visible in the figure. To find the number of these inner cubes, **we use the formula $(n-2)^3$, where 'n' represents the number of smaller cubes along each side.**

For example, if n equals 3, then the number of smaller cubes with no surface painted is calculated as $(3-2)^3$, which simplifies to 1. So, when n is 3, there is only 1 inner central or nucleus cube with no painted surfaces.

QUESTIONS

Q6. All the surfaces of a cube of 16 cm side are painted with red color and then it is cut into smaller cubes of 4 cm side. Then,

(i) How many smaller cubes are there having only one surface painted with red color?

(a) 18 (b) 36

(c) 24 (d) 54

(ii) How many smaller cubes are there having two surfaces painted with red color?

(a) 8 (b) 24

(c) 36 (d) 54

(iii) How many smaller cubes are there having only three surfaces painted with red color?

(a) 8 (b) 24

(c) 36 (d) 54

(iv) How many smaller cubes are there having 4 or more faces painted with red color?

(a) 0 (b) 8

(c) 36 (d) 81

(v) How many smaller cubes are there having no surfaces painted with red color?

(a) 3 (b) 9

(c) 8 (d) 64

(vi) How many smaller cubes are obtained from larger cube?

(a) 5 (b) 25

(c) 125 (d) 64

Ans:

(i) (c)

Explanation:

n = Side of bigger cube/Side of smaller cube 16/4 = 4

Required number of smaller cubes = $6 \times (n-2)^2 = 6 \times (4-2)^2 = 6 \times 4 = 24$

(ii) (b)

Explanation:

Required number of cubes = 12×(4-2) = 12x2=24

(iii) (a)

Explanation:

As cubes with three faces painted are always 8.

(iv) (a)

Explanation:

The number of cubes with four or more faces painted is 0.

(v) (c)

Explanation:

Required number of cubes = $(n-2)^3 = (4-2)^3 = (2)^3 = 8$

(vi) (d)

Explanation:

Total number of smaller cubes $(n)^3 = (4)^3 = 64$

Q7. A solid cube is painted yellow, blue and black such that opposite faces are of the same color. The cube is then cut into 36 cubes of two different sizes such that 32 cubes are small and the other four cubes are big. None of the faces of the bigger cube is painted blue. How many cubes have only one face painted? **(UPSC CSAT – 2019)**

(a) 4 (b) 6

(c) 8 (d) 10

Ans: (c)

Explanation:

We have a solid cube painted yellow, blue and black such that opposite faces are of same color. Now, the cube is cut into 36 pieces with 32 small and 4 big cubes.

No face of the 4 big cubes painted with blue.

The given information is shown below:

Let the length of cube is 4 units. So, there are 32 cubes with 1 unit length and 4 cubes with 2 unit length with no face painted blue.

We have to find the number of cubes with only one face painted.The middle 4 cubes of unit length on the blue face have only one face painted. Similarly, on the opposite side also.

So, the total number of such cubes = 4 + 4 = 8

Q8. The outer surface of a 4 cm × 4 cm x 4 cm cube is painted completely in red. It is sliced parallel to the faces to yield sixty four 1 cm × 1 cm × 1 cm small cubes. How many small cubes do not have painted faces? **(UPSC CSAT – 2017)**

(a) 8 (b) 16

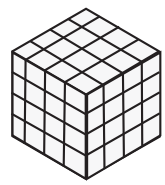
(c) 24 (d) 36

Ans: (a)

Explanation:

The dimensions of cube are 4 cm × 4 cm × 4 cm which is painted red

Now, it is sliced into 64 (1 cm × 1 cm × 1 cm) small cubes.



All the outer faces are painted red. Only the middle cubes of 2nd and 3rd row and 2nd and 3rd columns, have no face painted red.

These are, 4 + 4 = 8 cubes or

number of small cubes with no face painted

$= (n-2)^3 = (4-2)^3 = 8$

Q9. A piece of tin is in the form of a rectangle having length 12 cm and width 8 cm. This is used to construct a closed cube. The side of the cube is: **(UPSC CSAT – 2016)**

(a) 2 cm (b) 3 cm

(c) 4 cm (d) 6 cm

Ans: (c)

Explanation:

A piece of tin is in the form of a rectangle having length 12 cm and width 8 cm

Let the side of cube be X

The rectangle is used to construct a closed cube.

$\Rightarrow$ Surface area of cube = Area of rectangle

$\Rightarrow 6X^2 = 12 \times 8$

$\Rightarrow X^2 = 16$

$\Rightarrow X = 4$

So, the side of cube = 4 cm

Q10. A cube has all its faces painted with different colors. It is cut into smaller cubes of equal sizes such that the side of the small cube is one-fourth the big cube. The number of small cubes with only one of the sides painted is: (UPSC CSAT – 2016)

(a) 32 (b) 24

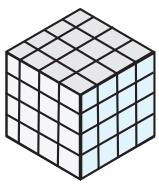
(c) 16 (d) 8

Ans: (b)

Explanation:

Let the cube be painted with yellow color on all the sides.It is cut into smaller cubes of equal sizes such that the side of the small cube is one-fourth the big cube.

So, there will be 64 small cubes. There are only 4 cubes (the middle ones) on each face who have only 1 side painted.



So, total number of cubes with only one side painted = 4 × 6 = 24

Q11. Each of the six different faces of a cube has been coated with a different color i.e., V, I, B, G, Y and O. Following information is given: (UPSC CSAT – 2015)

1. **Colors Y, O and B are on adjacent faces.**
2. **Colors I, G and Y are on adjacent faces.**
3. **Colors B, G and Y are on adjacent faces.**
4. **Colors O, V and B are on adjacent faces.**

Which is the color of the face opposite to the face colored with O?

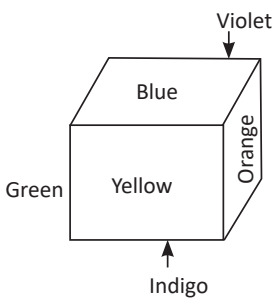
(a) B (b) V

(c) G (d) I

Ans: (c)

Explanation:

Given problem can be visualized through a picture as given below:



Hence, the color of the face opposite to orange is green.

II. WHEN A LARGER CUBE IS PAINTED WITH MORE THAN ONE COLOR

In this type, a larger cube is painted with more than one colour and then cuts are made to form smaller cubes.

I. Smaller cubes with one painted face

When you're asked to find the number of smaller cubes with one face painted in a specific colour, the first thing to do is figure out how many faces of the larger cube have that colour. Let's say the colour is labelled as 'X'. To find the number of smaller cubes with one painted face, you can use this formula:

Number of smaller cubes with one painted face = $(n-2)^2$ × Number of faces painted with colour 'X'.

Here, 'n' represents the number of cubes on one edge of the larger cube.

II. Smaller cubes with two painted faces

Such cubes are related to the edges. If a larger cube is painted with more than one colour, then such cubes are obtained as below.

(i) Smaller cubes having the same colour on both faces

When you're asked about cubes with two faces painted in a particular colour, you start by figuring out how many edges have two faces of the larger cube with that colour attached to them. Let's call this colour 'Y'. The formula to find the number of smaller cubes with both faces painted in colour 'Y' is:

Number of smaller cubes with both faces painted = (n – 2) × Number of edges with colour 'Y'.

Here, 'n' represents the number of cubes on one edge of the larger cube.

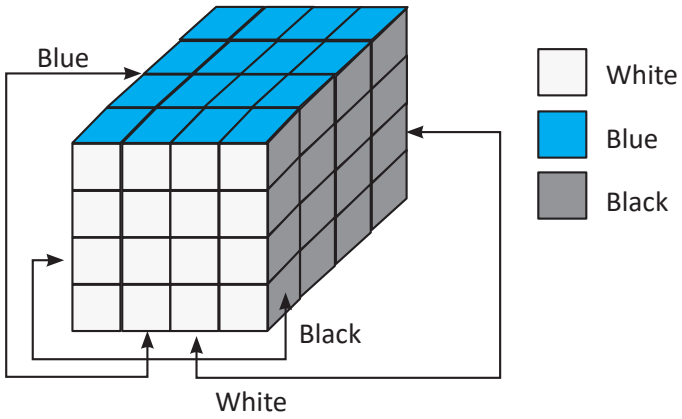
(ii) Smaller cubes having different colours on both faces

When you want to find the number of smaller cubes with two faces painted in one colour (let's call it 'P') on one side and another colour (let's call it 'Q') on the opposite side, you use the formula:

Number of smaller cubes with two faces painted in colours P and Q = (n-2) × Number of edges where both colours P and Q are attached.

DECODING THE COLOURED CUBES:

1. **A cube side of 4 cm is painted black on one pair of opposite surfaces, blue on another pair of opposite surfaces and white on the remaining pair of opposite surfaces. The cube is now divided into smaller cubes of equal side of 1 cm each**



(i) Number of smaller cubes with three surfaces painted = 8 (these smaller cubes will have all three surfaces painted with different colors - blue, black and white)

(ii) Number of smaller cubes with two surfaces painted = 24

(a) Number of cubes with two surfaces painted with black and blue colors = 8

(b) Number of cubes with two surfaces painted with blue and white colors = 8

(c) Number of cubes with two surfaces painted with black and white colors = 8

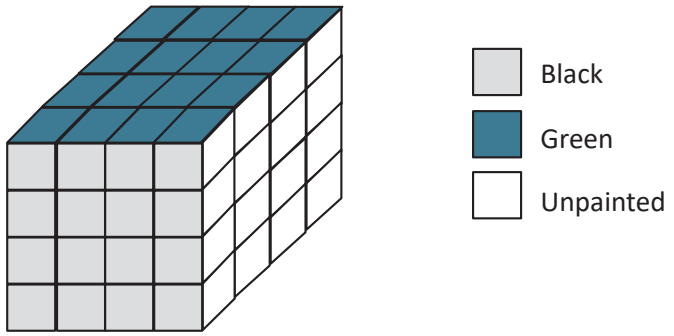
(iii) Number of smaller cubes with one surface painted = 24 and out of these.

(a) Number of cubes with one surface painted with black color = 8

(b) Number of cubes with one surface painted with blue color = 8

(c) Number of cubes with one surface painted with white color = 8

2. A cube side of 4 cm is painted black on one pair of opposite surfaces, green on another pair of opposite surfaces and one pair of opposite surfaces is left unpainted. Now, the cube is divided into 64 smaller cubes of side 1 cm each



(i) Number of smaller cubes with three surfaces painted = 0 (because each smaller cube at the corner is attached to a surface which is unpainted)

(ii) Number of smaller cubes with two surfaces painted

= Number of cubes present at the corners + Number of middle cubes present at 4 edges

$= 8 + (n - 2)x4$

$= 8 + 8 = 16$

(iii) Number of smaller cubes with one surface painted = Number of cubes present at the 8 edges + Number of cubes present at the four surfaces

$= (n - 2) \times 8 + (n - 2)^2 \times 4$

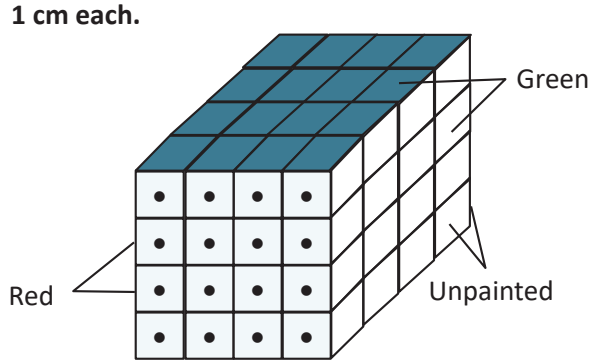
$= 2 \times 8 + 4 \times 4$

$= 16 + 16 = 32$

(iv) Number of smaller cubes with no side painted = Number of central cubes on the two unpainted surfaces + Number of cubes present inside the cube

$= (n - 2)^2 \times 2 + (n - 2)^3 = 4 \times 2 + (2)^3 \Rightarrow 8 + 8 = 16$

3. A cube of side 4 cm is painted red on one pair of adjacent surfaces, green on another pair of other adjacent surfaces and two adjacent surfaces are left unpainted. Now, the cube is divided into 64 smaller cubes of side 1 cm each.



(i) Number of smaller cubes with three surfaces painted = Number of smaller cubes at two corners = 2

(ii) Number of smaller cubes with two surfaces painted = Number of smaller cubes at four corners + Number of smaller middle cubes at 5 edges = $4 + (n - 2) \times 5 \Rightarrow 4 + 2 \times 5 = 4 + 10 = 14$

(iii) Number of smaller cubes with one surface painted = Number of smaller central cubes at four surfaces + Number of smaller middle cubes at 6 edges + Number of smaller cubes at two corners

$= (n - 2)^2 \times 4 + (n - 2) \times 6 + 2$

$= 4 \times 4 + 2 \times 6 + 2$

$= 16 + 12 + 2 = 30$

DICE

A dice is a three-dimensional figure with six faces, each displaying different numbers, letters, or colours. It has eight corners and twelve edges. In a dice, the length, breadth, and height are all equal to each other.

This section covers different types of questions:

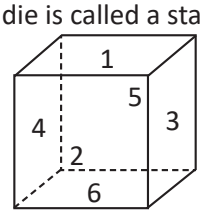
1. Finding the digits, dots, letters, or colours on the opposite face of a particular face.
2. Questions related to unfolded dice.

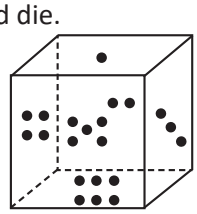
TYPES OF DICE

Dice having digits/dots from 1 to 6 on its surfaces can be divided into two types

1. **Standard Dice**

   When you roll a six-sided die and add up the number of dots on the opposite faces, if the total is 7, then that die is called a standard die.





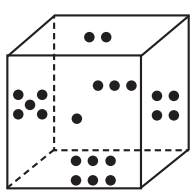
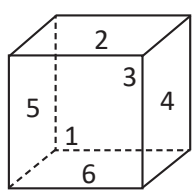
   Number Arrangement:

   - 1 is opposite to 6.
   - 2 is opposite to 5.
   - 3 is opposite to 4.

   The sum of the adjacent faces can vary from 3 to 11.

2. **General Dice**

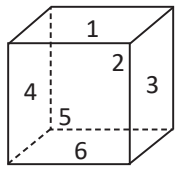
   General dice can have any arrangement of numbers and do not follow the specific sum rule of standard dice. **When the sum of digits/dots on opposite faces is not equal to 7, then the dice is called general dice.**

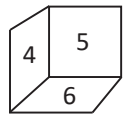



TYPES OF QUESTIONS

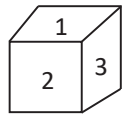
TYPE 1: FINDING DIGITS/DOTS/WORDS/ LETTERS/FIGURES/SYMBOLS ON OPPOSITE FACES OF A DICE

Basic Rule: Each face of a dice has an opposite face. In a standard dice, the sum of opposite faces is always 7.





Invisible Face



Visible Face

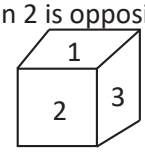
Standard Dice Opposites:

- 1 is opposite to 6.
- 2 is opposite to 5.
- 3 is opposite to 4.

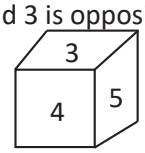
CASE 1: COMMON DIGIT ON DIFFERENT FACES

When the same number appears on different faces in two dice positions, rotate the dice from the common number in a clockwise direction.

For example: If 3 is the common digit, and rotating clockwise shows 1 and 2 on one dice and 4 and 5 on another, then 2 is opposite 5, and 3 is opposite 6.

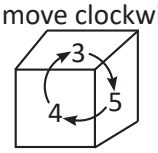


(i)

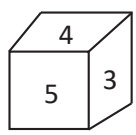


(ii)

When digits move clockwise.



(ii)

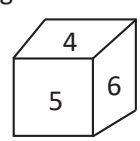


(iii)

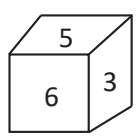
CASE 2: TWO COMMON DIGITS

When two numbers are common in two positions of the dice, the remaining uncommon numbers are opposite to each other.

For example: If 5 and 6 are common in two positions, and the remaining numbers are 3 and 4, then 3 is opposite to 4.



(i)



(ii)

QUESTIONS

Q12. The digit on the opposite face of the particular face having digit 4 in the dice given below?

(a) 2 (b) 1
(c) 3 (d) 6

Ans: (c)

Explanation:

Look at the dice. Add up the numbers on the faces next to each other:

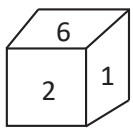
If you add 1 and 4, you get 5

If you add 1 and 5, you get 6

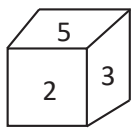
If you add 4 and 5, you get 9

Now, notice that none of these adds up to 7. In a standard dice, the total is always 7 when you add the numbers on opposite faces 4 + 3 = 7

Q13. What digit will be on the face opposite to face having digit 1 in the two positions of a single dice given dice?



(i)



(ii)

(a) 5 (b) 4

(c) 2 (d) 3

Ans: (d)

Explanation:

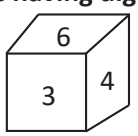
You have a dice with two positions, and in both positions, the common digit is 2. Now, look at the right face in each position:

In the I position, the right face has the digit 1

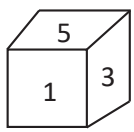
In the II position, the right face has the digit 3.

Since the common digit is 2 and the right faces have 1 and 3, it means 1 and 3 are on opposite faces.

Q14. In the following question, two positions of a single dice are given. Find the face which is opposite to the face having digit 6



(i)



(ii)

(a) 1 (b) 5

(c) 3 (d) 2

Ans: (a)

Explanation:

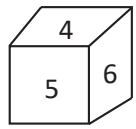
In this problem, common digit 3 is at different faces

Writing the digits of dice I,(clockwise)-3,6,4

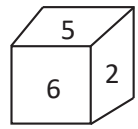
Writing the digits of dice II,(clockwise)-3,1,5

Clearly, 6 and 1 are opposite to each other

Q15. In the following question the two positions of a single dice are given. Find the digit on the face which is opposite to the face having digit 2.



(i)



(ii)

(a) 3 (b) 4

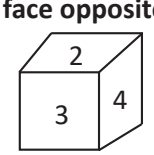
(c) 1 (d) 5

Ans: (b)

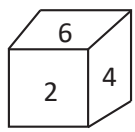
Explanation:

As in this case, 5 and 6 are common digits while 4 and 2 are uncommon. As the rule given in case IV, here uncommon digits will be opposite to each other. Hence, 4 will definitely be opposite to digit 2

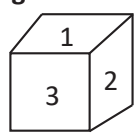
Q16. In the following question, three positions of the same dice are given. What will be the digit on the face opposite to the face having digit 1?



(i)



(ii)



(iii)

(a) 4 (b) 3

(c) 6 (d) 5

Ans: (a)

Explanation:

In the given question,

Taking dice I and III, 2 and 3 are common.

So, 4 will be opposite to 1.

TYPE 2: FINDING DIGITS/DOTS/ FIGURES/SYMBOLS ON A BLANK FACE

In these questions, one or more faces of the dice are left blank or hidden in the given images. Your task is to figure out what's on these blank faces.

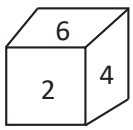
Strategies to Solve:

- **Use Known Faces to Eliminate Options:** If certain numbers or symbols are visible in the given views, you can rule them out as possibilities for the blank face.
- **Apply Dice Rules:** If it's a standard dice, use the rule that opposite faces sum to 7. For non-standard dice, use adjacent faces' information.
- **Look for Common Faces:** If a number or symbol appears on the same face in different views, it helps to establish a reference point.

❑ **Adjacent Faces Rule:** For any given face, there are four adjacent faces and one opposite face. If you can identify these adjacent faces from different views, you can narrow down the possibilities for the blank face.

QUESTIONS

Q17. Find the digit at the face opposite to the face having the digit 6 in the given dice.



(a) 1 (b) 3
(c) 5 (d) 1/3

Ans: (a)

Explanation:

According to the question, 6 + 2 = 8

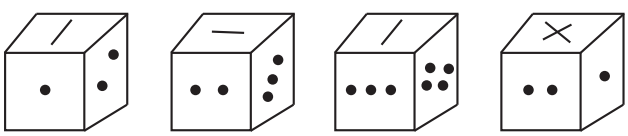
2 + 4 = 6

4 + 6 = 10

So, the given dice is a standard dice. (sum of opposite sides = 7)

Digit opposite to 6 = 1

Directions (Q25-Q27): Rotated positions of a single solid are shown below. The various faces of the solid are marked with different symbols like dots, cross and line. Answer the three questions that follow the given figures.



(i) (ii) (iii) (iv)

Q18. What is the symbol on the face opposite to that containing a single dot? **(UPSC CSAT – 2018)**

(a) Four dots (b) Three dots
(c) Two dots (d) Cross

Ans: (b)

Explanation:

From the above explanation, three dots face is opposite to single dot. Using figure (i) and (ii).

Q19. What is the symbol on the face opposite to that containing two dots? **(UPSC CSAT – 2018)**

(a) Single dot (b) Three dots
(c) Four dots (d) Line

Ans: (c)

Explanation:

From the above explanation, the four dots symbol face is opposite to two dots. Using figure (ii) and (iii).

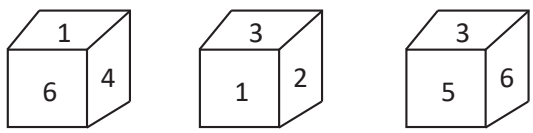
Q20. What is the symbol on the face opposite to that containing the cross? **(UPSC CSAT – 2018)**

(a) Single dot (b) Two dot
(c) Line (d) Four dots

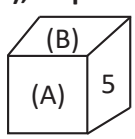
Ans: (c)

From the above explanation, the line symbol's face is opposite to the cross. Using figure (i) and (iv).

Q21. A cube has six numbers marked 1, 2, 3, 4, 5 and 6 on its faces. Three views of the cube are shown below: **(UPSC CSAT – 2013)**



What possible numbers can exist on the two faces marked (A) and (B), respectively on the cube?



(a) 2 and 3 (b) 6 and 1
(c) 1 and 4 (d) 3 and 1

Ans: (a)

Explanation:

Check the 1st 2 cubes: numbers which are adjacent to 1 are: 2, 3, 4 and 6

5 is not adjacent to 1 hence 5 will be opposite to 1.

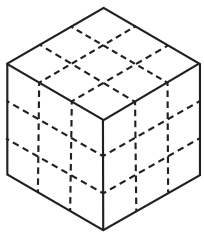
From this statement only we can eliminate all the options which contain 1.

Hence all options except option (a) are eliminated.

Hence, option (a) is the correct option.

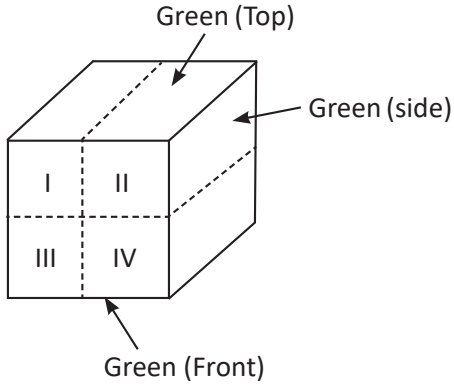
The following questions (1-3) are based on the information given below:

A cube is painted Red on all four adjoining sides and Green on two opposite sides i.e., top and bottom. It is then cut at equal distances at right angles four times vertically (top to bottom) and two times horizontally (along the sides) as shown in the figure where the dotted lines represent the cuts made. Study the diagram and answer the following questions:

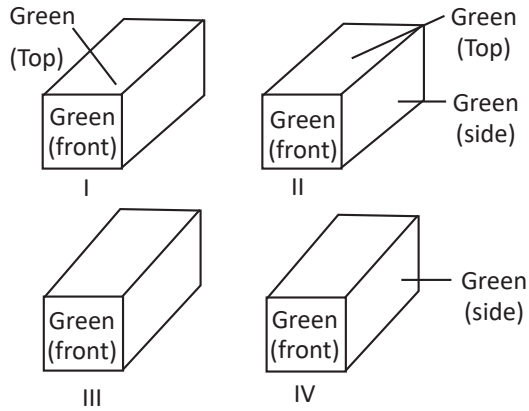


1. **How many cubes will have one face painted only in Red?**
   (a) 4 (b) 28
   (c) 36 (d) 14
2. **How many cubes will have one face painted only in Green?**
   (a) 2 (b) 18
   (c) 10 (d) 12
3. **How many cubes will have no face painted at all?**
   (a) 1 (b) 4
   (c) 6 (d) 12

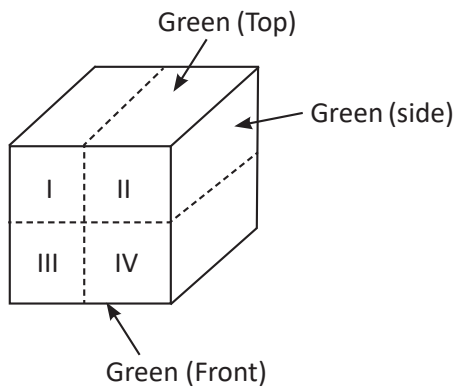
Directions (4-6): Three adjacent faces of a cube are colored Green. The cube is then cut (once horizontally and once vertically) to form four cuboids of equal size, each of these cuboids is colored red on all the un-colored faces and is then cut (as before) into four cuboids of equal size.



It is cut into 4 cuboids



Each of these cuboids is colored red on all the un-colored faces and is then cut (as before) into four cuboids of equal size.



4. **How many cuboids have two faces colored red?**
   (a) 4 (b) 6
   (c) 8 (d) 12
5. **How many cuboids have three faces colored red?**
   (a) 4 (b) 6
   (c) 9 (d) 12
6. **How many cuboids have three faces colored Green?**
   (a) 1 (b) 3
   (c) 5 (d) 7

The following questions (7-9) are based on the information given below:

A cuboid-shaped wooden block has 12 cm length, 8 cm breadth and 2 cm height.

Two faces measuring 8 cm × 2 cm are coloured in blue

Two faces measuring 12cm × 2 cm are coloured in red.

Two faces measuring 12 cm × 8 cm are coloured in black.

The block is divided into 6 equal cubes of side 2cm (from 12cm side), 4 equal cubes of side 2 cm (from 8 cm side)

7. How many cubes will have 4 coloured sides and two non-coloured sides?

(a) 4 (b) 8

(c) 12 (d) 14

8. How many cubes will have black colour on two sides and rest of the four sides having no colour?

(a) 4 (b) 8

(c) 12 (d) 14

9. How many cubes will remain if the cubes having both black and blue colour are removed?

(a) 8 (b) 12

(c) 16 (d) 14

The following questions(10-11) are based on the information given below:

A cube painted red on two adjacent faces and black on the faces opposite to the red faces and green on the remaining faces, is cut into sixty-four smaller cubes of equal size.

10. How many cubes are there which have no face painted?

(a) 8 (b) 12

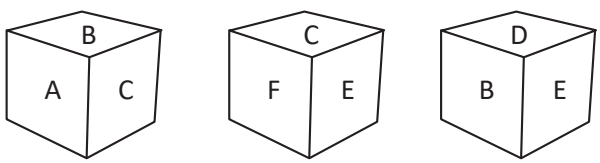
(c) 16 (d) 14

11. How many cubes have at most 2 faces painted?

(a) 24 (b) 36

(c) 48 (d) 56

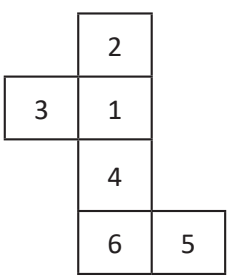
12. In the dice given below, which letter will be opposite to C?

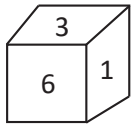


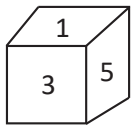
(a) E (b) F

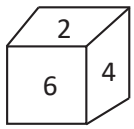
(c) A (d) D

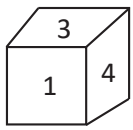
13. An explanatory figure of dice is given. Study the figure and identify the correct dice formed by that figure:



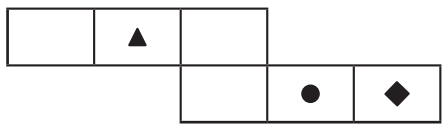
(a) 

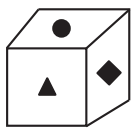
(b) 

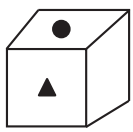
(c) 

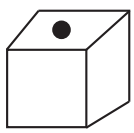
(d) 

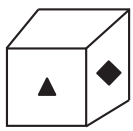
14. An explanatory figure of dice is given. Study the figure and identify the correct dice formed by that figure:



(1) 

(2) 

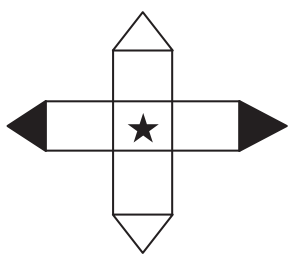
(4) 

(4) 

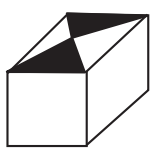
(a) 1 and 2 only (b) 2, 3 and 4 only

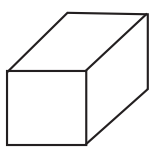
(c) 4 only (d) 3 and 4 only

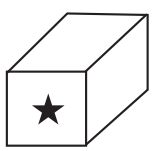
15. An explanatory figure of dice is given. Study the figure and identify the correct dice formed by that figure:



(1) 

(2) 

(3) 

(4) 

(a) 1 and 3 only (b) 2 and 4 only

(c) 2 and 3 only (d) 2,3 and 4 only

ANSWERS

1. (*a*)	2. (*a*)	3. (*a*)	4. (*b*)	5. (*c*)	6. (*a*)	7. (*a*)	8. (*b*)	9. (*c*)	10. (*a*)
11. (*d*)	12. (*d*)	13. (*d*)	14. (*d*)	15. (*b*)					

EXPLANATIONS

1. (a)

Explanation:

Since it's a cube of 3 × 3

On each face only a central or one cube will be of a single color

Since only 4 faces of the big cube are painted Red

The number of small cubes that have only red will be 4 (one from each face of the bigger cube)

2. (a)

Explanation:

Since it's a cube of 3 × 3

On each face, only central or one cube will be of a single color

Since only 2 faces of the big cube are painted Green

The number of small cubes that have only green will be 2 (one from each face of the bigger cube)

3. (a)

Explanation:

Number of cubes that will have no face painted at all will be $(n - 2)^3$

n= number of smaller cubes on each side

number of cubes with no paint at all will be $(3-2)^3 = 1$

4. (b)

Explanation:

In groups I and IV: 2 cuboids have 2 faces green, 2 faces red and 2 faces uncolored each. 2 cuboids have 1 face green, 3 faces red and 2 faces uncolored each.

In group II: 2 cuboids have 2 faces green, 2 faces red and 2 faces uncolored each.

1 cuboid has 3 faces green, 1 face red and 2 faces uncolored each.

1 cuboid has 1 face green, 3 faces red and 2 faces uncolored each.

In group III: All the four cuboids have 1 face green, 3 faces red and 2 faces uncolored each.

There are 2 cuboids in group I, 2 cuboids in group II and 2 cuboids in group IV having 2 faces red in each. Thus, there are 2 + 2 + 2 = 6 such cubes.

5. (c)

Explanation:

There are 2 cuboids in group I, 1 cuboid in group II, 4 cuboids in group III and 2 cuboids in set IV having 3 faces red each. Thus, there are 9 such cuboids.

6. (a)

Explanation:

There is only one cuboid having three faces blue. This cuboid lies in group II.

7. (a)

Explanation:

Only 4 cubes situated at the corners of the cuboid will have 4 coloured and 2 non-coloured sides.

8. (b)

Explanation:

There are 16 small cubes attached to the outer walls of the cuboid.

Therefore, the remaining inner small cubes will be the cubes having two sides black coloured.

So, the required number = 24 – 16 = 8

9. (c)

Explanation:

The number of small cubes which are Black and blue are 8 in all.

Hence, the number of remaining cubes is = 24 – 8 = 16

10. (a)

Explanation:

Number of cubes in each side (n) = $\sqrt[3]{64} = 4$

Number of cubes with no face painted = $(n - 2)^3 = (4 - 2)^3 = 8$

11. (d)

Explanation:

Number of cubes with zero face painted = $(n-2)^3$ = $(4-2)^3$ = 8

Number of cubes with only one face painted = 6 $(n-2)^2$ = 6 $(4-2)^2$ = 24

Number of cubes with 2 faces painted = 12(n – 2) = 12 * 2 = 24

Total = 8 + 24 + 24 = 56

Or

64 – cubes with 3 face painted = 64 – 8(one at each corner) = 56

12. (d)

Explanation:

When one face is common

Select the common side and go either in clockwise or anticlockwise direction:

In the first and second figure C is common

Going clockwise

C A B

C E F

Means A is opposite of E, and B is opposite of F

Thus, D will be opposite of C

13. (d)

Explanation:

When dice is cut open the alternate places will be opposite to each other

Here the opposites are

2 – 4, 1 – 6 and 3 – 5

In the first figure 1 – 6 are adjacent hence it is incorrect

In the second figure 3 – 5 are adjacent to each other hence it is incorrect

In the third figure 2 – 4 are adjacent to each other hence it is incorrect

14. (d)

Explanation:

When dice is cut open the alternate places will be opposite to each other

Here the opposites are

Empty – Empty

Diamond – Empty

Triangle – Circle

In Dice (1) and (2), triangles and circles are adjacent. Thus incorrect

Dice (3) and (4) can be possible answers.

15. (b)

Explanation:

The picture of dice cut open

When joined all the triangles will get together and form one side of a dice and that side will be opposite the side having Star

Non Verbal & Visual Reasoning

15

INTRODUCTION

Non-verbal and Visual Reasoning is about understanding and analysing pictures and diagrams. It doesn't need formulas, but it does require good attention and the ability to judge shapes and patterns. This kind of test is mainly about identifying patterns, similarities, and differences in a series of figures. It involves discerning patterns, sequences, and relationships within visual elements such as shapes, figures, and diagrams. Unlike traditional problem-solving, this area doesn't rely on textual or numerical data but instead uses pictorial representations.

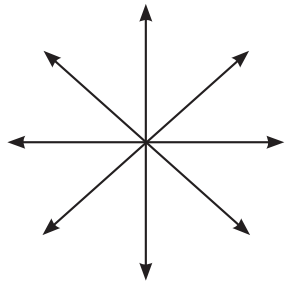
Topics Covered in this Chapter Include

- **Formation of Figures:** Assembling various parts to form a complete figure.
- **Embedded Figures:** Identifying hidden figures within a larger complex figure.
- **Counting of Figures:** Counting various shapes and figures embedded in complex diagrams.
- **Mirror Image:** Visualizing a mirror reflection of figures.
- **Water Image:** Understanding the water reflection of different shapes and figures.
- **Inserting Missing Characters:** Identifying the missing element in a sequence of symbols or figures.
- **Figure Matrix:** Understanding the relationship between figures in a matrix format.
- **Series:** Recognizing the pattern or sequence in a series of figures.
- **Analogy:** Finding a visual relationship between different sets of figures.
- **Classification:** Categorizing figures based on common characteristics.

SOME BASIC CONCEPTS OF NON-VERBAL REASONING

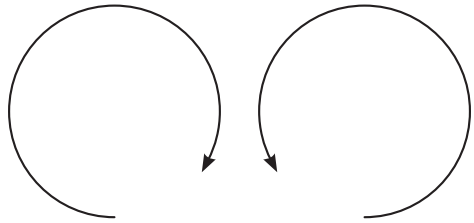
I. Directions

Understanding direction in non-verbal reasoning is crucial. It involves recognising the orientation of figures and their spatial relationships. In problems, directions such as North, South, East, West, and combinations like North-East or South-West often play a pivotal role. The ability to discern these directions and their implications is key to solving puzzles related to spatial arrangement and orientation.



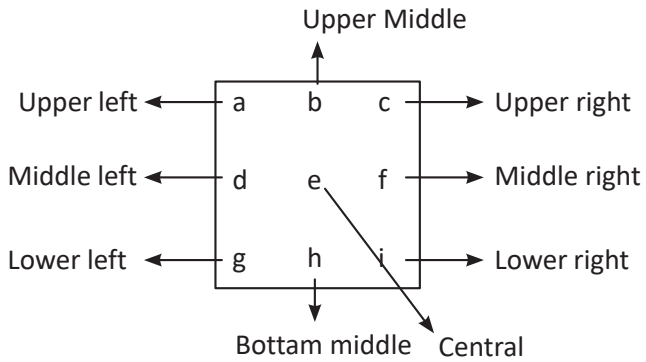
II. Rotational Directions

Rotational directions refer to the movement of figures either clockwise or anti-clockwise. This concept is vital in understanding how a figure changes orientation over a sequence. Recognising the degree of rotation (like 45°, 90°, or 180°) and the direction of rotation helps in predicting the next figure in a series or understanding the relationship between different figures.



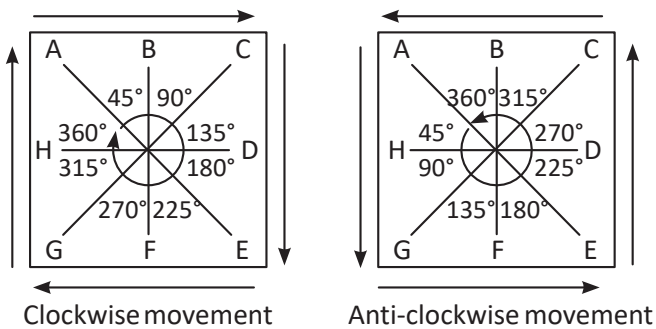
Clockwise Rotation Anti Clock Rotation

III. Position of Figures



The position of figures is about where a figure is located relative to others or within a given space. It includes understanding terms like 'top', 'bottom', 'left', 'right', 'center', or 'periphery'. Identifying these positions is important in tasks like finding the odd one out, completing sequences, or solving puzzles based on the arrangement of shapes.

IV. Directional Movement of Figures



This concept involves understanding how a design or part of a figure moves from one position to another. It includes recognizing patterns of movement, such as moving from the top left to the bottom right, or from the centre to the edge. These movements can be linear, circular, or in any geometric path, and identifying them correctly is crucial for solving series and pattern recognition problems.

VARIOUS TYPES OF NON-VERBAL REASONING QUESTIONS

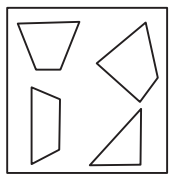
TYPE 1: FORMATION OF FIGURES

Formation of figures requires assembling various parts to form a complete figure. You'll be given different segments or parts of a figure and asked to visualize how they come together. This assesses your spatial awareness and ability to piece together fragmented information.

QUESTIONS

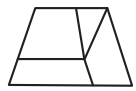
Direction (Q1-Q3): In each of the following questions, find the figure from the figures given in the options, that can be formed by joining the pieces given in the question figure.

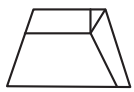
Q1. Question Image



Answers image:

(a) 

(b) 

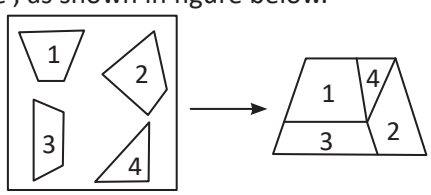
(c) 

(d) 

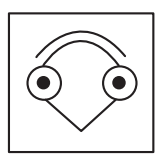
Ans: (b)

Explanation:

The figure shown in option (b) can be made by putting together the parts given in the question figure , as shown in figure below.



Q2. Question Image



Answers image:

(a) 

(b) 

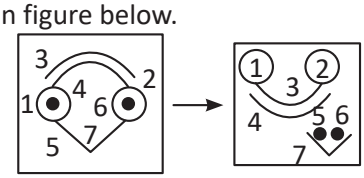
(c) 

(d) 

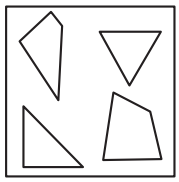
Ans: (c)

Explanation:

The figure shown in option (c) can be made by putting together the parts given in the question figure , as shown in figure below.

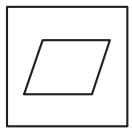


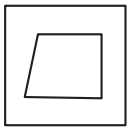
Q3. Question Image

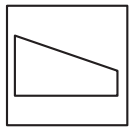


Answers image:

(a) 

(b) 

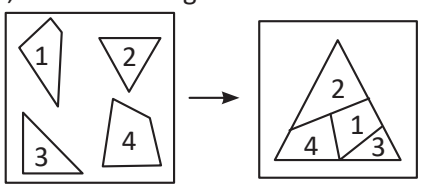
(c) 

(d) 

Ans: (a)

Explanation:

The figure shown in option (a) can be made by putting together the parts given in the question figure , as shown in figure below.



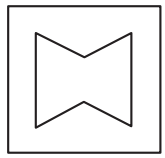
TYPE 2: EMBEDDED FIGURES

In these tasks, you're required to identify figures hidden within a larger, more complex figure. It challenges your attention to detail and ability to distinguish a specific figure from a distracting background. To solve these puzzles, you need to visualize the hidden figure and identify the option figure that contains it. These puzzles require good visual skills and practice to quickly recognize patterns.

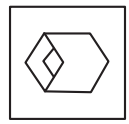
QUESTIONS

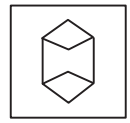
Direction(Q4 - Q6): In these questions a figure is given in question and a set of four figures is given in answers, find out the answer figure in which the question figure is embedded.

Q4. Question Image

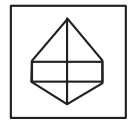


Answer Image

(a) 

(b) 

(c) 

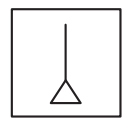
(d) 

Ans: (b)

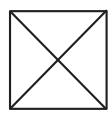
Explanation:

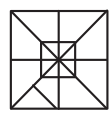
The figure in the question is clearly a part of the figure given as the answer in (b)

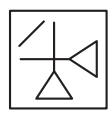
Q5. Question Image



Answer Image

(a) 

(b) 

(c) 

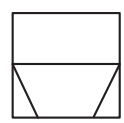
(d) 

Ans: (c)

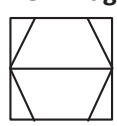
Explanation:

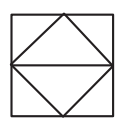
The figure in the question is clearly a part of the figure given as the answer in (c)

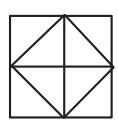
Q6. Question Image

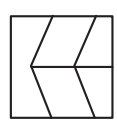


Answer Image

(a) 

(b) 

(c) 

(d) 

Ans: (a)

Explanation:

The figure in the question is clearly a part of the figure given as the answer in (a)

TYPE 3: COUNTING THE NUMBER OF FIGURES

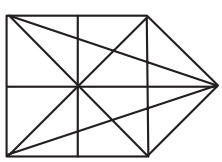
Counting the number of figures in non-verbal reasoning involves identifying and counting various shapes and figures within a complex diagram. These diagrams often consist of overlapping geometric shapes like triangles, squares, rectangles, circles, and other polygons. The challenge lies in accurately identifying and counting each instance of the specified figure without missing any or counting any twice.

SPECIFIC STRATEGIES FOR SOLVING COUNTING PROBLEMS

- **Label Key Points:** Start by naming the vertices or intersections in the figure. Labeling helps in systematically identifying and counting simpler shapes within the complex figure.
- **Segment the Figure:** Divide the complex figure into smaller, manageable sections or grids. This helps in isolating and focusing on one part at a time, making the counting process more manageable.
- **Count Basic Shapes First:** Identify and count the most basic shapes (like triangles or squares) before moving to more complex shapes. This provides a foundation for identifying shapes that are formed by combining these basic elements.
- **Utilize Symmetry and Repetition:** Look for symmetrical parts or repetitive patterns in the figure. Counting in one segment and multiplying by the number of symmetrical or repetitive segments can simplify the process.
- **Keep Track of Overlapping Areas:** Pay special attention to the areas where figures overlap, as these are the most common places to miss or double-count figures. Ensure each distinct figure in these areas is counted only once.

QUESTIONS

Q7. How many straight lines can be found in the given figure?

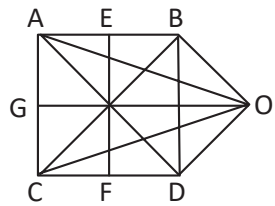


(a) 10 (b) 12

(c) 13 (d) 17

Ans: (b)

Explanation:



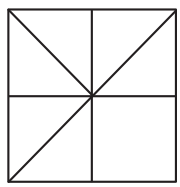
There are three horizontal lines : AB, GO, CD

There are three vertical lines : AC, EF, BD

There are six slant lines : BO, DO, AO, CO, AD, BC

Total 12 lines.

Q8. How many triangles can be counted in the provided figure?

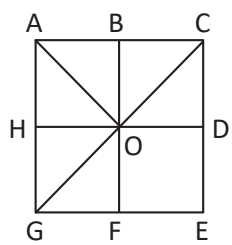


(a) 8 (b) 12

(c) 10 (d) 11

Ans: (c)

Explanation:



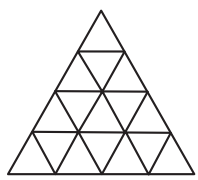
There are 6 small triangles: COB, DOC, GOF, GOH ,AOH, BOA.

Triangle formed with help of two small triangles: GOA, COA

Largest Triangle: CAG, ECG

Total triangle: 10

Q9. Count the triangles in the pattern

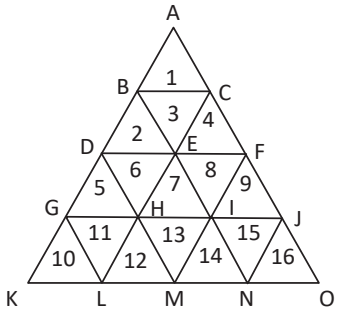


(a) 23 (b) 26

(c) 28 (d) 27

Ans: (d)

Explanation:



Total number of triangles in this figure is 27.

Small triangle 16 as shown in figure.

One big triangle.

Triangle with base parallel with side AO - KNB, KMD = 2.

Triangle with base parallel with side AK - OCL, OFM = 2.

Triangle with base parallel with side OK - AGJ, ADF = 2.

Triangle in middle of figure - FDM, IBG, HCJ, LNE = 4

Total 16 + 1 + 2 + 2 + 2 + 4 = 27

TYPE 4: MIRROR IMAGE

This concept involves visualizing a mirror reflection of figures. It's about understanding how a figure would look when reflected in a mirror, often involving lateral inversion (left becomes right and vice versa). This tests your spatial understanding and ability to mentally flip images.

Mirror Image of Capital Letters

Letters	Mirror Images	Letters	Mirror Images	Letters	Mirror Images
A	A	J	ꞁ	S	Ƨ
B	ᗺ	K	ꓘ	T	T
C	Ↄ	L	⅃	U	U
D	ᗡ	M	M	V	V
E	Ǝ	N	И	W	W
F	Ⅎ	O	O	X	X
G	⅁	P	ꟼ	Y	Y
H	H	Q	Ọ	Z	Z
I	I	R	Я		

The letters which have the same mirror image are - A,H,I,M,O,T,U,V,W,X, and Y.

MIRROR IMAGE OF SMALL LETTERS

Letters	Mirror Images	Letters	Mirror Images	Letters	Mirror Images
a	ɒ	j	ɾ	s	ƨ
b	d	k	ʞ	t	ɟ
c	ɔ	l	l	u	ᴎ
d	b	m	ɯ	v	v
e	ɘ	n	ᴎ	w	w
f	ɟ	o	o	x	x
g	ϱ	p	q	y	ʏ
h	ɥ	q	p	z	ƨ
i	i	r	ɹ	–	–

The letters which have the same mirror image are - i,l,o,v,w and x.

MIRROR IMAGE OF NUMBERS

Number	Mirror Images	Number	Mirror Images	Number	Mirror Images
1	⅃	4	↊	7	٧
2	Ƨ	5	ƨ	8	8
3	Ɛ	6	ə	9	ϱ

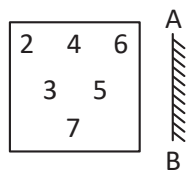
The number which has the same mirror image is – 8.

QUESTIONS

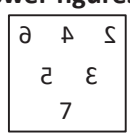
Direction (Q10 – Q12): In the below questions find out the mirror image of the Question image from the options images.

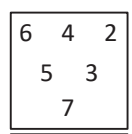
Here AB represents mirror

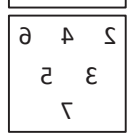
Q10. Question figure:

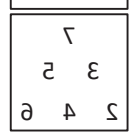


Answer figures:

(a) 

(b) 

(c) 

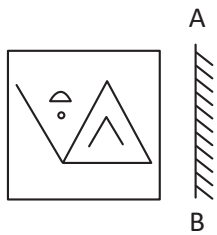
(d) 

Ans: (c)

Explanation:

Mirror image of the above figure is given in option (c).

Q11. Question figure:



Answer figures:

(a) 

(b) 

(c) 

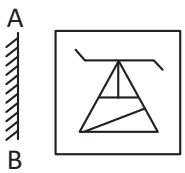
(d) 

Ans: (a)

Explanation:

Mirror image of the above figure is given in option (a).

Q12. Question figure:



Answer figures:

(a) 

(b) 

(c) 

(d) 

Ans: (c)

Explanation:

Mirror image of the above figure is given in option (c).

TYPE 5: WATER IMAGE

Similar to mirror images, water images involve visualizing the reflection of figures in water. This generally means flipping the figure vertically (top becomes bottom and vice versa). It challenges your ability to invert figures mentally along a horizontal axis.

- In water image,left and right side of the figure always remains constant.
- Upper and lower portion of the figure gets interchanged. This is called vertical inversion.

WATER IMAGE OF CAPITAL LETTERS

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
∀	B	C	D	E	Ⅎ	⅁	H	I	ſ	K	⅂	M	N	O	Ԁ	Ό	Я	Ƨ	⊥	∩	Λ	M	X	⅄	Z

The letters which have same water image are - **C, D, E, H, I, K, O and X.**

WATER IMAGE OF SMALL LETTERS

a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z
ɐ	q	ɔ	p	ǝ	ɟ	ƃ	ɥ	!	ſ	ʞ	l	ɯ	u	o	d	b	ɹ	s	ʇ	n	ʌ	ʍ	x	ʎ	z

The letters which have same water image are- **c, l, o and x.**

WATER IMAGE OF NUMBERS

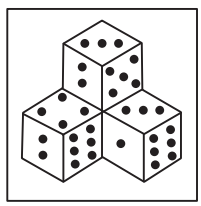
Numbers	0	1	2	3	4	5	6	7	8	9
Water Images	0	⇂	Ƨ	3	ↄ	Ƨ	9	ㄥ	8	ə

Numbers **0,3 and 8** have the same water image.

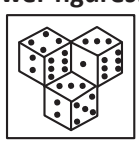
QUESTIONS

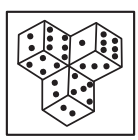
Direction(Q13-Q15): In the below questions find out the water image of the Question image from the options images.

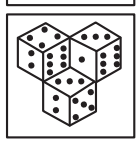
Q13. Question figure:

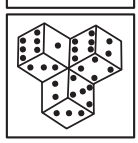


Answer figures:

(a) 

(b) 

(c) 

(d) 

Ans: (b)

Explanation:

Option (b) shows the right way the picture would look if it were reflected in water.

Q14. Question figure:

Answer figures:

(a) 

(b) 

(c) 

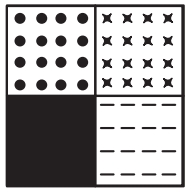
(d) 

Ans: (d)

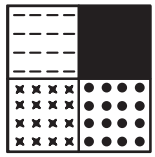
Explanation:

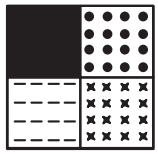
Option (d) shows the right way the picture would look if it were reflected in water.

Q15. Question figure:



Answer figures:

(a) 

(b) 

(c) 

(d) 

Ans: (d)

Explanation:

Option (d) shows the right way the picture would look if it were reflected in water.

TYPE 6: INSERT MISSING CHARACTER

This involves identifying the missing element in a sequence of symbols or figures. By analyzing the pattern or rule governing the sequence, you can predict the missing symbol or figure. This tests your ability to understand sequences and relationships between different elements. These pictures could be circles, triangles, matrices or any new shaped figures having character at empty places. Different types of questions that can be asked in this section are given below:

- **Number Puzzles**: These puzzles present a series of numbers arranged following a specific logic. The task is to decipher this logic, which could involve arithmetic operations like addition, subtraction, multiplication, or division, as well as more complex mathematical actions like squaring or cubing. Recognizing the pattern allows you to find the missing number in the sequence.
- **Letter Puzzles:** Similar to number puzzles, letter puzzles involve sequences of letters from the English alphabet arranged according to a certain rule. Here, the key is to understand the positional values of the letters and how they are manipulated - through addition, subtraction, or other mathematical operations - to form a pattern. Identifying this rule helps in determining the missing letter in the sequence.

QUESTIONS

Q16. What number will replace the question mark?

84			81			88		
14	12		18	9		?	11	

(a) 7 (b) 24

(c) 21 (d) 16

Ans: (d)

Explanation:

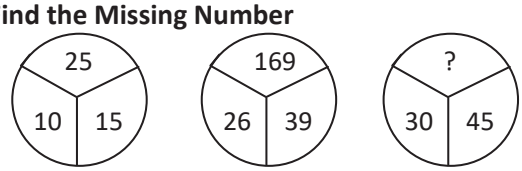
The arrangement is like this

$84 \div 12 = 7$; $7 \times 2 = 14$

$81 \div 9 = 9$; $9 \times 2 = 18$

Similarly, $88 + 11 = 8$ and $8 \times 2 = 16$

Q17. Find the Missing Number



(a) 75 (b) 215

(c) 125 (d) 225

Ans: (d)

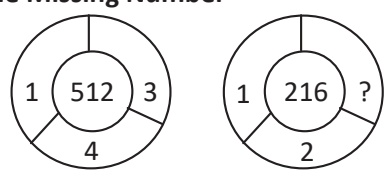
Explanation:

1st figure: $5\ \ 2 = 10$; $5 \times 3 = 15$, and $5^2 = 25$

2nd Figure: $13 \times 2 = 26$; $13 \times 3 = 39$ and $13^2 = 169$

Similarly, in 3rd figure: $15 \times 2 = 30$; $15 \times 3 = 45$ and $15^2 = 225$

Q18. Find the Missing Number



(a) 3 (b) 4

(c) 5 (d) 6

Ans: (a)

Explanation:

Let the unknown number be X

$1 + 3 + 4 = 8$ and $8^3 = 512$

Similarly, $6^3 = 216$

So, $1 + 2 + X = 6$

$X = 3$

Q19. find out the missing term.

B	G	N
D	J	R
G	N	?

(a) U (b) V

(c) Z (d) W

Ans: (d)

Explanation:

$$\overset{2}{B} + 5 = \overset{7}{G} + 7 = \overset{14}{N}$$

$$\overset{4}{D} + 6 = \overset{10}{J} + 8 = \overset{18}{R}$$

$$\overset{7}{G} + 7 = \overset{14}{N} + 9 = \overset{23}{W}$$

Q20. Find out the missing term.

R	Q	L
S	P	M
T	?	N

(a) O (b) R

(c) V (d) W

Ans: (a)

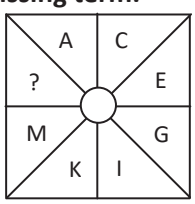
Explanation:

$$\overset{18}{R} + 1 = \overset{19}{S} + 1 = \overset{20}{T}$$

$$\overset{17}{Q} - 1 = \overset{16}{P} - 1 = \overset{15}{O}$$

$$\overset{12}{L} + 1 = \overset{13}{M} + 1 = \overset{14}{N}$$

Q21. Find out the missing term.



(a) B (b) W

(c) O (d) V

Ans: (c)

Explanation:

Start from the letter A and go around in a circle to the right. Add 2 to each letter to find the next one.

A + 2 = C

C + 2 = E

F + 2 = G

G + 2 = I

I + 2 = K

K + 2 = M

M + 2 = O

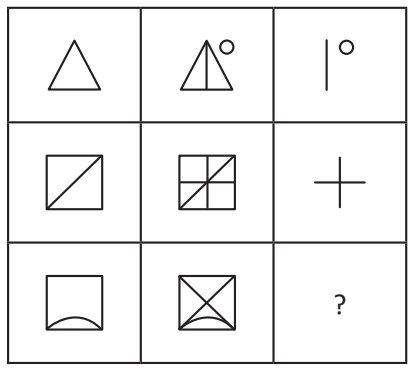
TYPE 7: FIGURE MATRIX

A figure matrix presents a grid of figures where each row and column follows a certain rule or pattern. Your task is to understand this underlying rule and determine the missing figure in the matrix. This challenges your ability to recognize relationships and patterns in a two-dimensional layout.

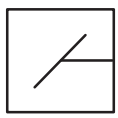
QUESTIONS

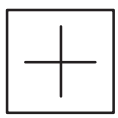
Direction (Q22-Q24): in each of the following questions, find out the answer figure which completes the problem figure matrix

Q22. Question Figure



Answer Figure

(a) 

(b) 

(c) 

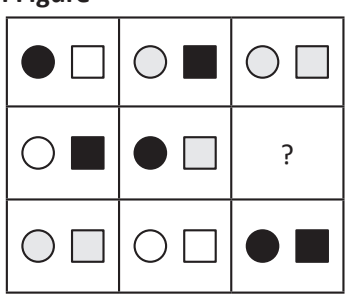
(d) 

Ans: (c)

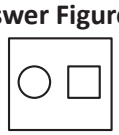
Explanation:

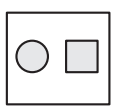
The third picture in every row has pieces that are different from the ones in the first two pictures.

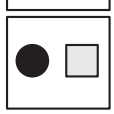
Q23. Question Figure

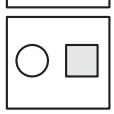


Answer Figure

(a) 

(b) 

(c) 

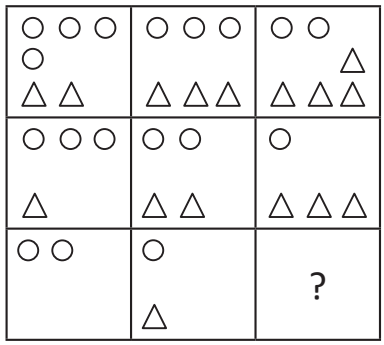
(d) 

Ans: (a)

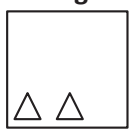
Explanation:

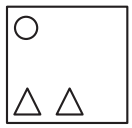
In each column, there are three pictures, each having one circle and one square. These figures are arranged so that each column displays three different patterns for both the circle and square.

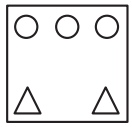
Q24. Question Figure

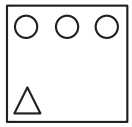


Answer Figure

(a) 

(b) 

(c) 

(d) 

Ans: (a)

Explanation:

In every row, as we go from the left to the right, there's one less circle, and one more triangle is added.

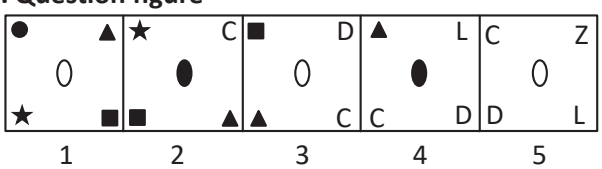
TYPE 8: SERIES

This concept focuses on identifying the pattern or sequence in a series of figures. Each figure in the series changes or evolves in a particular way. Recognizing this progression lets you predict the next figure in the series, testing your pattern recognition and predictive reasoning.

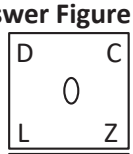
QUESTIONS

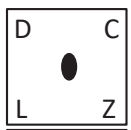
Direction (Q25-Q26): Determine the next figure of the series given in the Question figures.

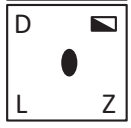
Q25. Question figure

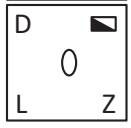


Answer Figure

(a) 

(b) 

(c) 

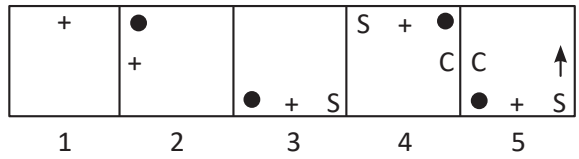
(d) 

Ans: (c)

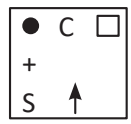
Explanation:

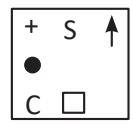
The inner circle changes between dark and white in a repeating pattern. All four diagrams are rotating counterclockwise, and a new diagram takes the place of the old one in the upper right-hand corner

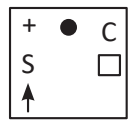
Q26. Question figure

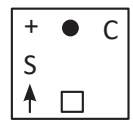


Answer Figure

(a) 

(b) 

(c) 

(d) 

Ans: (a)

Explanation:

The sign '+' moves 1, 1, 2, 2, 3,... steps anti-clockwise and one new symbol is added before and after it, in each of the successive figures.

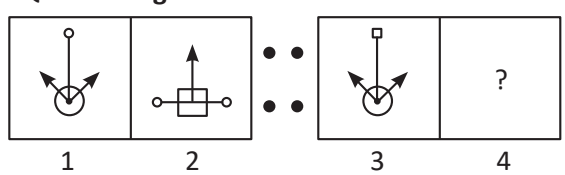
TYPE9: ANALOGY

Analogies in non-verbal reasoning involve finding a visual relationship between two sets of figures. By understanding how the figures in the first set are related, you can determine the relationship in the second set. This assesses your ability to draw parallels and understand relationships between different visual elements.

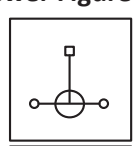
QUESTIONS

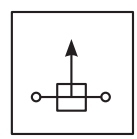
Direction (Q27-Q29): Which figure from the answer figure will replace the question mark in the problem figure.

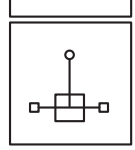
Q27. Question figure

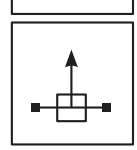


Answer Figure

(a) 

(b) 

(c) 

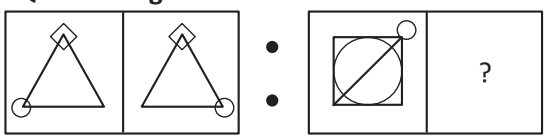
(d) 

Ans: (d)

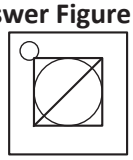
Explanation:

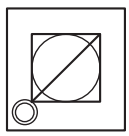
Moving from figure (1) to (2), the bottom circle is swapped with a square. Additionally, the two side lines now form a 90° angle, and the upper portions of both lines are exchanged with the upper part of the middle line, and vice versa.

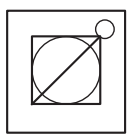
Q28. Question figure

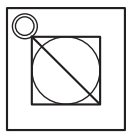


Answer Figure

(a) 

(b) 

(c) 

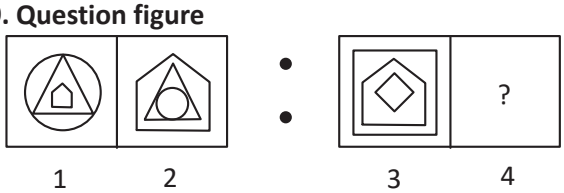
(d) 

Ans: (a)

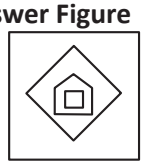
Explanation:

In going from figure (1) to (2), the circle shifts by one step in the anti - clockwise direction.

Q29. Question figure

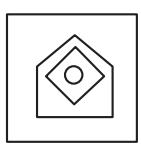


Answer Figure

(a) 

(b) 

(c) 

(d) 

Ans: (a)

Explanation:

Moving from figure 1 to figure 2, the innermost shape becomes the outermost one, and the outermost shape becomes the innermost one. In simpler terms, the first and third figures switch places.

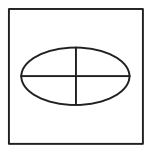
TYPE10: CLASSIFICATION

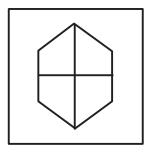
Classification tasks require you to categorize figures based on common characteristics. Among a group of figures, you'll need to identify the one that doesn't belong to the group based on certain criteria. This tests your ability to discern differences and similarities among various figures.

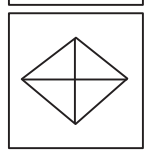
QUESTIONS

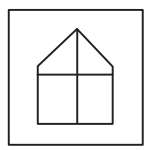
Direction (Q30 - Q32): In the below questions find out the mirror image of the Question image from the options images.

Q30. Find the odd one

(a) 

(b) 

(c) 

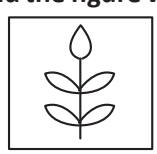
(d) 

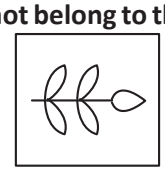
Ans: (d)

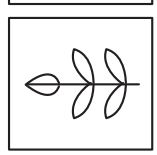
Explanation:

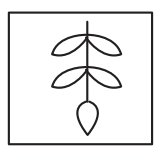
Every figure is divided into four equal parts, except for figure (d).

Q31. Three are similar to each other and form a group. Find the figure which does not belong to that group.

(a) 

(b) 

(c) 

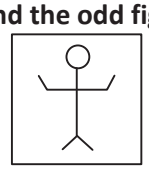
(d) 

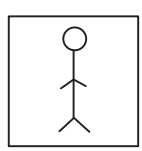
Ans: (c)

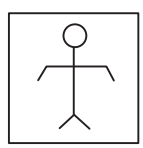
Explanation:

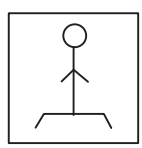
With the exception of (c), all the others have an unsplit leaf above the line.

Q32. Find the odd figure out.

(a) 

(b) 

(c) 

(d) 

Ans: (b)

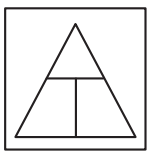
Explanation:

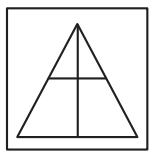
All figures consist of six line segments, except for figure (b)

PRACTICE QUESTIONS

Direction (Q1-Q3): In each of the following questions, find the figure from the figures given in the options, that can be formed by joining the pieces given in the question figure.

1.

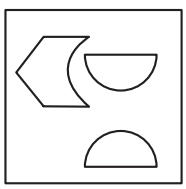
(a) 

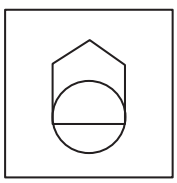
(b) 

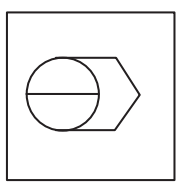
(c) 

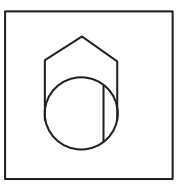
(d) 

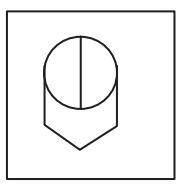
2.



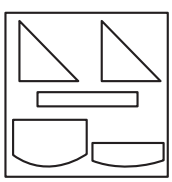
(a) 

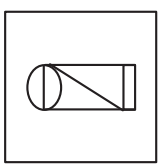
(b) 

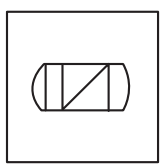
(c) 

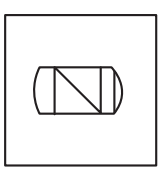
(d) 

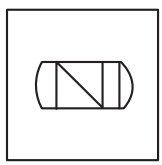
3.



(a) 

(b) 

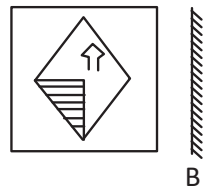
(c) 

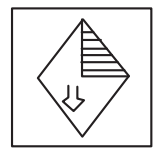
(d) 

Direction (Q4–Q6): In the below questions find out the mirror image of the Question image from the options images.

Here AB represents mirror

4.



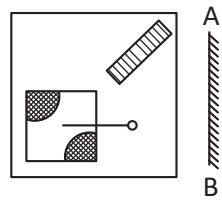
(a) 

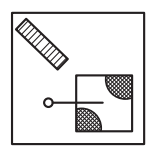
(b) 

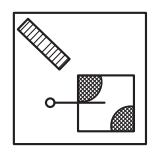
(c) 

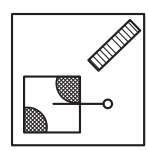
(d) 

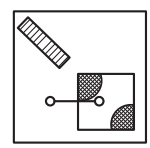
5.



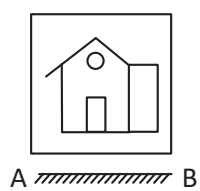
(a) 

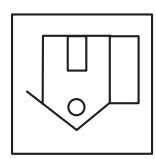
(b) 

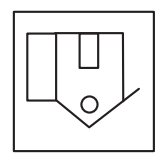
(c) 

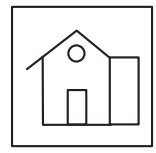
(d) 

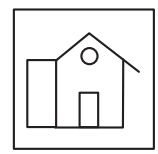
6.



(a) 

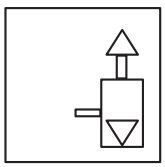
(b) 

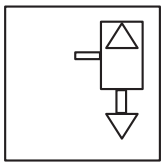
(c) 

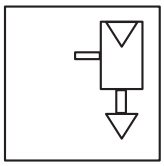
(d) 

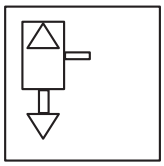
Direction(Q7-Q9): In the below questions find out the water image of the Question image from the options images.

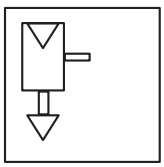
7.



(a) 

(b) 

(c) 

(d) 

8.

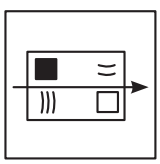
(a) 

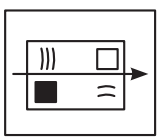
(b) 

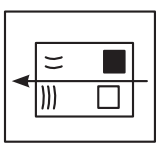
(c) 

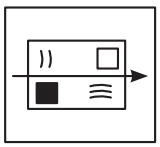
(d) 

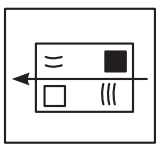
9.



(a) 

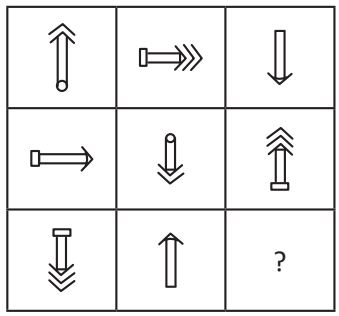
(b) 

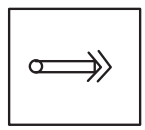
(c) 

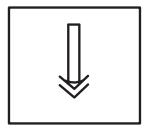
(d) 

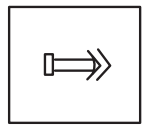
Direction (Q10-Q12): in each of the following questions , find out the answer figure which completes the problem figure matrix

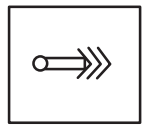
10.



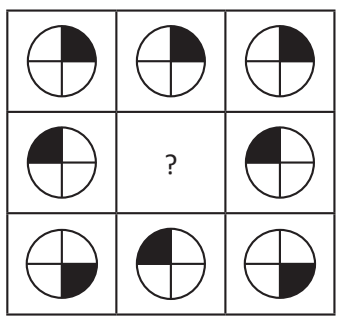
(a) 

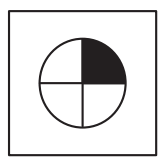
(b) 

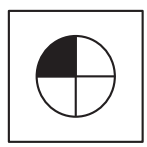
(c) 

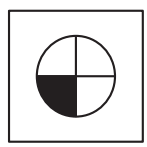
(d) 

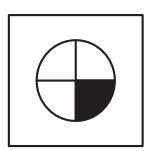
11.



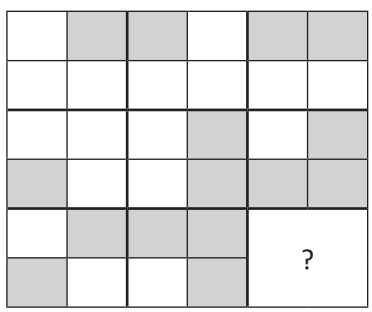
(a) 

(b) 

(c) 

(d) 

12.

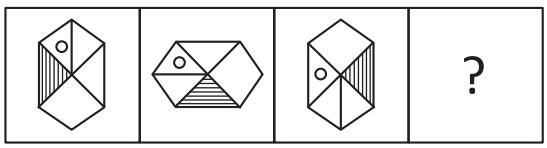


(a)  (b) 

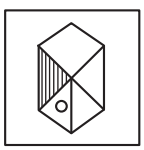
(c)  (d) 

Direction(Q13- Q15): Determine From Answer Figure that will continue the series in problem figure

13.

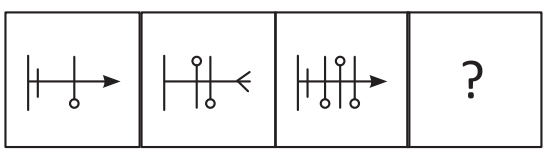


1 2 3 4

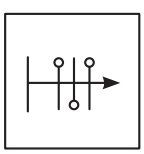
(a)  (b) 

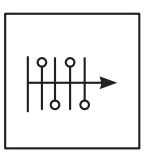
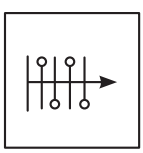
(c)  (d) 

14.

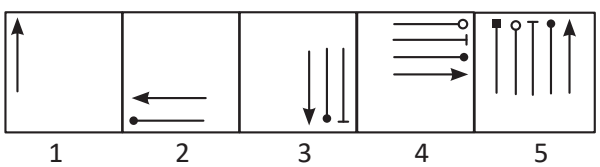


1 2 3 4

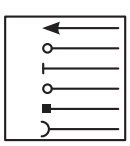
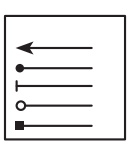
(a)  (b) 

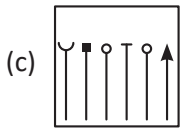
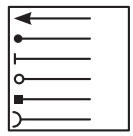
(c)  (d) 

15.



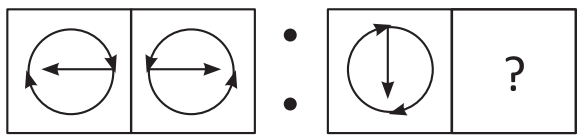
1 2 3 4 5

(a)  (b) 

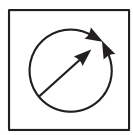
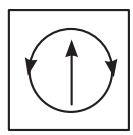
(c)  (d) 

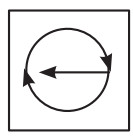
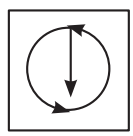
Direction (Q16-Q18): Which figure from the answer figure will replace the question mark in the problem figure.

16.

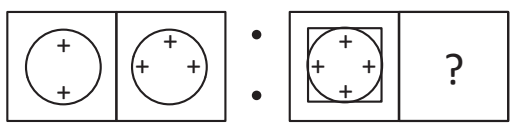


1 2 3 4

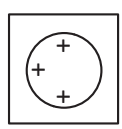
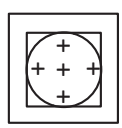
(a)  (b) 

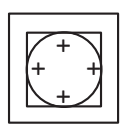
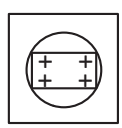
(c)  (d) 

17.

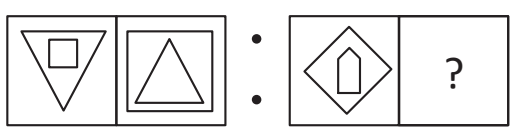


1 2 3 4

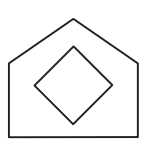
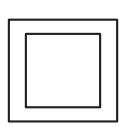
(a)  (b) 

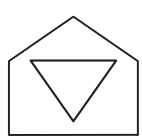
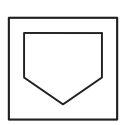
(c)  (d) 

18.

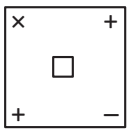


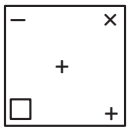
1 2 3 4

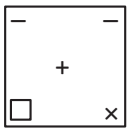
(a)  (b) 

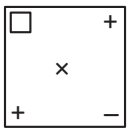
(c)  (d) 

19. Find the odd one out.

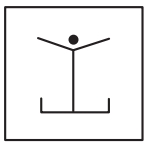
(a) 

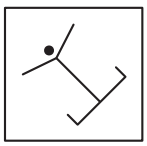
(b) 

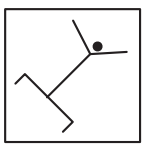
(c) 

(d) 

20. Find the odd one out

(a) 

(b) 

(c) 

(d) 

21. Find the odd one out

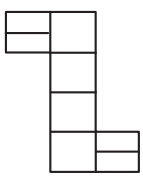
(a) 

(b) 

(c) 

(d) 

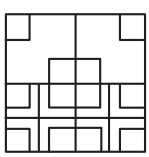
22. Count the number of rectangles in the given figure.



(a) 8 (b) 17

(c) 18 (d) 27

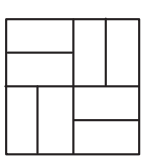
23. How many squares are there in the given figure?



(a) 27 (b) 23

(c) 24 (d) 26

24. Count the rectangle in the given figure which are not squares

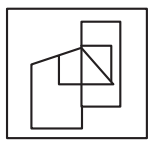


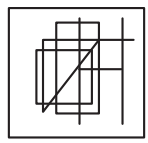
(a) 24 (b) 22

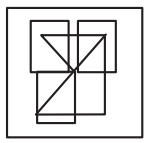
(c) 15 (d) 16

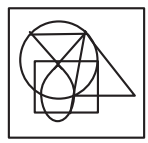
Direction(Q25 - Q27): In these questions a figure is given in question and a set of four figures is given in answers, find out the answer figure in which the question figure is embedded.

25.

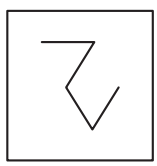
(a) 

(b) 

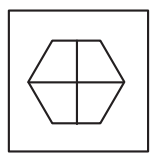
(c) 

(d) 

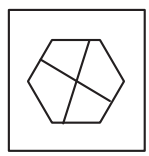
26.



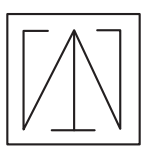
(a) 

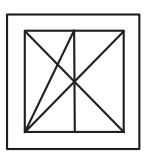
(b) 

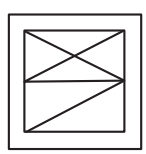
(c) 

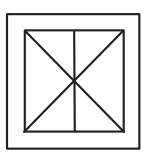
(d) 

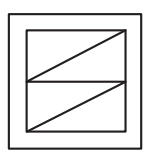
27.



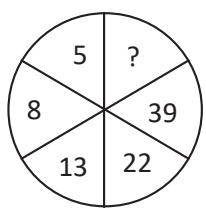
(a) 

(b) 

(c) 

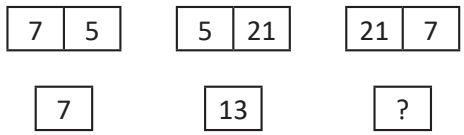
(d) 

28. Which number will replace the question mark in the given figure?



(a) 66 (b) 72
(c) 71 (d) 78

29. Find the missing number.



(a) 4 (b) 8
(c) 20 (d) 14

30. Find the missing number.

24	25	50
24	20	10
4	9	3
12	5	?

(a) 20 (b) 15
(c) 5 (d) 10

Answers

1. (c)	2. (b)	3. (d)	4. (c)	5. (a)	6. (a)	7. (a)	8. (d)	9. (a)	10. (a)
11. (d)	12. (d)	13. (c)	14. (b)	15. (d)	16. (d)	17. (b)	18. (a)	19. (c)	20. (c)
21. (c)	22. (c)	23. (a)	24. (d)	25. (c)	26. (a)	27. (b)	28. (b	29. (d)	30. (a)

Explanations

1. (c)

Explanation:

2 acute triangles, one obtuse triangle

2. (b)

Explanation:

Clearly option (b) is formed using the 3 given figures.

3. (d)

Explanation:

Clearly option (d) is formed using the given figures in the questions.

4. (c)

Explanation:

Mirror image of a figure

Lines in the shaded triangle should be horizontal.

5. (a)

Explanation:

In Mirror image of the figure. Elements are switched from Left to Right and vice-versa

6. (a)

Explanation:

Option (a) shows correct mirror Images.

7. (a)

Explanation:

Option (a) shows the right way the picture would look if it were reflected in water.

8. (d)

Explanation:

Option (d) shows the right way the picture would look if it were reflected in water.

9. (a)

Explanation:

Option (a) shows the right way the picture would look if it were reflected in water

10. (a)

Explanation:

There are different kinds of arrows: one with a single head, one with two heads, and one with three heads. These arrows can point upwards, downwards, or to the right. Additionally, each arrow has a base, and there are three types of bases: flat, rectangular, and circular. In every row, one of each of these features is used.

11. (d)

Explanation:

In the first and third columns, the black parts of the middle image are diagonally opposite to those in the lower image. So, the middle image in the second column must be identical to the one shown in option (d).

12. (d)

Explanation:

In every row, the third figure is formed by combining the two figures on its left.

13. (c)

Explanation:

In each step, the picture turns 90° to the left, and the circle shifts one block to the right.

14. (b)

Explanation:

In each new step, the line with the circle moves one step to the left in the opposite direction, and a small line shows up in every figure with an odd number. head of the arrow is reversed with the even number.

15. (d)

Explanation:

With each step, a new design is introduced in the figure. Following this, there is a 90° anticlockwise rotation, causing the design to move one position in the anti clockwise direction

16. (d)

Explanation:

Figure (2) is created by flipping or mirroring figure (1) horizontally. In simpler terms, it's a sideways reflection of figure (1).

17. (b)

Explanation:

Going from the first figure to the second, both designs inside the circle shift in a clockwise direction, and a new design appears in the middle between the two original designs. A square is also introduced around the circle.

18. (a)

Explanation:

As we go from figure (1) to (2), the positions of both designs swap, and one of the designs is flipped or inverted.

19. (c)

Explanation:

Apart from (c) all the others have two plus signs and one minus sign, whereas in figure (c), it's the opposite.

20. (c)

Explanation:

With the exception of (c), the legs of all the figures point upward.

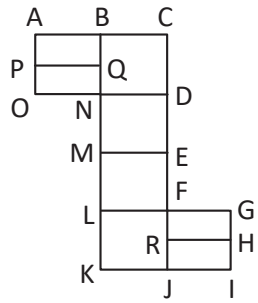
21. (c)

Explanation:

Except for (c), all the other figures are different rotations of the same figure.

22. (c)

Explanation:



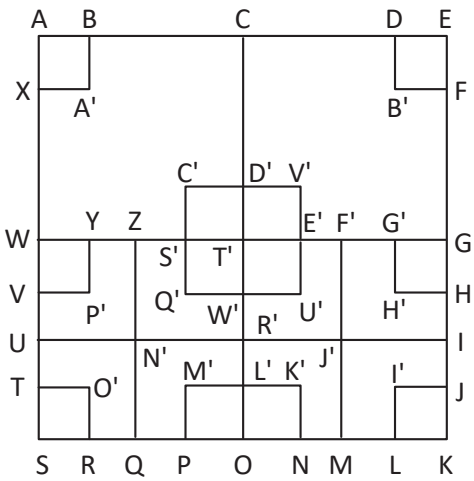
Rectangles in figure -

ABQP, NDEM, FGHR, BCEM, FGIJ, NDJK, PQNO, MEFL, RHIJ, NDFL, ACDO, LGIK, BCDN, LFJK, ABNO, MEJK, BCFL, BCJK.

Total Rectangle : 18

23. (a)

Explanation:



Squares in figure -

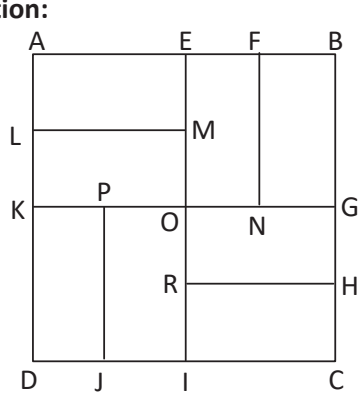
ABA'X, DEFB', C'D'T'S', D'V'E'T', WYP'V, TO'RS, S'T'W'Q', T'E'U'W', G'GHH', M'L'OP, L'K'NO, I'JKL, ACT'W, CEGT', WT'OS, T'GKO, AEKS, C'V'U'Q', WZN'U, ZT'R'N', T'F'J'R', F'GIJ', UN'QS, N'R'OQ R'J'MO,

J'IKM, ZF'MQ

There are 27 squares.

24. (d)

Explanation:



Rectangles in figure -

AEID, KGCD, KPJD, BGNF, AFNK, LMID, BEIC, AEML, POIJ, ORHG BERH, ABGK, LMOK, EFNO, HCIR, PGCJ

There are 16 rectangles

25. (c)

Explanation:

The figure in the question is clearly a part of the figure given as the answer in (c)

26. (a)

Explanation:

The figure in the question is clearly a part of the figure given as the answer in (a)

27. (b)

Explanation:

The figure in the question is clearly a part of the figure given as the answer in (b)

28. (b)

Explanation:

The pattern is as follows

$(5 \times 2) - 2 = 8$

$(8 \times 2) - 3 = 13$

$(13 \times 2) - 4 = 22$

$(22 \times 2) - 5 = 39$

$(39 \times 2) - 6 = 72$

$? = 72$

29. (d)

Explanation:

As, $(7 + 5) \div 2 = 6$ and $(5 + 21)\ 2 = 13$

Like this, missing number

$(21 + 7) \div 2 = 14$

30. (a)

Explanation:

$(24 + 24) / 12 = 4$

$(25 + 20) / 5 = 9$

Like this, $(50 + 10) / ? = 3$

$60 / ? = 3$

$? = 60 / 3 = 20$