

# CDS-AFCAT 1 2025

SSBCrack  
EXAMS

LIVE

# MATHS

## RATIO & PROPORTION

CLASS 3

NAVJYOTI SIR



# MIXTURE

2 or more substances are mixed in some ratio or proportion.

Eg - milk & water,  
alcohol & water

# CONCENTRATION

→ calculated in percentage for each substance present in a mixture.

$$\text{Milk} : \text{water} = 11 : 9$$

$$\text{conc. of milk} = \frac{11}{11+9} \times 100 = 55\%$$

$$\text{conc. of water} = 100 - 55\% = \underline{45\%}$$

# REPLACEMENT OF MIXTURE

400 L milk,

① 20% is removed and 20% water is added,

$$\underbrace{\quad}_{-\frac{1}{5} = 80L} \quad \left| \begin{array}{l} -80L - \text{milk} \\ +80L - \text{water} \end{array} \right.$$

② -80L milk and +80L water

Same quantity  
is replaced in  
each step

$$\neq \text{ Pure milk in mixture} = 400L \left(1 - \frac{1}{5}\right) \left(1 - \frac{1}{5}\right) = 400 \times \frac{4}{5} \times \frac{4}{5} = \underline{256L}$$

$$\neq \text{ Water in mixture} = 400L - 256L = \underline{144L}$$

# REPLACEMENT OF MIXTURE

400 L

$$\textcircled{1} \quad 20\% \text{ removed} \quad \left| \begin{array}{l} -80 \text{ L milk} \left(-\frac{1}{5}\right) \\ +80 \text{ L water} \end{array} \right.$$

$$\textcircled{2} \quad 10\% \text{ removed} \quad \left| \begin{array}{l} -40 \text{ L milk} \left(-\frac{1}{10}\right) \\ +40 \text{ L water} \end{array} \right.$$

$$\textcircled{3} \quad 40\% \text{ removed} \quad \left| \begin{array}{l} -160 \text{ L milk} \left(-\frac{2}{5}\right) \\ +160 \text{ L water} \end{array} \right.$$

final mixture

$$\text{Milk} = 400 \left(\frac{4}{5}\right) \left(\frac{9}{10}\right) \left(\frac{3}{5}\right)$$

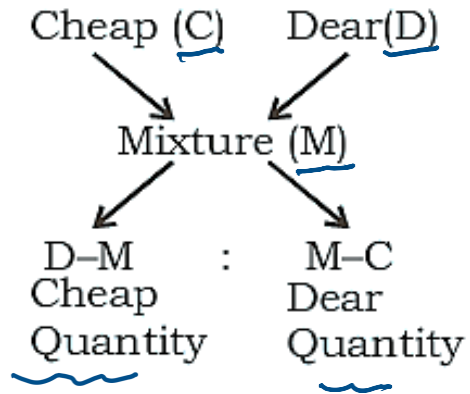
$$\text{Water} = 400 - 400 \left(\frac{4}{5}\right) \left(\frac{9}{10}\right) \left(\frac{3}{5}\right)$$

# ALLIGATION CONCEPT

The cost of cheap object is Rs. C/kg and the cost of dear object is Rs. D/kg. If the mixture of both object costs Rs. M/kg then

(costlier)

$$\frac{\text{Cheap object}}{\text{Dear object}} = \frac{D - M}{M - C} \quad \checkmark$$



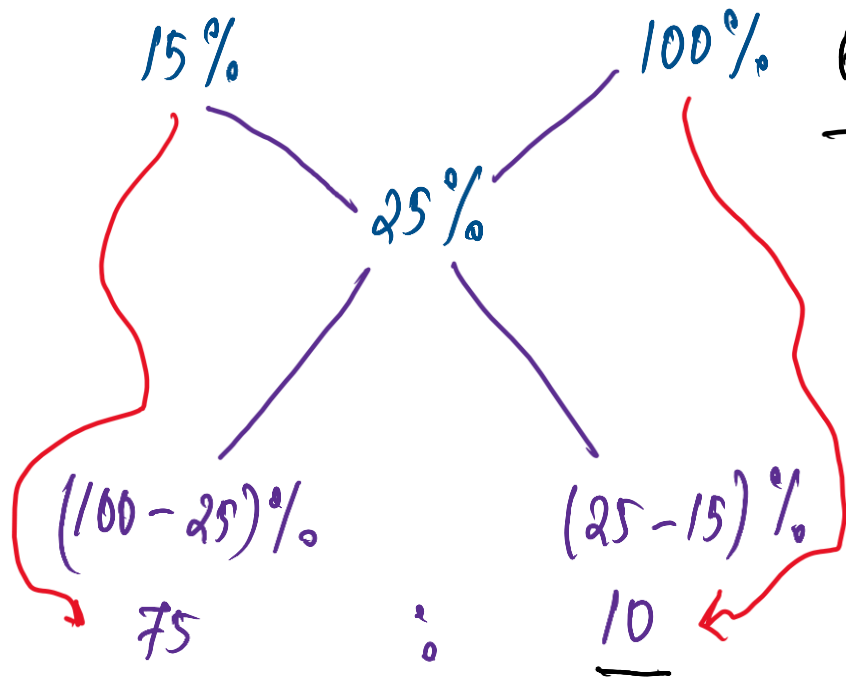
Q) How many litres of pure alcohol must be added to 10 litres of mixture which is 15% alcohol to make a mixture which will be 25% alcohol?

(a)  $\frac{5}{4}$

(b)  $\frac{5}{2}$

(c)  $\frac{3}{4}$

(d)  $\frac{4}{3}$



$$\frac{\text{Qty of } 15\%}{\text{Qty of } 100\%} = \frac{75}{10} = \frac{15}{2} = 15:2$$

$$\frac{\text{Qty of } 100\% \text{ alcohol in } 10 \text{ L}}{\frac{2}{15} \times 10 = \frac{4}{3}}$$

**Q)** How many litres of pure alcohol must be added to 10 litres of mixture which is 15% alcohol to make a mixture which will be 25% alcohol?

- (a)  $\frac{5}{4}$       (b)  $\frac{5}{2}$       (c)  $\frac{3}{4}$       (d)  $\frac{4}{3}$

**Ans: (d)**



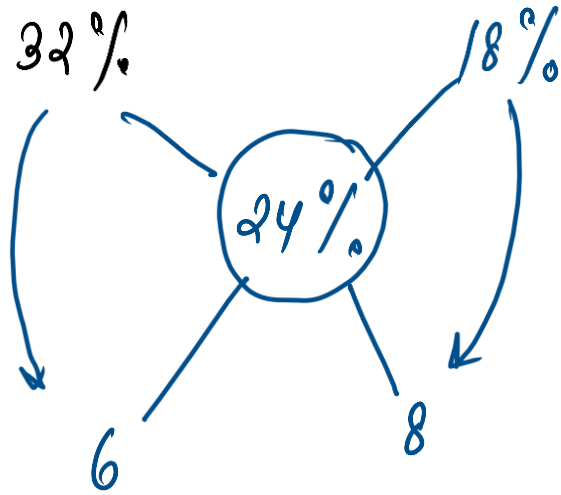
**Q)** A butler stole wine from a butt of sherry which contained 32% of spirit and then replaced what he stole, by wine containing only 18% spirit. The butt was then of 24% strength only. How much of the butt had he stolen?

(a)  $\frac{3}{8}$

(b)  $\frac{5}{7}$

(c)  $\frac{4}{7}$

(d)  $\frac{7}{11}$



$$\frac{\text{Qty of } 32\%}{\text{Qty of } 18\%} = \frac{6}{8} = \frac{3}{4}$$

$$\text{stolen} = 1 - \frac{3}{7} = \frac{4}{7}$$

$$\text{Quantity of } 32\%, \text{ now after theft} = \frac{3}{7}$$

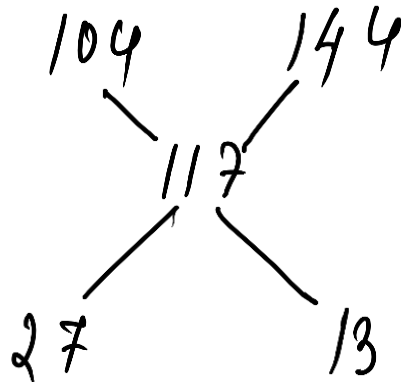
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- (a)  $\frac{3}{8}$       (b)  $\frac{5}{7}$       (c)  $\frac{4}{7}$       (d)  $\frac{7}{11}$

**Ans: (c)**

**Bottle 1** contains a mixture of milk and water in 7:2 ratio and **Bottle 2** contains a mixture of milk and water in 9:4 ratio. In what ratio of volumes should the liquids in bottle 1 and bottle 2 be combined to obtain a mixture of milk and water in 3:1 ratio ?

$$\left. \begin{array}{l} \frac{2}{9} \text{ (water in bottle 1)} \\ \frac{4}{13} \text{ (water in bottle 2)} \end{array} \right\} 9 \times 13 \times 4$$
$$\frac{1}{4} \text{ (water in new mixture)}$$



27 : 13

Q) The train fare and bus fare between two stations is in the ratio 3 : 4. If the train fare increases by 20% and bus fare increase by 30%, then what is the ratio between revised train fare and revised bus fare?

- (a)  $\frac{9}{13}$       (b)  $\frac{17}{12}$       (c)  $\frac{32}{43}$       (d)  $\frac{19}{21}$

$$\frac{\left[ \cancel{3} \times \left( \frac{\cancel{12}^3}{\cancel{10}} \right) \right]}{\left[ \cancel{4} \times \left( \frac{\cancel{13}}{\cancel{10}} \right) \right]} = \frac{9}{13}$$

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- (a)  $\frac{9}{13}$       (b)  $\frac{17}{12}$       (c)  $\frac{32}{43}$       (d)  $\frac{19}{21}$

**Ans: (a)**

Q) Given  $y$  is inversely proportional to  $\sqrt{x}$ , and  $x = 36$  when  $y = 36$ . What is the value of  $x$  when  $y = 54$ ?

- (a) 54                      (b) 27                      (c) 16                      (d) 8

$$y \propto \frac{1}{\sqrt{x}}$$

$$54 = \frac{216}{\sqrt{x}}$$

$$y = \frac{k}{\sqrt{x}}$$

$$\sqrt{x} = \frac{216}{54} = \frac{36}{9} = 4$$

$$36 = \frac{k}{\sqrt{36}} \Rightarrow k = 36 \times 6 = \underline{216}$$

$$x = 16$$

**Q)** Given  $y$  is inversely proportional to  $\sqrt{x}$ , and  $x = 36$  when  $y = 36$ . What is the value of  $x$  when  $y = 54$ ?

- (a) 54            (b) 27            (c) 16            (d) 8

**Ans: (c)**

Q) If  $a : b = c : d = 1 : 6$ , then what is the value of  $\frac{a^2 + c^2}{b^2 + d^2}$ ?

- (a)  $\frac{1}{600}$       (b)  $\frac{1}{60}$       (c)  $\frac{1}{36}$       (d)  $\frac{1}{6}$

$$\frac{a}{b} = \frac{1}{6}$$

$$\frac{c}{d} = \frac{1}{6}$$

$$a = x \quad b = 6x$$

$$c = y \quad ; \quad d = 6y$$

$$\frac{x^2 + y^2}{(6x)^2 + (6y)^2}$$

$$\frac{x^2 + y^2}{36x^2 + 36y^2} = \frac{1}{36}$$



$$\frac{a}{b} = \frac{c}{d} = \frac{e}{f} = \dots$$

$$\Rightarrow \frac{a+c+e \dots}{b+d+f \dots} = \frac{a}{b} / \frac{c}{d} / \frac{e}{f}$$

$$\Rightarrow \frac{a^2+c^2+e^2}{b^2+d^2+f^2} = \left(\frac{a}{b}\right)^2 / \left(\frac{c}{d}\right)^2 / \left(\frac{e}{f}\right)^2 \dots$$

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- (a)  $\frac{1}{600}$       (b)  $\frac{1}{60}$       (c)  $\frac{1}{36}$       (d)  $\frac{1}{6}$

Ans: (c)

Q) A and B start an enterprise together, with A as active partner. A invests ₹ 4000 and ₹ 2000 more after 8 months. B invests ₹ 5000 and withdraws ₹ 2000 after 9 months. Being the active partner, A takes ₹ 100 per month as allowance, from the profit. What is the share of B if the profit for the year is ₹ 6700?

- (a) ₹ 3350 (b) ₹ 3250 (c) ₹ 2700 (d) ₹ 2800

$$\text{Inv. by A} = (4000 \times 8) + (4000 + 2000) \times 4 = 56000$$

$$\text{" " B} = (5000 \times 9) + (3000 \times 3) = 54000$$

$$\text{Ratio of profits} = \frac{56000}{54000} = \frac{56}{54} = \left(\frac{28}{27}\right)$$

Actual profit at end  
of year

$$6700 - (100 \times 12)$$

$$= \underline{5500}$$

$$\frac{27}{27+28} \times 5500 = \frac{27}{55} \times 5500$$

$$= \underline{2700}$$

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- (a) ₹ 3350   (b) ₹ 3250   (c) ₹ 2700   (d) ₹ 2800

**Ans: (c)**

Q) A milk vendor bought 28 litres of milk at the rate of ₹ 8.50 per litre. After adding some water he sold the mixture at the same price. If his gain is 12.5%, how much water did he add?

- (a) 4.5 litres  
(c) 3.5 litres

- (b) 4 litres  
(d) 3 litres

'x' L

$$\frac{(28+x) \times 8.50 - 28(8.50)}{28(8.50)} \times 100 = 12.5$$

$$\frac{x}{28} \times 100 = 12.5$$

$$x = \frac{12.5 \times 28}{100} = \frac{3.5 \times 2}{1} = 3.5 \text{ L}$$

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(c) 3.5 litres                      (d) 3 litres

**Ans: (c)**

**Q)** If  $A : B = 1 : 2$ ,  $B : C = 3 : 4$ ,  $C : D = 2 : 3$  and  $D : E = 3 : 4$ ,  
then what is  $B : E$  equal to?

- (a)  $3 : 2$       (b)  $1 : 8$       (c)  $3 : 8$       (d)  $4 : 1$

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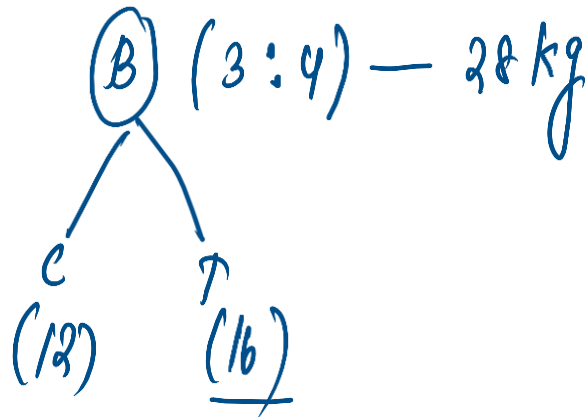
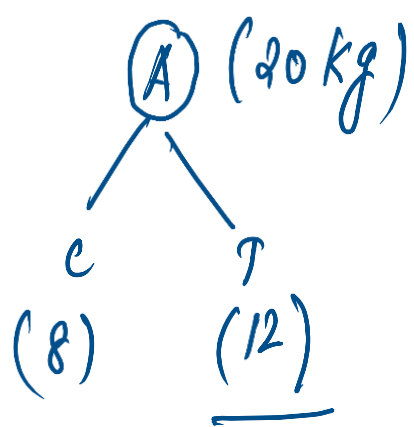
- (a)  $3 : 2$       (b)  $1 : 8$       (c)  $3 : 8$       (d)  $4 : 1$

Ans: (c)



Q) An alloy  $A$  contains two elements, copper and tin in the ratio of  $2 : 3$ , whereas an alloy  $B$  contains the same elements in the ratio of  $3 : 4$ . If  $20$  kg of alloy  $A$ ,  $28$  kg of alloy  $B$  and some more pure copper are mixed to form a third alloy  $C$  which now contains copper and tin in the ratio of  $6 : 7$ , then what is the quantity of pure copper mixed in the alloy  $C$ ?

- (a) 3 kg      (b) 4 kg      (c) 5 kg      (d) 7 kg



$x$  kg — pure copper,

$$\frac{8 + 12 + x}{12 + 16} = \frac{6}{7}$$

$$140 + 7x = 168$$

$$7x = 28$$

$$x = 4 \text{ kg}$$

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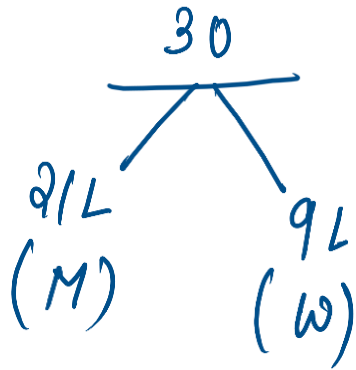
**Ans: (b)**

Q) In a mixture of milk and water of volume 30 litre, the ratio of milk and water is 7 : 3. The quantity of water to be added to the mixture to make the ratio of milk and water 1 : 2 is

- (a) 30  
(c) 33

- (b) 32  
(d) 35

x 'L'



$$\frac{21 \cdot}{9 + x} = \frac{1}{2}$$

$$42 = 9 + x$$

$$x = 33$$

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- (a) 30  
(c) 33

- (b) 32  
(d) 35

**Ans: (c)**

Q) The sides of a triangle are in the ratio  $\frac{1}{2} : \frac{1}{3} : \frac{1}{4}$ . If its perimeter is 52 cm, then what is the length of the smallest side?

- (a) 9 cm                                      (b) 10 cm  
(c) 11 cm                                      (d) 12 cm

$$\frac{1}{2} : \frac{1}{3} : \frac{1}{4}$$

$$6x + 4x + 3x = 52$$

$$\underline{x = 4}$$

$$\underline{6 : 4 : 3}$$

$$3x = 3 \times 4 = \underline{12 \text{ cm}}$$

**Q)** The sides of a triangle are in the ratio  $\frac{1}{2} : \frac{1}{3} : \frac{1}{4}$ . If its perimeter is 52 cm, then what is the length of the smallest side?

- (a) 9 cm                                      (b) 10 cm  
(c) 11 cm                                      (d) 12 cm

**Ans: (d)**

- Q)** A, B and C started a business. A invests  $\frac{1}{2}$  capital for  $\frac{1}{4}$  time, B invests  $\frac{1}{8}$  capital for  $\frac{1}{2}$  time and C invests the remaining capital for whole time. Find the share of B in the total profit of ₹ 9900.
- (a) ₹ 2200   (b) ₹ 1100   (c) ₹ 6600   (d) ₹ 4400

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- (a) ₹2200 (b) ₹1100 (c) ₹6600 (d) ₹4400

**Ans: (b)**



**Q)** Divide ₹ 671 among A, B, C such that if their shares be increased by ₹ 3, ₹ 7 and ₹ 9 respectively, the remainder shall be in the ratio 1 : 2 : 3.

- (a) ₹ 112, ₹ 223, ₹ 336      (b) ₹ 114, ₹ 221, ₹ 336  
(c) ₹ 112, ₹ 227, ₹ 332      (d) ₹ 114, ₹ 223, ₹ 334

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(c) ₹ 112, ₹ 227, ₹ 332      (d) ₹ 114, ₹ 223, ₹ 334

**Ans: (a)**

**Q)**  $(x + y) : (x - y) = 3 : 5$  and  $xy = \text{positive}$  imply that

- (a)  $x$  and  $y$  are both positive
- (b)  $x$  and  $y$  are both negative
- (c) one of them is positive and one of them is negative
- (d) no real solutions for  $x$  and  $y$  exist

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  - (c) one of them is positive and one of them is negative
  - (d) no real solutions for  $x$  and  $y$  exist

**Ans: (d)**

**Q)** The height of a tree varies as the square root of its age (between 5 to 17 yr). When the age of the tree is 9 yr, its height is 4 ft. What will be the height of the tree at the age of 16 yr ?

- (a) 5 ft 4 inch                      (b) 5 ft 5 inch  
(c) 4 ft 4 inch                      (d) 4 ft 5 inch

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- (a) 5 ft 4 inch                      (b) 5 ft 5 inch  
(c) 4 ft 4 inch                      (d) 4 ft 5 inch

**Ans: (a)**

**Q)** In an express train, the passengers travelling in A.C. sleeper class, First class and Sleeper class are in the ratio 1:2:7, and rate for each class is in the ratio 5 : 4 : 2. If the total income from this train is ₹ 54, 000, find the income of Indian Railways from A.C. sleeper class.

- (a) ₹ 12,000                      (b) ₹ 20,000  
(c) ₹ 22,000                      (d) ₹ 10,000

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- (a) ₹ 12,000                      (b) ₹ 20,000  
(c) ₹ 22,000                      (d) ₹ 10,000

**Ans: (d)**



Q) If  $\frac{a}{b} = \frac{b}{c} = \frac{c}{d}$ , then which of the following is/are correct?

1. 
$$\frac{b^3 + c^3 + d^3}{a^3 + b^3 + c^3} = \frac{d}{a}$$

2. 
$$\frac{a^2 + b^2 + c^2}{b^2 + c^2 + d^2} = \frac{a}{d}$$

Select the correct answer using the code given below.

(a) 1 only

(b) 2 only

(c) Both 1 and 2

(d) Neither 1 nor 2

Q) If  $\frac{a}{b} = \frac{b}{c} = \frac{c}{d}$ , then which of the following is/are correct?

1. 
$$\frac{b^3 + c^3 + d^3}{a^3 + b^3 + c^3} = \frac{d}{a}$$

2. 
$$\frac{a^2 + b^2 + c^2}{b^2 + c^2 + d^2} = \frac{a}{d}$$

Select the correct answer using the code given below.

- (a) 1 only                                      (b) 2 only  
(c) Both 1 and 2                              (d) Neither 1 nor 2

**Ans: (a)**

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LIVE

# MATHS

## NUMBER SYSTEM

CLASS 2



NAVJYOTI SIR