

## Mixed operations involving +, -, ×, and ÷

Till now we have solved problems involving only one type of operation, that is, one of the following: addition, subtraction, division, and multiplication. But what do we do if a problem involves two or more operations together? Consider the following problem:

### Mixed operations

#### 1st Case

$$\begin{aligned} &16 - 6 + 2 - 3 \\ &= 10 + 2 - 3 \\ &= 12 - 3 \\ &= 9 \end{aligned}$$

#### 2nd Case

$$\begin{aligned} &16 - 6 + 2 - 3 \\ &= 16 - 8 - 3 \\ &= 8 - 3 \\ &= 5 \end{aligned}$$

When a problem involves all the operations namely, +, -, ×, and ÷, then there is an agreed formula denoted by 'DMAS', which mathematicians follow. In 'DMAS', D stands for division, M for multiplication, A for addition, and S for subtraction. DMAS represents the order of operations.

For example, consider the following cases

#### (a) Simplify: $5 + 4 \times 3 - 9 \div 3$

In the above example, all the four operations are there, so we must use DMAS rule, as shown below:  $5 + 4 \times 3 - 9 \div 3$

$$\begin{aligned} &= 5 + 4 \times 3 - 3 \quad (\text{Division: } 9 \div 3 = 3) \\ &= 5 + 12 - 3 \quad (\text{Multiplication: } 4 \times 3 = 12) \\ &= 17 - 3 \quad (\text{Addition: } 5 + 12 = 17) \\ &= 14 \quad (\text{Subtraction: } 17 - 3 = 14) \end{aligned}$$

#### (b) Simplify: $7 \times 3 - 4 + 60 \div 10$

In this example too, all the four operations are there, hence, to simplify this we must use DMAS rule.  $7 \times 3 - 4 + 60 \div 10$

$$\begin{aligned} &= 7 \times 3 - 4 + 6 \quad (\text{Division: } 60 \div 10 = 6) \\ &= 21 - 4 + 6 \quad (\text{Multiplication: } 7 \times 3 = 21) \\ &= 27 - 4 \quad (\text{Addition: } 21 + 6 = 27) \\ &= 23 \quad (\text{Subtraction: } 27 - 4 = 23) \end{aligned}$$

**(c) Simplify:  $7 + 3 \times 4 - 3$**

In the above example, the three operations involved are +, -, and  $\times$ . To solve this problem, we first multiply the numbers, then we go for addition, and at the end we subtract.

$$\begin{aligned} &7 + 3 \times 4 - 3 \\ &= 7 + 12 - 3 \text{ (Multiplication: } 3 \times 4 = 12\text{)} \\ &= 19 - 3 \text{ (Addition: } 7 + 12 = 19\text{)} \\ &= 16 \text{ (Subtraction: } 19 - 3 = 16\text{)} \end{aligned}$$

**(d) Simplify:  $16 - 6 \div 2 + 8$**

In the above example, the three operations involved are +, -, and  $\div$ . To solve this problem, we first divide, then add, and at the end subtract the number.  $16 - 6 \div 2 + 8$

$$\begin{aligned} &= 16 - 3 + 8 \text{ (Division: } 6 \div 2 = 3\text{)} \\ &= 24 - 3 \text{ (Addition: } 16 + 8 = 24\text{)} \\ &= 21 \text{ (Subtraction: } 24 - 3 = 21\text{)} \end{aligned}$$

**(e) Simplify:  $24 - 4 \div 2 \times 3$**

$$\begin{aligned} &24 - 4 \div 2 \times 3 \\ &= 24 - 2 \times 3 \text{ [Performing division } 4 \div 2 = 2\text{]} \\ &= 24 - 6 \text{ [Performing multiplication } 2 \times 3 = 6\text{]} \\ &= 18. \text{ [Performing subtraction } 24 - 6 = 18\text{]} \end{aligned}$$

**(f) Simplify:  $48 \div 8 \times 3 + 2$**

$$\begin{aligned} &48 \div 8 \times 3 + 2 \\ &= 6 \times 3 + 2 \text{ [Performing division } 48 \div 8 = 6\text{]} \\ &= 18 + 2 \text{ [Performing multiplication } 6 \times 3 = 18\text{]} \\ &= 20. \text{ [Performing addition } 18 + 2\text{]} \end{aligned}$$

**(g) Simplify:  $(-20) + (-8) \div (-2) \times 3$**

$$\begin{aligned} &(-20) + (-8) \div (-2) \times 3 \\ &= (-20) + 4 \times 3 \text{ [Performing division } (-8) \div (-2) = 4\text{]} \\ &= (-20) + 12 \text{ [Performing multiplication } 4 \times 3 = 12\text{]} \\ &= -8. \text{ [Performing subtraction } -20 + 12 = -8\text{]} \end{aligned}$$

**(h) Simplify:  $52 - (2 \times 6) + 17$**

$$\begin{aligned} &52 - (2 \times 6) + 17 \\ &= 52 - 12 + 17 \\ &= 52 + 17 - 12 \\ &= 57 \end{aligned}$$

**(i) Simplify:  $(-5) - (-48) \div (-16) + (-2) \times 6$**

$$\begin{aligned} & (-5) - (-48) \div (-16) + (-2) \times 6 \\ & = (-5) - 3 + (-2) \times 6 \text{ [Performing division } (-48) \div (-16) = 48 \div 16 = 3\text{]} \\ & = (-5) - 3 + (-12) \text{ [Performing multiplication } (-2) \times 6 = -12\text{]} \\ & = -5 - 3 - 12 \\ & = -8 - 12. \text{ [Performing addition } -5 - 3 = -8\text{]} \\ & = -20 \text{ [Performing addition } -8 - 12 = -20\text{]} \end{aligned}$$

**(j)  $42 \div 2 + a \times 3 - 22 = 8$**

$$\begin{aligned} & 42 \div 2 + a \times 3 - 22 = 8 \\ & \text{Using DMAS, we will first work on the division} \\ & 21 + a \times 3 - 22 = 8 \\ & \text{Next, we will do the rearrangement of terms, followed by subtraction} \\ & a \times 3 - 22 + 21 = 8 \\ & a \times 3 - 1 = 8 \\ & \text{Taking -1 to the other side} \\ & a \times 3 = 8 + 1 \\ & a \times 3 = 9 \\ & a = 9/3 \\ & a = 3 \end{aligned}$$

**The BODMAS Hierarchy**

Letter	Operation	Description
B	Brackets	Solve everything inside ( ), { }, or [ ] first.
O	Orders	Solve exponents, powers, or roots (e.g., $3^2$ , $\sqrt{16}$ ).
D	Division	Perform division.
M	Multiplication	Perform multiplication.
A	Addition	Perform addition.
S	Subtraction	Perform subtraction.

**Crucial Tips for Success**

- **Equal Priority:** Division and Multiplication hold the *same* level of importance. When you have both in an expression, solve them **from left to right**, exactly as they appear.
- **The Same for A and S:** Similarly, Addition and Subtraction have the same priority. Solve them **from left to right**.
- **Other Acronyms:** You may hear of **BIDMAS** (where 'I' stands for Indices) or **PEMDAS** (used in the US, where 'P' stands for Parentheses and 'E' for Exponents). These follow the exact same mathematical logic; only the terminology differs

- 1)  $784 \div 14 + 598 \div 13 + ? = 99\%$  of 2500  
 a) 2475      b) 2373  
 c) 2285      d) 2565  
 e) None of these
- 2)  $221 \div 13 \times \sqrt{576} + 10^2 = ?$   
 a) 628      b) 428  
 c) 408      d) 508  
 e) None of these
- 3)  $15^2 + 12^2 = 11^2 + ?$   
 a) 258      b) 248  
 c) 262      d) 282  
 e) None of these
- 4)  $6 \times 6 \times 6 \times 6 \times 6 + 6 \times 6 \times 6 \times 6 = 81 \times 3.5 \times ?$   
 a) 64      b) 16  
 c) 32      d) 16  
 e) None of these
- 5)  $18 \frac{1}{3}$  of 18 +  $19 \frac{1}{4}$  of 28 = 5.5 X ?  
 a) 198      b) 68  
 c) 158      d) 136  
 e) None of these
- 6)  $3^{-2} + 22 \frac{2}{9} \%$  of 364 = ?  
 a) 243      b) 57  
 c) 105      d) 81  
 e) None of these
- 7)  $\sqrt{1024} \times \left(\frac{1}{2^{-5}}\right) + 8^2 \times 4 = ? \times 2^6$   
 a) 12      b) 34  
 c) 6      d) 36  
 e) None of these
- 8)  $3 \frac{2}{3} \times 4 \frac{1}{5} \times \frac{3 \frac{1}{5}}{2 \frac{1}{5}} = ?$   
 a) 54.2      b) 68.4  
 c) 22.4      d) 44.8  
 e) None of these
- 9)  $15^2 + 17^2 - ? = 21^2$   
 a) -63      b) -53  
 c) 53      d) 73
- e) None of these
- 10)  $0.5 \times 8.4 + 3.5 \times 12.2 + 0.25 \times 10^2 = ?$   
 a) 128.1      b) 71.9  
 c) 52.7      d) 107.9  
 e) None of these
- 11)  $9 \times 9 \times 9 + 6 \times 6 \times 6 = (1.5)^2 \times 35 \times 8$   
 a) 6      b) 9  
 c) 3      d) 1.5      e) None of these
- 12)  $0.005 \times 10^5 \times 33 - ? = (60)^2$   
 a) 13500      b) 1230  
 c) -1950      d) 12900      e) None of these
- 13)  $\frac{3}{5}$  of  $\frac{4}{7}$  of  $\frac{2}{3}$  of  $875 \div 5^{-1} = ?$   
 a) 1500      b) 200  
 c) 1000      d) 40  
 e) None of these
- 14)  $11 \times ? \times 19 = 19^3 - 37 \times 95$   
 a) 24      b) 8  
 c) 22      d) 16  
 e) None of these
- 15)  $15 \times 15 \times 15 + 45^2 = 3^2 \times ?$   
 a) 1800      b) 200  
 c) 600      d) 900  
 e) None of these
- 16)  $5 \frac{1}{3}$  of 5 +  $373 \frac{1}{3}$  of 1 + ? =  $5^2 \times 4^2$   
 a) 200      b) -200  
 c) 0      d) -400  
 e) None of these
- 17)  $333 \div 18.5 + 10^4 \div 2^4 + 10^2 = ?$   
 a) 848      b) 743  
 c) 924      d) 683  
 e) None of these

18)  $5\frac{1}{5}\%$  of 3000 +  $6\frac{1}{3}\%$  of 3000 = ?

- a) 35600 b) 3800  
c) 346 d) 848  
e) None of these

19)  $56\%$  of 2400 –  $82\%$  of 6000 = ? –  $32\%$  of 1800

- a) – 2400 b) – 3000  
c) 2400 d) 3000  
e) None of these

20)  $16^{4.5} \times 4^{6.3} \times 8^{2.1} \div 2^{9.2} \times 32^{0.64} = 8^{2.3+?}$

- a) 9 b) 7  
c) 8 d) 3 e) 10

21)  $\frac{1}{6}$  of 355 of  $\frac{1}{5}$  of 2160 +  $\sqrt{3969}$  - 448.98 = ?

- a) 25424.02 b) 18436.02  
c) 26834.02 d) 25174.02  
e) None of these

22)  $? = \frac{1224}{44} \times \frac{220}{23} \div \frac{340}{414}$

- a) 316 b) 324  
c) 336 d) 354 e) 386

23) If X = 10, Y = 7, then  $\frac{(X-Y)^4 - 18}{7} \times \frac{9X}{10Y - 6X} = ?$

- a) 44 b) 113  
c) 66 d) 81 e) 69

24)  $3990 \div \sqrt{57} + \sqrt{361} + \sqrt{324} = ?^2 \times 535 \div 729 \times 5$

- a) 6.2 b) 4.5  
c) 5.6 d) 6.4  
e) None of these

25)  $[(2211 \div 67)^2 - 21 \times \sqrt{256}] \div (549 - 213) = ? \div 1344$

- a) 3052 b) 3012  
c) 3042 d) 3062  
e) 3032

26)  $784 \div \sqrt{196} + 25.6 \div 2 \times 1.5 \div \sqrt{8100} \times 3 = ?$

- a) 66.64 b) 76.54 c) 56.64 d) 72.64 e) 76.46

27)  $?^2\%$  of 11.11% of 256 X 1872  $\div$  2704 = 81

- a) 9.75 b) 10.50  
c) 11.25 d) 12.75  
e) None of these

28)  $3\frac{4}{7} \div [(62\% \text{ of } 620 \times 7) \div 2401] = ?^2$

- a)  $\frac{25}{61}$  b)  $(\frac{35}{62}) \times \sqrt{10}$   
c)  $(\frac{32}{75}) \times \sqrt{10}$  d)  $\frac{52}{83}$

- e) None of these

29)  $(6561 \times 117) \div 108 \times \sqrt{36} = 3^{?+4} \div 216^{\frac{1}{3}} \times 39$

- a) 10 b) 6  
c) 4 d) 8 e) 2

30)  $13\frac{7}{5} \div (512^{\frac{1}{3}} \div \sqrt{1225}) [\frac{2}{4} + \frac{3}{7} (\frac{17}{3} \div \frac{68}{10})] = ?547310$

- a) 65 b) 45  
c) 74 d) 84  
e) None of these

31)  $(2^{12} - 3^9) \times (3^6 - 9^3) + 11^2 = ?$

- a) 12251 b) 17781  
c) 91641 d) 72361  
e) None of these

32)  $(37.5 \times 22 \times 48) \div 2^4 - ? = 11^3$

- a) 1234 b) 1144  
c) 1284 d) 1384  
e) 1674

33)  $(47 + 47 + 47 + 47 + 47 + 47) \times 5 \times (47 + 47) \times 6 \div (47 \times 2) = 47 \times ?$

- a) 47 X 180 b) 47 X 90 c) 90  
d) None of these e) 124

34)  $2\sqrt{3} \times 3\sqrt{8} \times 2\sqrt{27} \times 2\sqrt{2} = 2^4 \times ?$

- a) 18 b) 54 c) 9  
d) 27 e) None of these

35)  $17^2 + 19^2 + ? = 21^2 + 15^2$

- a) – 16 b) 0 c) 32

d) 36

e) 16

36)  $\frac{1}{1 \times 6} + \frac{1}{6 \times 11} + \frac{1}{11 \times 16} + \frac{1}{16 \times 21} = ?$

a)  $\frac{3}{21}$

b)  $\frac{8}{42}$

c)  $\frac{2}{21}$

d)  $\frac{20}{21}$

e) none of these

37)  $(5175 \div 23)^{\frac{1}{2}} + (72 \times 2)^{\frac{1}{2}} = (?)^{\frac{1}{2}}$

a) 26

b) 29

c) 729

d) 841

e) None of these

38)  $641.23 - 228.48 - 124.21 = ?$

a) 378.54

b) 278.54

c) 288.54

d) 298.54

e) None of these

39)  $\frac{\sqrt{3}+1}{\sqrt{3}-1} \times 20^2 - 3^{\frac{1}{2}} \times 2^2 \times 10^2 = ? \times 10$

a) 30

b) 20

c) 90

d) 120

e) None of these

40)  $\sqrt{15 + \sqrt{?}} = 3^{\frac{3}{2}}$

a) 12

b) 13

c) 169

d) 144

e) None of these

41)  $61\% \text{ of } 550 - ?\% \text{ of } 250 = 3^5$

a) 32

b) 28

c) 37

d) 44

e) None of these

42)  $5 \times ? = 735 \div 3$

a) 39

b) 59

c) 43

d) 49

e) 53

43)  $\frac{4}{7} \times \frac{9}{14} \div \frac{16}{21} \times ? = 1$

a)  $\frac{27}{56}$

b)  $2\frac{4}{27}$

c)  $1\frac{9}{27}$

d)  $2\frac{2}{27}$

e) None of these

44)  $19\% \text{ of } 250 + ? = 2^7$

a) 85.5

b) 75.5

c) 80.5

d) 70.5

b) e) None of these

45)  $(6 \times 6 \times 6 \times 6 \times 6)^5 \times (9 \times 9 \times 9)^5 \div (18 \times 18 \times 18)^3 = 2^{16} \times 3^?$

a) 36

b) 39

c) 37

d) 41

e) 43

46)  $50\% \text{ of } (13\frac{1}{10} + 11\frac{1}{10}) = ?$

a) 16.2

b) 20.1

c) 12.1

d) 6.50

e) None of these

47)  $\sqrt{729} \div 45 \times 720 + ? = 30^2$

a) 512

b) 468

c) 528

d) 498

e) None of these

48)  $9\frac{3}{8} \times 7\frac{3}{5} \times ? = 15^2$

a)  $2\frac{2}{19}$

b)  $4\frac{6}{19}$

c)  $4\frac{1}{19}$

d)  $3\frac{3}{19}$

e) None of these

49)  $600\% \text{ of } \sqrt{\frac{180 \times 81}{5}} \times 12 \div 3^{-1} = ?^2$

a) 108

b) 72

c) 144

d) 96

e) None of these

50)  $16\frac{2}{3}\% \text{ of } (2.8 \times 6 + 5.4 \times 9) = 10^{-1} \times ?$

a) 10.7

b) 107

c) 126

d) 119

e) None of these