

General Aptitude Study Notes for Exams

Numerical Reasoning Study Notes for GATE

This section deals with questions on simple mathematical operations. Here, the four fundamental operations – addition, subtraction, multiplication and division and also statements such as less than, 'greater than', 'equal to', 'not equal to, etc. are represented by symbols, different from the usual ones. The questions involving these operations are set using artificial symbols. The candidate has to substitute the real signs and solve the questions accordingly, to get the answer.

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Different types of questions covered in this chapter are as follows

- Symbol Substitution
- Balancing the Equation
- Interchange of Signs and Numbers
- Trick-Based Mathematical Operations

Note:- While solving a mathematical expression, proceed according to the rule **BODMAS** — **i.e.**, Brackets, Of, Division, Multiplication, Addition, Subtraction.

Example:

$$(36 - 12) \div 4 + 6 + 2 \times 3 = 24 \div 4 + 6 + 2 \times 3 \text{ (Solving Bracket)}$$

$$= 6 + 6 + 2 \times 3 \text{ (Solving Division)}$$

$$= 6 + 6 + 6 \text{ (Solving Multiplication)}$$

$$= 18 \text{ (Solving Addition)}$$

Type 1: Symbol Substitution

In this question, a candidate is provided with substitutes for various mathematical symbols, followed by a question involving calculating an expression or choosing the correct/ incorrect equation. The candidate must put the real signs in the given equation and then solve the questions as required.

Ex 1: if '×' means '-', '÷' means '+', and + means '×', then $18 \times 5 \div 5 + 6$ is equal to

2. 49
3. 43
4. 37

Solution: (c)

Change of symbols according to the question,

$$\begin{aligned} ? &= 18 \times 5 \div 5 + 6 = 18 - 5 + 5 \times 6 \\ &= 18 - 5 + 30 = (18 + 30) = 43 \end{aligned}$$

Type 2: Balancing the Equation

In this type of question, the signs in one of the alternatives are required to fill up the blank spaces for the signs to balance the given equation

Ex: If the following equations have to be balanced, the signs of which of the following options will be used?

$$24 \ 6 \ 12 \ 16 = 0$$

1. -, + and +
2. \div , + and \div
3. -, - and -
4. \div , + and -

Solution: (d)

From Option (d)

$$\begin{aligned} 24 \div 6 + 12 - 16 &= 0 \\ \frac{24}{6} + 12 - 16 &= 0 \\ 4 + 12 - 16 &= 0 \\ 16 - 16 &= 0 \\ \text{LHS} &= \text{RHS} \end{aligned}$$

Hence, option (d) is correct.

Type 3: Interchange of Signs and Numbers

In this type of questions, the given equation becomes correct and fully balanced when either two signs of the equation or both the numbers and the signs of the equation are interchanged. The candidate is required to find the correct pair of signs and numbers from the given alternatives.

Ex: Which one of the given interchange in signs would make the given equation correct?

$$10 - 2 + 9 \times 2 \div 4 = 19$$

1. - and ÷
2. - and +
3. ÷ and ×
4. × and ÷

Solution: (a)

Let us check the options one by one

From option (a),

$$10 - 2 + 9 \times 2 \div 4 = 19$$

$$10, 2 + 9 \cdot 2 - 4 = 19$$

$$10 + 9 \cdot 2 - 4 = 19$$

$$10 + 18 - 4 = 19 \quad \text{D} \quad 23 - 4 = 19$$

$$19 = 19$$

As options (a) gives us the correct answer. Hence, there is no need to check other options

Type 4: Trick Based Mathematical Operations

The questions are based on simple mathematical operations that do not come under any of the above given types covered here. These questions can be based on several different patterns.

Ex: If $9 \times 5 \times 2 = 529$ and $4 \times 7 \times 2 = 724$, then $3 \times 9 \times 8 = ?$

1. 983
2. 839
3. 938
4. 893

Solution: (a)

As,

$$9 \times 5 \times 2 = 529 \quad \text{and} \quad 4 \times 7 \times 2 = 724$$

Similarly,

$$3 \times 9 \times 8 = 983$$

= 983

Series

Series is a sequential order of letters, numbers or both arranged such a way that each term in the series is obtained according to some specific rules. These rules can be based on mathematical operations, place of letters in alphabetical order etc.

Different types of questions covered in this chapter as follows

- **Number Series**
- **Letter Series**
- **Alpha-Numeric Series**
- **Continuous Pattern Series**

On the basis of various types of questions that are asked in competitive exams, we have classified series into several types as follows.

Number Series

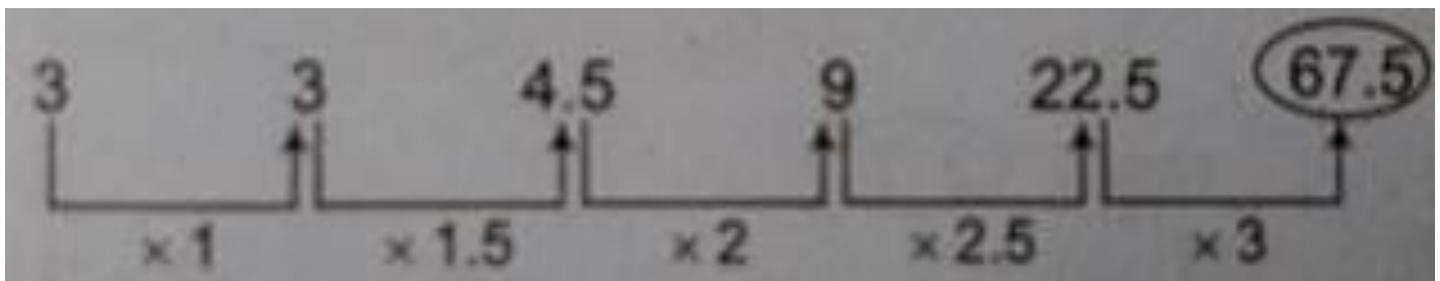
Ex 1: Replace the question mark (?) in the following number series with suitable option.

3, 3, 4.5, 9, 22.5, ?

- (a) 27.3
- (b) 24
- (c) 55
- (d) 67.5

Solution: (d)

In the given series, the ratio between two consecutive elements is in increasing order and element are multiplied by the numbers in increasing order.



Ex 2: Replace the question mark (?) in the following number series with the suitable option.

5, 11, 23, 47, 95, ?

(a) 191

(b) 185

(c) 194

(d) 198

Solution: (a)

In the given series, following pattern is used.

Next number = (Previous number \times 2 + 1).

Same Number Multiplication and Addition in Increasing Order Series

In this type series, each previous element is multiplied by same number while numbers in increasing order are added respectively, in this multiplication to obtain the next element.

Ex 3: Replace the question mark (?) in the given series with suitable option.

5, 11, 24, 51, 106, ?

(a) 178

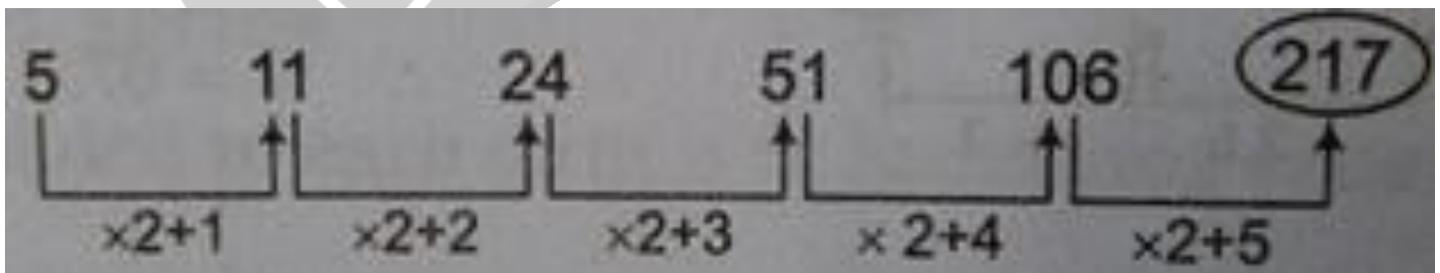
(b) 210

(c) 185

(d) 217

Solution: (d)

In the given series, following pattern is used.



Increasing order Multiplication and Increasing Order Subtraction Series

In this type of series, previous elements are multiplied respectively by numbers in increasing order and then numbers in increasing order are subtracted respectively from such multiplication to obtain the next elements.

Ex 4: What comes in place of question mark (?) in the following number series?

3, 5, 13, 49, 241, ?

(a) 1541

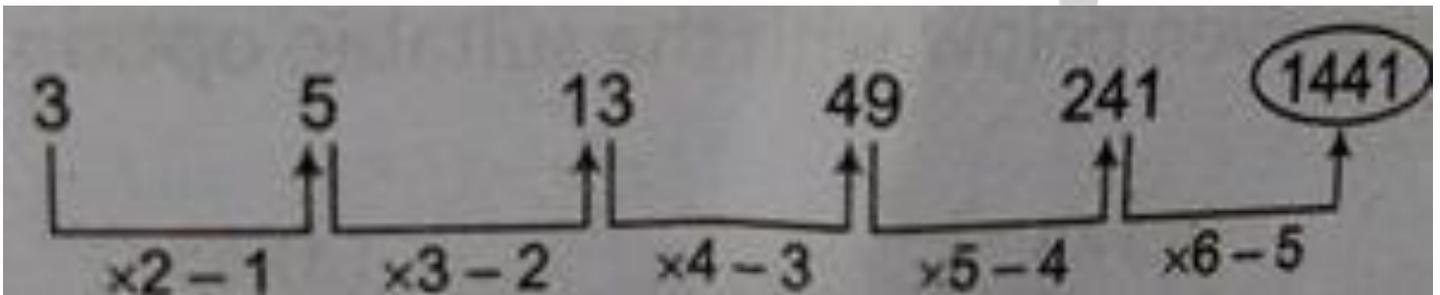
(b) 4411

(c) 1600

(d) 1441

Solution: (d)

In the given series, following pattern is used.



Multiplication and Division Series

In this type of series, each next element is obtained by the operation of multiplication and division alternatively.

Ex 5: Replace the questions marks (?) in the given series with the suitable option.

24, 72, 36, 108, 54, ?

(a) 145

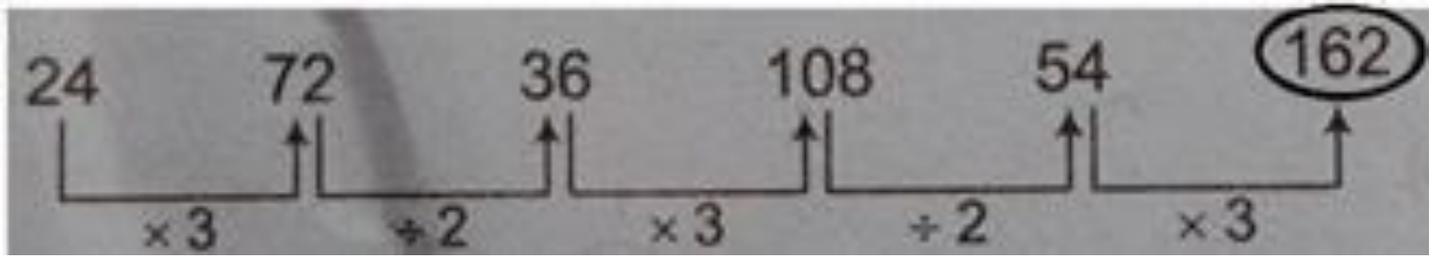
(b) 162

(c) 158

(d) 165

Solution: (b)

The series pattern is $\times 3, \div 2, \times 3, \div 2$ and so on.



Square Addition series

In this type of series, square of numbers in a particular manner are added, respectively to each element to obtain the next element.

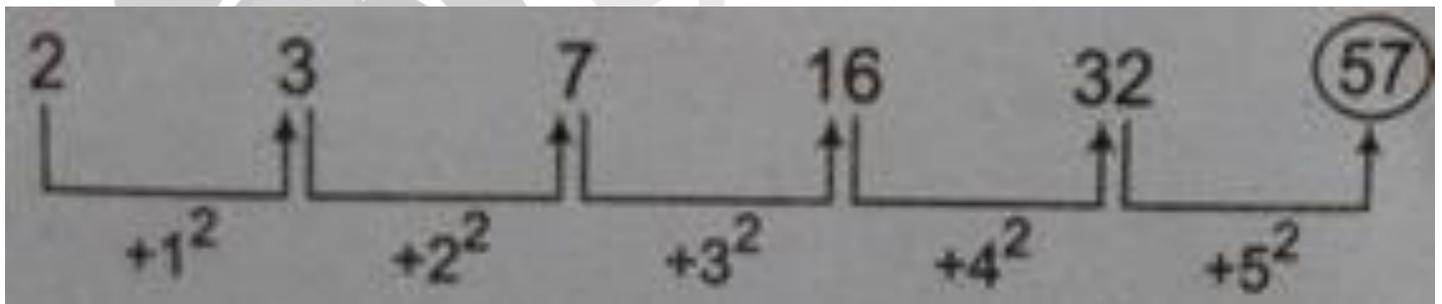
Ex: 6 Replace the question mark (?) in the series given below with the suitable option.

2, 3, 7, 16, 32, ?

- (a) 57
- (b) 37
- (c) 48
- (d) 55

Solution: (a)

In the given series, following pattern is used



Cube Addition series

In this type of series, cube of number in a particular manner are added, respectively to each element to obtain the next element.

Ex 7: What comes in place of question mark (?) in the series given below?

1, 2, 10, 37, 101, ?

- (a) 226

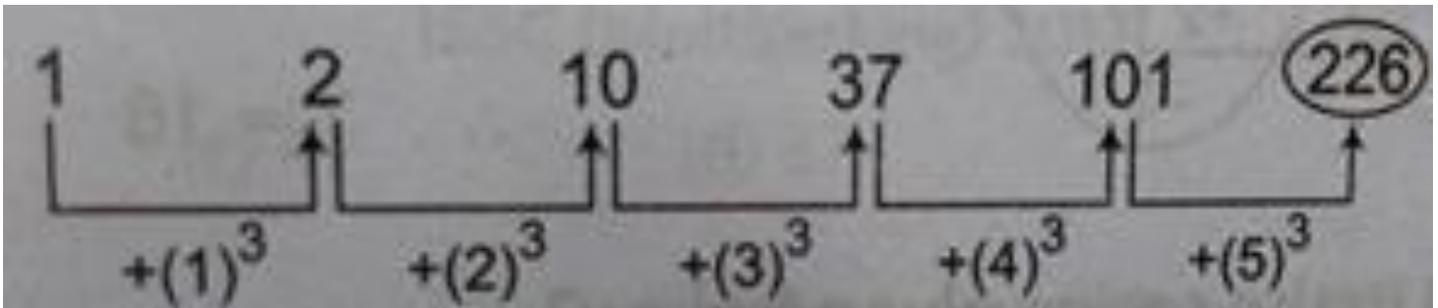
(b) 215

(c) 218

(d) 229

Solution: (a)

In the given series, following pattern is used



Prime Number Series

In this type of series, each element is prime number in certain sequence.

Ex 8: What replace the question mark (?) in the following number series?

2, 3, 5, 7, 11, ?

(a) 14

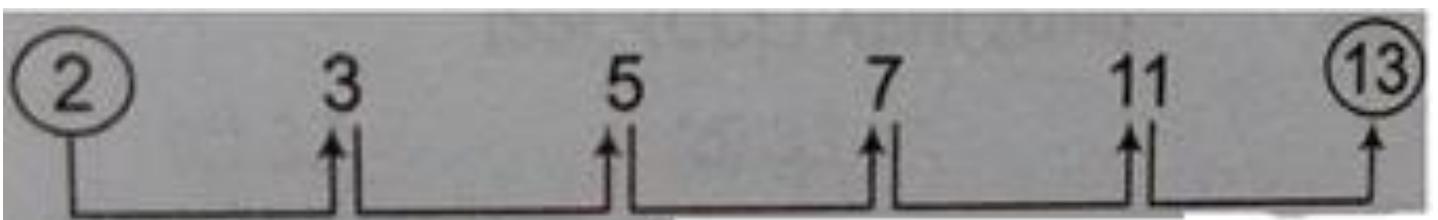
(b) 15

(c) 13

(d) 17

Solution: (c)

Each next element is the next prime number.



Digital Operation of Number Series

In this type of series, the digits of each number are operated in a certain way to obtain the next element of the series.

Ex 9: What replace question mark (?) in the series given below?

88, 64, 24, ?

(a) 8

(b) 6

(c) 2

(d) 5

Solution: (a)

In the given series, following pattern is used.

$$8 \times 8 = 64, 6 \times 4 = 24, 2 \times 4 = 8$$

Mixed /Combination series

In this type of series, odd place element makes one series while the even place elements make another series.

Ex 10: Replace the question mark (?) in the following number series.

5, 25, 7, 22, 9, 19, 11, ?

(a) 15

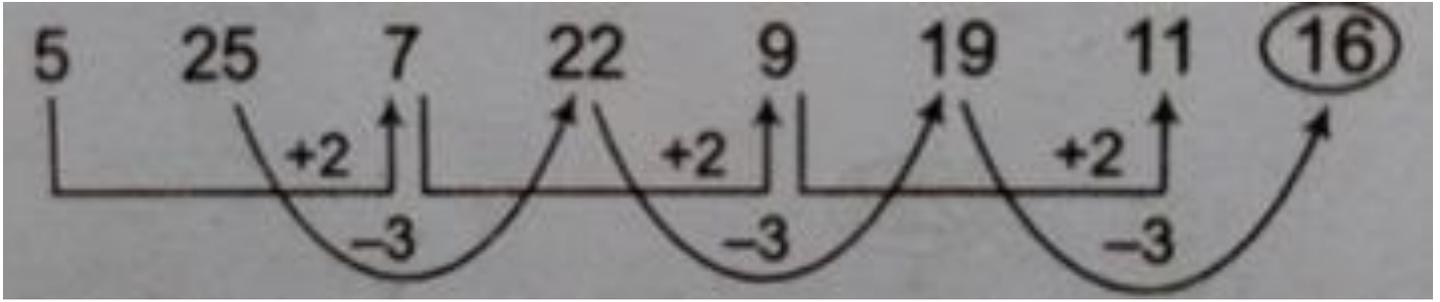
(b) 14

(c) 13

(d) 16

Solution: (d)

In the given series, following pattern is used.



Thanks

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