(Olympiad Excellence Notes)

NOTES

FUNDAMENTALS

This chapter is based on four distinct concepts:

(a) Mathematical Series:

- The three or more numbers having a sequence of pattern is given. The numbers follow a **certain rule** which relates the consecutive terms. Students should be able to recognize the **rule or pattern.** This will help them predict the next term or number.

Rule/Pattern may exist in the following ways:

(i) Series of odd number:

Example: 1, 3, 5, 7, ...

Ans. Next number will be 9

(ii) Series of even numbers:

Example: 2, 4, 6, ...

Ans. Next number will be 8.

(iii) Series of prime numbers:

Example: 2, 3, 5, 7, 11, 13.....

Ans. Next number will be 17

(iv) Series of square of natural numbers:

Example: 1,4,9, 16, ...

Ans. Next number will be 25

(v) Series of squares of even natural numbers:

Example: 4, 16, 36, 64

Ans. Next numbers will be 100

(vi) Series of cubes of natural numbers

Example: 1, 8, 27.....

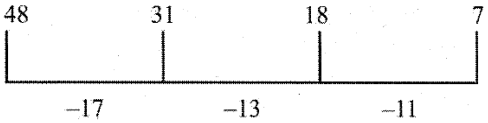
Ans. Next number will be 64

Solved Examples

1. Find the number to fill in the blank:

48, 31, 18, ____?

Ans. Sequence comprises subtraction of prime numbers:



∴ It is 7

2. Find 86, 61, 45,.....?

∴ It is 36

Ans. Square comprises subtraction of squares of natural numbers as follows:

Therefore, you should have the following at finger tips:

1. Sequence of prime numbers from 1 to 100 i.e., 2, 3, 5, 7, 11, 13,.....97
2. Sequence of squares of natural numbers from I to 20 i.e., 1,4, 9.....361,400
3. Sequence of cubes of natural numbers from 1 to 20 i.e., 1, 8, 27..... ..6859, 8000

Alphabetic Series

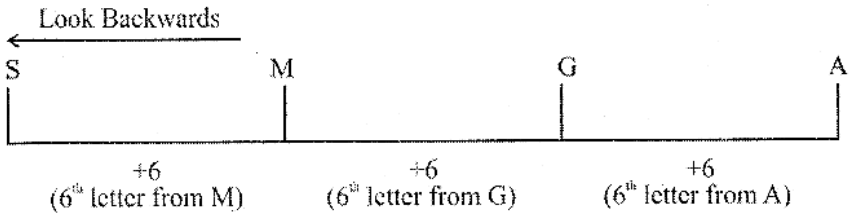
➢ An arranged sequence of letters which follows a particular rule/pattern is called an alphabetical series. Here again, the pattern of alphabets or distance between alphabets needs to be recognized.

Example: The three blanks in the sequence can be given by (if the last blank contains 'G')

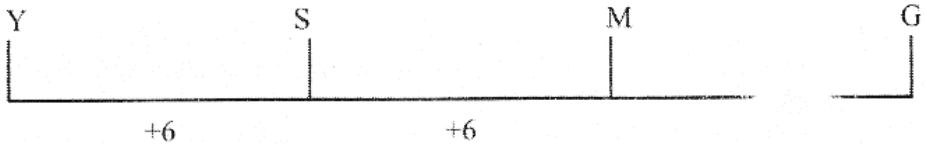
S, ____; M, ____; G, _____; A, ____ G ____

(a) TPV (b) YSM (c) YSR (d) None

Sol. Now let us understand the pattern



Similarity the gaps can be filled up as:



∴ YSM is the answer.

Analogy Type?

In many questions, term 1 is related to terms 2 by some relationship.

Same relationship is to be used to relate term 3 to term 4 in order to find term 4 (which is unknown)

This can be represented as

Term 1 : Term 2 : : Term 3 : ??

Example: Bihar : Patna :: Jharkhand : ?

Sol. Bihar $\xleftarrow{(is\ Capital\ of)}$ Patna

Similarly Jharkhand $\xleftarrow{(is\ Capital\ of)}$ (Ranchi)

Here, the analogy was based on states of India and their capitals. Similarly, analogy could be based on.

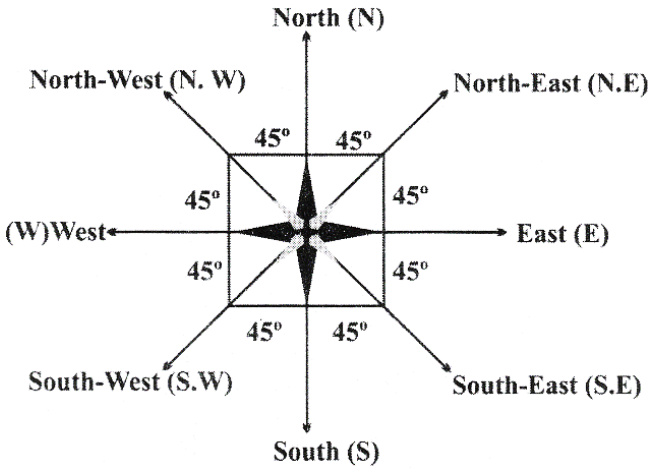
- Males of animals and their females, e.g., *Dog* → *Bitch*; *Bull* → *Cow*
- Workers and work place, e.g. *Lawyer* → *Court*; *Mechanic* → *Garage*
- Individuals and Groups (in biology)

Example: *Man* → *Mammal*; *Whale* → *Mammal*; *Kiwi* → *Bird*

- **Quantities and Units**

Example: *Force* → *Newton*; *Pressure* → *Pascal*; *Current* → *Ampere*

Direction Sense

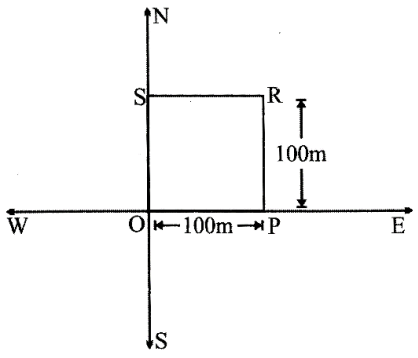


- When somebody is moving right (while he/she is on northward path) implies that he/she has turned 90° clockwise from north direction to eastward direction?
- If one turns by 45° right of north implies that he is on North-Eastward path while if one turns by 45° left of north means he is on North-West path. This can also be understood from diagram as above.

Elementary Question

Example: If one person is moving east by 100 m, then turns left and goes 100 m. He again turns left and goes 100m. How far and in which direction is he from his original position?

Sol. This is best solved by drawing North-South direction axis. Consider the person at origin.



His final position is 'S' , distance OS = 100 m and he has gone 100 m north of starting point 'O'