CHAPTER 06

Mathematical Operations

Mathematical operation can be defined as the simplification of expression containing numbers and different mathematical signs. While simplifying a mathematical problem, one must follow 'VBODMAS' rule.

The order of various operations is the same as the order of letters in **'VBODMAS'** from left to right.

V → Vinculum, (—)

B → Bracket, ( ), { }, [ ]

O → of

D → Divide, (÷)

M → Multiply, (×)

A → Addition (+)

S → Subtraction (−)

The various types of questions that are asked in competitive exams are as follows:

1. Problem Solving by Substitution- In this type, there are substitutes for various mathematical symbols or the numerals and questions are asked related to calculation of an expression or choosing the correct equation.

Example 1: If '+ ' means '× ', '−' means '÷', '×' means '+' and '÷' means '−'; compute the value of the expression

17+ 6 × 13 ÷ 8 = ?

(a) 100 (b) 107 (c) 110 (d) 109

Sol. (b) Given 17 + 6 × 13 ÷ 8

↓ ↓ ↓

17 × 6 +13 − 8

= 102 + 13 −8

= 115 – 8 = 107

Example 2: If P denotes ÷,Q denotes ×, R denotes + and S denotes –, then what is the value of 18 Q 12 P 4 R 5 S 6 = ?

(a) 64 (b) 81 (c) 53 (d) 24

Sol. (c) Converting alphabets into mathematical symbols, we get $18 \times 12 \div 4 + 5 - 6 = 18 \times 12 + 4 - 6 = 53$

2. Interchanging 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 signs of the equation are interchanged.

The candidate is required to find the correct pair of signs and numbers from the given alternatives.

Example 3: If '−' means '+', '+' means '−', '×' means '÷' and'÷' means '×', then which of the following equation is correct?

(a) $30 - 5 + 4 \div 10 \times 5 = 62$ (b) $30 + 5 \div 4 - 10 \times 5 = 22$

(c) $30 + 5 - 4 \div 10 \times 5 = 28$ (d) $30 \times 5 - 4 \div 10 + 5 = 41$

Sol. (d) From option (d),

LHS = $30 \times 5 \div 4 - 10 + 5$

$\downarrow \quad \downarrow \quad \downarrow \quad \downarrow$

$\div \quad + \quad \times \quad -$

$= 30 \div 5 + 4 \times 10 - 5 = 6 + 4 \times 10 - 5$

$= 6 + 40 - 5$

$= (6 + 40) - 5 = 41$ RHS (using VBODMAS rule)

$\therefore$ LHS = RHS

Example 4: Which of the given interchanges in signs would make the given equation correct?

$3 \div 5 \times 8 + 2 - 10 = 13$

(a) + and − (b) × and ÷ (c) ÷ and − (d) ÷ and +

Sol. (d) On interchanging + and − as in option (a) the result is

$$3 \div 5 \times 8 - 2 + 10 = \frac{24}{5} + 8 \neq 13$$

On interchanging symbols × and ÷ as given in option (b), we get

$$3 \times 5 \div 8 + 2 - 10 = 3 \times \frac{5}{8} + 2 - 10 \neq 13$$

On interchanging ÷ and − as given in option (c), we get

$3 - 5 \times 8 + 2 \div 10 = 3 - 5 \times 8 + \frac{2}{10}$

$= 3 - 40 + 2 \neq \frac{10}{13}$

On interchanging ÷ and + as given in option (d), we get

$3 + 5 \times 8 \div 2 - 10 = 3 + 5 \times \frac{8}{2} - 10$

$= 30 + 20 - 10 = 13$

3. Balancing the Equation- In this type of questions, the signs given in one of the alternatives are required to fill up the blank spaces for the signs in order to balance the given equation.

Example 5: Select the correct set of symbols

44 4 7 5 = 82

(a) ×, −, ÷ (b) +, ÷, − (c) +, −, ÷ (d) ÷, ×, +

Sol. (d) From option (d), we get $44 \div 4 \times 7 + 5 = 82$

$\Rightarrow 11 \times 7 + 5 = 82$

$\Rightarrow 77 + 5 = 82$

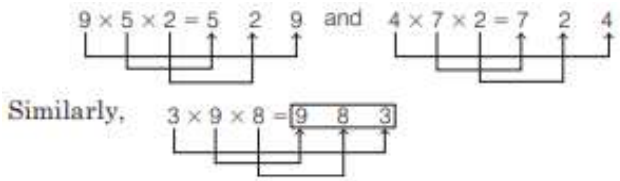
$\Rightarrow 82 = 82$

4. Trick Based Mathematical Operations- In this type of questions, there is some logic behind the given expressions. The candidate is required to find that logic and then solve the questions accordingly.

Example 6: 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, Similarly,



Practice Questions

1. If the mathematical operator '÷ ' means '× ', '+ ' means '− ', ' ×' means '+' and '−' means '÷ ', then

25 + 18 − 3 × 7 ÷ 3 = ?

(a) 25 (b) 21 (c) 19 (d) 40

2. If '+' stands for '× ', '−' for '÷', '× ' for '− ' and '÷' for '+', find the value of 26 + 74 − 4 × 5 ÷ 2 .

(a) 220 (b) 376 (c) 478 (d) 488

3. If '+' 'means 'multiplication', '−' means 'division', '×' means 'subtraction' and '÷' means 'addition', then 9 + 8 ÷ 8 – 4 × 9 is

(a) 65 (b) 11 (c) 26 (d) 56

4. If '×' stands for +, ÷ stands for '−', '−' stands for '×' and '+' stands for '÷' then find the value of following equation.

54 ÷ 16 – 3 × 6 + 2 = ?

(a) 9 (b) 12 (c) 8 (d) 15

5. If P means '÷ ', R means '× ', Q means '+' and S means '− ', then 48 P 8 Q 6 R 9 S 31 = ?

(a) 60 (b) 29 (c) 31 (d) 54

6. 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

7. If P means '÷', Q means '+', R means '−' and S means '×', then the value of 10 R 192 P 48 S 48 P 96 Q 1 is

(a) 10 (b) 9 (c) 8 (d) 7

8. If P denotes '+', Q denotes '−', R denotes '×' and S denotes '÷', which of the following statement is correct?

(a) 36 R 4 S 8 Q 7 P 4 = 10

(b) 16 R 12 P 49 S 7 Q 9 = 200

(c) 32 S 8 R 9 = 160 Q 12 R 12

(d) 8 R 8 P 8 S 8 Q 8 = 57

9. If '−' stands for division + stands for subtraction ÷ stands for multiplication '×' stands for addition, then which one of the following equations is correct?

(a) 70 2 4 5 6 44 − + ÷ × =

(b) 70 2 4 5 6 21 − + ÷ × =

(c) 70 2 4 5 6 341 − + ÷ × =

(d) 70 2 4 5 6 36 − + ÷ × =

10. If '−' stands for '÷' '+' stands for '×', '÷' for '−' × for '+', which one of the following equations is correct ?

(a) 30 6 5 4 2 27 − + × ÷ =

(b) 30 6 5 4 2 30 + − ÷ × =

(c) 30 6 5 4 2 32 × ÷ − + =

(d) 30 6 5 4 2 40 ÷ × + − =

Directions (Q.Nos. 11-16) Which of the following alternatives would make the equation correct?

11. 42 ÷ 4 + 2 − 3 × 5 = 29

(a) + and × (b) + and − (c) − and × (d) ÷ and +

12. 2 × 3 + 6 − 12 ÷ 4 = 17

(a) × and + (b) + and − (c) + and ÷ (d) − and ÷

13. 12 ÷ 2 − 6 × 3 + 8 = 16

(a) ÷ and + (b) − and + (c) × and + (d) ÷ and ×

14. 5 + 6 ÷ 3 − 12 × 2 = 17

(a) ÷ and × (b) + and × (c) + and ÷ (d) + and –

15. 8 × 20 ÷ 3 + 9 − 5 = 38

(a) 3, 9 (b) 3, 8 (c) 8, 9 (d) 3, 5

16. (18÷9) + 3 × 5 = 45

(a) × and ÷ (b) + and ÷ (c) 18 and 5 (d) 3 and 9

17. If '+' and '÷', '×' and '−' are interchanged in the equation 17 ÷ 7 − 27 + 7 × 37 , then its value will be

(a) 7 (b) 17 (c) 27 (d) 37

Directions (Q. Nos. 18 and 19) On making interchanges in signs and numbers, which of the equations would be correct?

18. Given interchanges : Signs + and × and numbers 4 and 5.

(a) 5 4 20 40 × + = (b) 5 4 20 85 × + =

(c) 5 4 20 104 × + = (d) 5 4 20 95 × + =

19. Given interchanges : Signs − and × and numbers 3 and 6.

(a) 6 3 2 9 − × = (b) 3 6 8 10 − × =

(c) 6 3 4 15 × − = (d) 3 6 4 33 × − =

Directions (Q. Nos. 20-24) If the following equations has to be balance, then the signs of which of the following options will be used?

20. 65 40 11 = 36

(a) − and + (b) × and ÷ (c) ÷ and + (d) + and

21. 6 5 4 = 34

(a) − and + (b) × and + (c) ÷ and × (d) × and –

22. 27 3 19 10 = 90

(a) × ,–,÷ (b) +, ÷, – (c) +, – ,÷ (d) ×, + – ,

23. 7 4 8 2 = 24

(a) –, × and × (b)–, × and ÷ (c) × –, and ÷ (d) × ÷, and –

24. 8 * 8 * 1 * 7 = 8

(a) × ÷ + (b) + ÷ × (c) ÷ × + (d) + × ÷

25. Replace # sign with the mathematical operators '+', '÷' and '–' and '=' to get a balanced equation out of **(27 # 15 # 2) # 10 # 4**.

Choose the right sequence from below.

(a) + ÷ = – (b) – + = ÷ (c) + – ÷ = (d) + = ÷ –

26. If 4 × 6 × 2 = 351 and 3 × 9 × 8 = 287 , then 9 × 5 × 6 = ?

(a) 270 (b) 845 (c) 596 (d) 659

27. If 5 × 3 × 9 = 395 and 9 × 7 × 5 = 759 , then 7 × 6 × 4 = ?

(a) 676 (b) 476 (c) 647 (d) 764

28. If 2463 = 36 and 5552 = 30, then 6732 = ?

(a) 32 (b) 36 (c) 34 (d) 39

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

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

30. If 2 = 6, 4 = 12 and 8 = 24, then 10 = ?

(a) 30 (b) 20 (c) 15 (d) 2

ANSWERS

1.	(d)	**2.**	(c)	**3.**	(a)	**4.**	(a)	**5.**	(b)	**6.**	(a)	**7.**	(b)	**8.**	(d)	**9.**	(b)	**10.**	(a)
11.	(d)	**12.**	(a)	**13.**	(b)	**14.**	(a)	**15.**	(d)	**16.**	(b)	**17.**	(a)	**18.**	(c)	**19.**	(b)	**20.**	(a)
21.	(b)	**22.**	(d)	**23.**	(c)	**24.**	(c)	**25.**	(c)	**26.**	(b)	**27.**	(c)	**28.**	(a)	**29.**	(c)	**30.**	(a)

Hints & Solutions:

1. (d) Given, $25 + 18 - 3 \times 7 \div 3 = ?$

$$\downarrow \quad \downarrow \quad \downarrow$$

$$= 25 - 18 \div 3 + 7 \times 3$$

$$= 25 - 6 + 7 \times 3$$

$$= 25 - 6 + 21 = 19 + 21 = 40$$

2. (c) Using the correct symbols, we have given expression

$$= 26 \times 74 \div 4 - 5 + 2 = 26 \times \frac{37}{2} - 5 + 2$$

$$= 13 \times 37 - 5 + 2 = 481 - 5 + 2 = 478$$

3. (a) Given, $9 + 8 \div 8 - 4 \times 8\ 8\ 4\ 9$

$$\downarrow \quad \downarrow \quad \downarrow \quad \downarrow$$

$$9 \times 8 + 8 \div 4 - 9$$

$$= 9 \times 8 + 2 - 9 = 72 + 2 - 9$$

$$= 74 - 9 = 65$$

4. (a) Using the correct symbols, we have given expression $54 - 16 \times 3 + 6 \div 2$

$$\Rightarrow 54 - 48 + 3 \Rightarrow 57 - 48 = 9$$

5. (b) Given, 48 P 8 Q 6 R 9 S 31

$$\downarrow \quad \downarrow \quad \downarrow \quad \downarrow$$

$$48 \div 8 + 6 \times 9 - 31$$

$$= \frac{48}{8} + 6 \times 9 = 6 + 54 - 31 = 60 - 31 = 29$$

6. (a) Using the correct symbols, we have given expression $18 \times 14 + 6 - 16 \div 4$

$\Rightarrow 252 + 6 - 4 \Rightarrow 252 + 2 = 254$

7. (b) Given, 10 R 192 P 48 S 48 P 96 Q 1

$\downarrow \quad \downarrow \quad \downarrow \quad \downarrow \quad \downarrow$

$= 10 - 192 \div 48 \times 48 \div 96 + 1$

$= 10 - 4 \times \frac{48}{96} + 1$

$= 10 - 4 \times \frac{1}{2} + 1$

$= 10 - 2 + 1 = 8 + 1 = 9$

8. (d) Using the proper notations in option (d), we get the statement as

$= 8 \times 8 + 8 \div 8 - 8 = 64 + 1 - 8 = 65 - 8 = 57$

9. (b) Using the proper notations in option (b), we get the statement as $70 \div 2 - 4 \times 5 + 6$

$\Rightarrow 35 - 20 + 6 \Rightarrow 41 - 20 = 21 = \text{RHS}$

10. (a) Using the proper notation in option (a), we get the statement as $30 \div 6 \times 5 + 4 - 2$

$\Rightarrow 5 \times 5 + 2$

$\Rightarrow 25 + 2 = 27 = \text{RHS}$

11. (d) From option (d), $42 \div 4 + 2 - 3 \times 5 = 29$

$\downarrow \quad \downarrow$

$42 + 4 \div 2 - 3 \times 5 = 29$

$\text{LHS} = 42 + 2 - 3 \times 5 = 42 + 2 - 15$

$= 44 - 15 = 29 = \text{RHS}$

12. (a) On interchanging $\times$ and $+$, we get

Given expression $= 2 + 3 \times 6 - 12 \div 4$

$= 2 + 3 \times 6 - 3 = 2 + 18 - 3 = 17$

13. (b) On interchanging − and +, we get

Given expression = 12 ÷ 2 + 6 × 3 − 8

= 6 + 6 × 3 − 8 = 6 + 18 − 8 = 16

14. (a) On interchanging ÷ and ×, we get the equation as, 5 + 6 × 3 − 12 ÷ 2

⇒ 5 + 18 − 6

⇒ 23 − 6 = 17 = RHS

15. (d) On interchanging 3 and 5, we get the equation as 8 × 20 ÷ 5 + 9 − 3

⇒ 8 × 4 + 6

⇒ 32 + 6 = 38 = RHS

16. (b) On interchanging + and ÷ we get the equation as, (18 + 9) ÷ 3 × 5

⇒ 27 ÷ 3 × 5

⇒ 9 × 5 = 45 = RHS

17. (a) Given, 17 ÷ 7 − 27 + 7 × 37

↓ ↓ ↓ ↓

17 + 7 × 27 ÷ 7 − 37

$= 17 + 7 \times \frac{27}{7} - 37$

= 17 + 27 − 37 = 44 − 37 = 7

18. (c) On interchanging + and × and 4 and 5 in option (c), we get the equation as

4 + 5 × 20 = 104 = RHS

19. (b) On interchanging − and × and 3 and 6 in option (b) we get the equation as

6 × 3 − 8 = 10

⇒ 18 − 8 = 10 = RHS

20. (a) From option (a) $65 - 40 + 11 = 76 - 40$

$= 36 = \text{RHS}$

21. (b) From option (b), $6 \times 5 + 4 \Rightarrow 30 + 4 = 34 = \text{RHS}$

22. (d) From option (d), $27 \times 3 + 19 - 10 = 90$

$\Rightarrow 81 + 19 - 10 = 90$

$\Rightarrow 100 - 10 = 90$

$\Rightarrow 90 = 90$

23. (c) From option (c), $7 \times 4 - 8 \div 2$

$\Rightarrow 28 - 4 = 24 = \text{RHS}$

Hence, option (c) is correct.

24. (c) From option (c), $8 \div 8 \times 1 + 7 \Rightarrow 1 \times 1 + 7$

$\Rightarrow 1 + 7 = 8 = \text{RHS}$

Hence, option (c) is correct.

25. (c) From option (c),

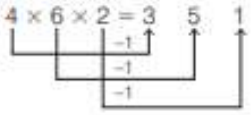
$(27 \# 15 \# 2) \# 10 \# 4$

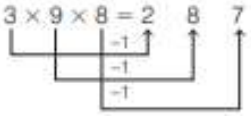
$\Rightarrow (27 + 15 - 2) \div 10 = 4$

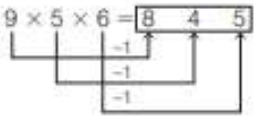
$\Rightarrow (42 - 2)\ 10 \div 4 = 42$

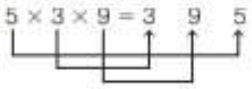
$\Rightarrow 40 \div 10 = 4$

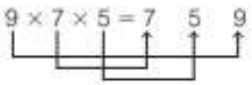
$\Rightarrow 4 = 4$

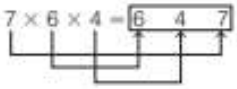
26. (b) As, 

and 

Similarly, 

27. (c) As, 

and 

Similarly, 

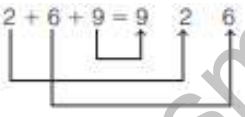
28. (a) As, 2463 = (2 + 4 + 6) × 3

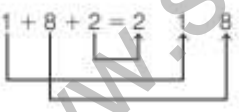
= 12 × 3 = 36

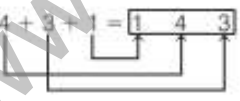
and 5552 = (5+ 5 + 5 × 2)

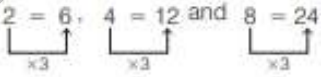
= 15 × 2 = 30

Similarly, 6732 (6 +7+ 3 +2) × 2 = 32

29. (c) As, 

and 

Similarly, 

30. (a) As, 

Similarly,