



# Mathematical Operations

Mathematical operations are basically the simplification of an expression containing numbers and different mathematical symbols.

In this chapter, we deal with questions in which four fundamental operations, addition (+), subtraction (−), multiplication (×) and division (÷) are represented by symbols, different from usual ones. The candidate is required to substitute the real signs in place of artificial symbols to solve the questions.

To solve such questions, we need to follow the VBODMAS rule. This rule gives us the correct order, in which various operations regarding simplification are to be performed.

	Letter	Rule	VBODMAS
Do First	V	Vinculum	— or bar
	B	Brackets	( ), { }, [ ]
	O	Of	×
	D	Division	÷
	M	Multiplication	×
	A	Addition	+
Do Last	S	Subtraction	−

**Example 1** If '+' means '÷', '−' means '×', '×' means '+', '÷' means '−', then give the value for

$$45 + 9 - 3 \times 15 \div 2$$

(a) 40

(c) 56

(b) 36

(d) 28

**Sol.** (d) Replacing the proper signs in the given expression, we have

$$\begin{aligned} 45 + 9 - 3 \times 15 \div 2 &= 45 \div 9 \times 3 + 15 - 2 \\ &= 5 \times 3 + 15 - 2 \\ &= 15 + 15 - 2 = 30 - 2 = 28 \end{aligned}$$

**Example 2** If P denotes '×', T denotes '−', M denotes '+' and B denotes '÷', then

$$12 \text{ P } 6 \text{ M } 15 \text{ T } 16 \text{ B } 4 = ?$$

(a) 70

(c) 75

(b) 83

(d) 110

**Sol.** (b)  $12 \text{ P } 6 \text{ M } 15 \text{ T } 16 \text{ B } 4$

$$\begin{aligned} &= 12 \times 6 + 15 - 16 \div 4 \\ &= 12 \times 6 + 15 - 4 \\ &= 72 + 15 - 4 = 87 - 4 = 83 \end{aligned}$$

**Example 3** If the following equation has to be balance, then the signs of which of the following options will be used?

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

(a) ÷, + and −

(c) −, − and −

(b) −, ÷ and +

(d) ÷, + and ÷

**Sol.** (a) From option (a),

$$24 \div 6 + 12 - 16 = 0$$

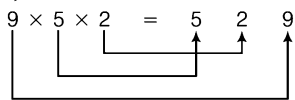
$$\text{LHS} = \frac{24}{6} + 12 - 16 = 4 + 12 - 16 = 16 - 16 = 0$$

$$\therefore \text{LHS} = \text{RHS}$$

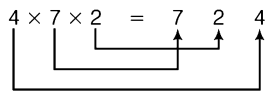
**Example 4** If  $9 \times 5 \times 2 = 529$  and  $4 \times 7 \times 2 = 724$ , then  $3 \times 9 \times 8 = ?$

- (a) 983 (b) 839  
(c) 938 (d) 893

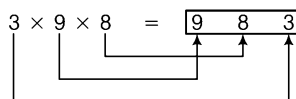
**Sol.** (a) As,



and



Similarly,



$\therefore ? = 983$

## Practice Exercise

- If '+' means '÷', '÷' means '-', '-' means '×' and '×' means '+', then  
 $12 + 6 \div 3 - 2 \times 8 = ?$   
(a) -2 (b) 4 (c) 2 (d) 8
- If '×' stands for '+', ÷ stands for '-', '-' stands for '×' and '+' stands for '÷', then find the value of following equation.  
 $54 \div 16 - 3 \times 6 + 2 = ?$   
(a) 9 (b) 12 (c) 8 (d) 15
- If '×' means subtraction, '+' means multiplication and '-' means addition, then find the value of following equation.  
 $12 + (3 \times 1) + 4 - 1 = ?$   
(a) 98 (b) 75  
(c) 85 (d) 97
- If '-' denotes addition, '+' denotes subtraction, '×' denotes division and '÷' denotes multiplication, then  
 $7 - 10 \times 5 \div 6 + 4 = ?$   
(a) 3 (b) 12  
(c) 15 (d) 9
- If A means '+', B means '-', C means '×' and D means ÷, then  
 $18 C 14 A 6 B 16 D 4 = ?$   
(a) 254 (b) 238  
(c) 188 (d) 258
- If '+' means '÷', '÷' means '-', '-' means '×' and '×' means '+', then value of  
 $12 + 3 \div 1 - 5 \times 2$  is  
(a) 5 (b) -3  
(c) 1 (d) -1
- If 'P' means '+', 'Q' means '×', 'R' means '÷' and 'S' means '-', then  
 $44 Q 9 R 12 S 6 Q 4 P 16 = ?$   
(a) 36 (b) 124  
(c) 25 (d) 112
- If P denotes '÷', Q denotes '×', R denotes '+' and S denotes '-', then  
 $18 Q 12 P 4 R 5 S 6 = ?$   
(a) 95 (b) 53 (c) 51 (d) 57
- If '÷' means addition and '×' means subtraction, then  $(15 \times 9) \div (12 \times 4) \times (4 \div 4)$  is equal to  
(a) 96 (b) 6  
(c)  $3/128$  (d)  $143/8$
- If A means '-', B means '÷', C means '+' and D means '×', then  $15 B 3 C 24 A 12 D 2 = ?$   
(a) 3 (b) 5 (c) 7 (d) 9
- If A = '+', B = '-', C = '×' and D = '÷', then  
 $5 C 5 D 5 A 5 B 5 = ?$   
(a) 0 (b) 5 (c) 10 (d) 15
- If A means '-', B means '+', C means '×' and D means '÷', then  $32 D 4 B 7 C 2 A 6$   
(a) 18 (b) 24  
(c) 36 (d) 16
- Select the correct combination of mathematical signs to replace '★' signs and to balance the following equation.  
 $6 \star 4 \star 12 \star 12$   
(a) +, -, = (b) +, -, +  
(c) =, -, ÷ (d) ×, -, =

14. Which of the following sets of operations with the usual notations replacing the stars in the order given makes the statements valid?

$$\sqrt{100} \star \sqrt{16} \star \sqrt{225} \star \sqrt{1}$$

(a)  $\times, =, +$  (b)  $+, =, -$   
(c)  $+, =, \times$  (d)  $-, \times, =$

15. If  $2 + 6 + 9 = 926$  and  $1 + 8 + 2 = 218$ , then  $4 + 3 + 1 = ?$

- (a) 314  
(b) 341  
(c) 143  
(d) 431

## Answers

1	(b)	2	(a)	3	(d)	4	(c)	5	(a)	6	(c)	7	(c)	8	(b)	9	(b)	10	(b)
11	(b)	12	(d)	13	(d)	14	(b)	15	(c)										

## Hints & Solutions

1. According to the question,

$$\begin{aligned} ? &= 12 + 6 \div 3 - 2 \times 8 \\ &\quad \downarrow \quad \downarrow \quad \downarrow \quad \downarrow \\ &\quad + \quad - \quad \times \quad + \\ &= 12 + 6 - 3 \times 2 + 8 \quad (\text{using VBODMAS rule}) \\ &= 2 - 3 \times 2 + 8 = 2 - 6 + 8 = (2 + 8) - 6 = 4 \end{aligned}$$

2. According to the question,

$$\begin{aligned} ? &= 54 \div 16 - 3 \times 6 + 2 \\ &\quad \downarrow \quad \downarrow \quad \downarrow \quad \downarrow \\ &\quad - \quad \times \quad + \quad \div \\ &= 54 - 16 \times 3 + 6 \div 2 \quad (\text{using VBODMAS rule}) \\ &= 54 - 16 \times 3 + 3 \\ &= 54 - 48 + 3 = 6 + 3 = 9 \end{aligned}$$

3. According to the question,

$$\begin{aligned} ? &= 12 + (3 \times 1) + 4 - 1 \\ &\quad \downarrow \quad \downarrow \quad \downarrow \quad \downarrow \\ &\quad \times \quad - \quad \times \quad + \\ &= 12 \times (3 - 1) \times 4 + 1 \quad (\text{using VBODMAS rule}) \\ &= 12 \times 2 \times 4 + 1 = 96 + 1 = 97 \end{aligned}$$

4. According to the question,

$$\begin{aligned} ? &= 7 - 10 \times 5 \div 6 + 4 \\ &\quad \downarrow \quad \downarrow \quad \downarrow \quad \downarrow \\ &\quad + \quad \div \quad \times \quad - \\ &= 7 + 10 \div 5 \times 6 - 4 \\ &\quad (\text{using VBODMAS rule}) \\ &= 7 + 2 \times 6 - 4 = (7 + 12) - 4 = 15 \end{aligned}$$

5. According to the question,

$$\begin{aligned} ? &= 18 \text{ C } 14 \text{ A } 6 \text{ B } 16 \text{ D } 4 \\ &\quad \downarrow \quad \downarrow \quad \downarrow \quad \downarrow \\ &\quad \times \quad + \quad - \quad \div \\ &= 18 \times 14 + 6 - 16 \div 4 \\ &\quad (\text{using VBODMAS rule}) \\ &= 18 \times 14 + 6 - 4 \\ &= 252 + 6 - 4 = 258 - 4 = 254 \end{aligned}$$

6. Given equation,  $12 + 3 \div 1 - 5 \times 2$

Changing the signs as per the question,

$$\begin{aligned} 12 \div 3 - 1 \times 5 + 2 &= \frac{12}{3} - 5 + 2 = 4 - 5 + 2 \\ &= 6 - 5 = 1 \end{aligned}$$

7.  $44 \times 9 \div 12 - 6 \times 4 + 16 = ?$

$$\begin{aligned} \Rightarrow 44 \times 9 \times \frac{1}{12} - 24 + 16 &= ? \\ \Rightarrow 33 - 24 + 16 &= ? \Rightarrow 49 - 24 = ? \\ \therefore ? &= 25 \end{aligned}$$

8. Given, 18 Q 12 P 4 R 5 S 6

After changing the letters into signs as per the question, we have

$$\begin{aligned} 18 \times 12 \div 4 + 5 - 6 \\ &= 18 \times \frac{12}{4} + 5 - 6 \quad (\text{by VBODMAS rule}) \\ &= 18 \times 3 + 5 - 6 \\ &= 54 + 5 - 6 \\ &= 59 - 6 = 53 \end{aligned}$$

9. According to the question,

$$\begin{aligned} &= (15 \times 9) \div (12 \times 4) \times (4 \div 4) \\ &\quad \downarrow \quad \downarrow \quad \downarrow \quad \downarrow \quad \downarrow \\ &\quad - \quad + \quad - \quad - \quad + \\ &= (15 - 9) + (12 - 4) - (4 + 4) \\ &\quad (\text{using VBODMAS rule}) \\ &= 6 + 8 - 8 = 6 \end{aligned}$$

10. According to the question,

$$\begin{aligned} ? &= 15 \text{ B } 3 \text{ C } 24 \text{ A } 12 \text{ D } 2 \\ &\quad \downarrow \quad \downarrow \quad \downarrow \quad \downarrow \\ &\quad \div \quad + \quad - \quad \times \\ &= 15 \div 3 + 24 - 12 \times 2 \quad (\text{using VBODMAS rule}) \\ &= 5 + 24 - 12 \times 2 = 5 + 24 - 24 = 5 \end{aligned}$$

11. According to the question,

$$\begin{array}{ccccccc} ? & = & 5 & C & 5 & D & 5 & A & 5 & B & 5 \\ & & \downarrow & & \downarrow & & \downarrow & & \downarrow & & \downarrow \\ & & \times & & + & & + & & - & & - \end{array}$$

$$= 5 \times 5 + 5 + 5 - 5 \quad (\text{using VBODMAS rule})$$

$$= 5 \times 1 + 5 - 5 = 10 - 5 = 5$$

12. According to the question,

$$\begin{array}{ccccccc} ? & = & 32 & D & 4 & B & 7 & C & 2 & A & 6 \\ & & \downarrow & & \downarrow & & \downarrow & & \downarrow & & \downarrow \\ & & + & & + & & \times & & - & & - \end{array}$$

$$= 32 + 4 + 7 \times 2 - 6 \quad (\text{using VBODMAS rule})$$

$$= 32 \times \frac{1}{4} + 14 - 6 = 8 + 14 - 6 = 16$$

13.  $6 \star 4 \star 12 \star 12$

From option (d),

$$6 \times 4 - 12 = 12 \Rightarrow 12 = 12$$

14. From option (b),

$$\sqrt{100} + \sqrt{16} = \sqrt{225} - \sqrt{1}$$

$$\Rightarrow 10 + 4 = 15 - 1 \Rightarrow 14 = 14$$

15. As,

$$\begin{array}{ccccccc} 2 & + & 6 & + & 9 & \rightarrow & 9 & 2 & 6, & 1 & + & 8 & + & 2 & \rightarrow & 2 & 1 & 8 \end{array}$$

Similarly,

$$\begin{array}{ccccccc} 4 & + & 3 & + & 1 & \rightarrow & 1 & 4 & 3 \end{array}$$



## Try Yourself

- If '+' means '÷', '-' means '+', 'x' means '-' and '÷' means 'x', then what is the value of  $24 \div 12 - 18 + 9 = ?$   
(a) -25 (b) 0.72 (c) 15.30 (d) 290
- If K denotes 'x', B denotes '÷', T denotes '-' and M denotes '+', then  $40 B 8 T 6 M 3 K 4 = ?$   
(a) 19 (b) 11 (c) -31 (d) 23
- If S means '-', Q means 'x', R means '÷' and P means '+', then  $1 P 45 R 2 Q 2 S 4 = ?$   
(a) 40 (b) 42 (c) 36 (d) 46
- If '@' means 'x', '©' means '÷', % means + and '\$' means '-', then  $6\%12\textcircled{c}3\textcircled{a}8 \$ 3 = ?$   
(a) 37 (b) 35 (c) 39 (d) 33
- If '÷' means '-', '-' means 'x', 'x' means '+' and '+' means '÷', then  $20 \times 60 \div 40 - 20 + 10 = ?$   
(a) 80 (b) 60 (c) 40 (d) 0
- If Q denotes addition, J denotes multiplication, T denotes subtraction and K denotes division, then  $30 K 2 Q 3 J 6 T 5 = ?$   
(a) 18 (b) 28 (c) 31 (d) 6
- If '+' means '-', '-' means 'x', '÷' means '+' and 'x' means '÷', then  $10 \times 5 \div 3 - 2 + 3 = ?$   
(a) 5 (b)  $\frac{53}{3}$  (c) 21 (d) 36
- Find the correct group of signs to solve the equation  $26 * 16 * 8 * 52$   
(a) + - = (b) - + =  
(c) x ÷ = (d) + - =
- Select the correct combination of mathematical signs to replace  $\star$  signs and to balance the following equation.  
 $8 \star 8 \star 1 \star 7 = 8$   
(a) x ÷ + (b) + ÷ x  
(c) ÷ x + (d) + x ÷
- If  $5 \times 3 \times 9 = 395$  and  $9 \times 7 \times 5 = 759$ , then  $7 \times 6 \times 4 = ?$   
(a) 676 (b) 476  
(c) 647 (d) 764

## Answers

- |       |       |       |       |        |
|-------|-------|-------|-------|--------|
| 1 (d) | 2 (b) | 3 (b) | 4 (b) | 5 (d)  |
| 6 (b) | 7 (a) | 8 (c) | 9 (c) | 10 (c) |