RATIOS & PROPORTIONS

- KOUSTAV

CONCEPT

100
E : A
2 : 3

$E : A$

$2x + 3x = 100$

$5x = 100$

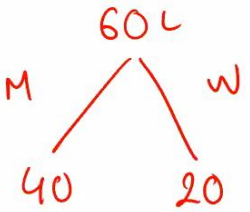
$x = 20$

$E = \frac{2}{5} \times 100$

$A = \frac{3}{5} \times 100$

1. In a mixture of 60 litres, the ratio of milk and water is 2:1. What is the amount of water and milk present in the mixture?

A) 50L, 10L B) 40L, 20L C) 30L, 30L D) 20L, 40L



W & M = 20, 40

2. Two numbers are respectively 20% and 50% more than a third number. The ratio of the two numbers is:

A) 2 : 5 B) 3 : 5 C) 4 : 5 D) 5 : 4

C = 100

A = 120

B = 150 = 4/5

LESS

A = 80

B = 50 = 8/5

OF

A = 20

B = 50 = 2/5

3. In a bag, there are coins of 25p, 10p and 5p in the ratio of 1:2:3. If there is Rs.30 in total, how many 5p coins are there?

A) 50 B) 100 C) 150 D) 200

25p 10p 5p

1x 2x 3x

$25x \times 1x + 10 \times 2x + 5 \times 3x = 30 \times 100$

$60x = 3000$

$x = 50$

$3x = 150$

4. Four numbers are in proportion. The sum of the squares of the four numbers is 50 and the sum of the means is 5. The ratio of the first two terms is 1:3. What is the average of the four numbers?

A) 2 B) 5 C) 3 D) 6

$A:B::C:D$

$\frac{A}{B}=\frac{C}{D}$

Means → B & C

Extremes → A & D

$A^2+B^2+C^2+D^2=50$

[Means the max value of A, B, C, D can be 6]

$B+C=5$

$\frac{A}{B}=\frac{1}{3}=\frac{C}{D}$

Let $A=1$, $B=3$

$C=5-3=2 \Rightarrow D=6$

$\frac{1+3+2+6}{4}=\frac{12}{4}=3$

5. The ratio of work efficiencies of Aquaman and Batman is 5 : 3 and the ratio of efficiencies of Batman and Cyborg is 5 : 8. Who is the most efficient?

A) Aquaman B) Batman C) Cyborg D) Can't be determined

$A:B=5:3$ (×5)

$B:C=5:8$ (×3)

$A:B=25:15$

$B:C=15:24$

$A:B:C=25:15:24$

$A:B=1:2$ (×3)

$B:C=3:4$ (×2)

$C:D=5:6$ (×8)

$A:B:C=3:6:8$ (×5)

$A:B:C:D=15:30:40:48$

6. Rs. 171 is divided among four friends in the ratio of $\frac{1}{3}:\frac{1}{4}:\frac{1}{5}:\frac{1}{6}$. What is the amount of the greatest share?

A) 14 B) 40 C) 36 D) 60

$\frac{1}{3}:\frac{1}{4}:\frac{1}{5}:\frac{1}{6}$

LCM(3,4,5,6) = 60

$60 \times \frac{1}{3}:\frac{1}{4}:\frac{1}{5}:\frac{1}{6}$

20 : 15 : 12 : 10

$\frac{20}{20+15+12+10} \times 171 = \frac{20}{57} \times 171^{3}$

$= 60$

$\frac{1/3}{1/3+1/4+1/5+1/6} \times 171$

$= 60$

7. Two numbers are in the ratio 3:5. If 9 is subtracted from each, the new numbers are in the ratio 12:23. The smaller number is:

A) 27 B) 33 C) 49 D) 55

$\frac{A}{B} = \frac{3x-9}{5x-9} = \frac{12}{23}$

$69x - 9 \times 23 = 60x - 9 \times 12$

$9x = 9(23-12)$

$x = 11$

$3x = 33$

8. Three containers A, B and C are having mixtures of milk and water in the ratio of 1:5, 3:5 and 5:7 respectively. If the capacities of the containers are in the ratio 5:4:5, find the ratio of milk to water, if the mixtures of all the three containers are mixed together.

A) 25:53 B) 53:115 C) 50:103 D) 33:79

A B C

$$\frac{M}{W} = \frac{\frac{1}{6}\times5 + \frac{3}{8}\times4 + \frac{5}{12}\times5}{\frac{5}{6}\times5 + \frac{5}{8}\times4 + \frac{7}{12}\times5} = \frac{\frac{10+18+25}{12}}{\frac{50+30+35}{12}}$$

$$= \frac{53}{115}$$

9. The proportion of milk and water in 3 samples is 2:1, 3:2 and 5:3. A mixture comprising of equal quantities of all 3 samples is made. The proportion of water and milk in the mixture is:

A) 227 : 133 B) 5 : 1 C) 99 : 61 D) 133 : 227

A B C

$$\frac{M}{W} = \frac{\frac{2}{3}\times1 + \frac{3}{5}\times1 + \frac{5}{8}\times1}{\frac{1}{3}\times1 + \frac{2}{5}\times1 + \frac{3}{8}\times1} = \frac{\frac{80+72+75}{120}}{\frac{40+48+45}{120}}$$

$$\frac{M}{W} = \frac{227}{133} \qquad \frac{W}{M} = \frac{133}{227}$$

10. A camel pursues an elephant and takes 5 leaps for every 7 leaps of the elephant, but 5 leaps of elephant are equal to 3 leaps of camel. What is the ratio of speeds of camel and elephant?

A) 24: 22 B) 25 : 21 C) 23 : 19 D) 22 : 21

$5C : 7E$

$5E = 3C$

$E = \frac{3C}{5}$

$5C : 7 \times \frac{3C}{5}$

$25 : 21$

11. The value of a diamond is directly proportional to the square of its weight. A diamond unfortunately breaks into three pieces with weights in the ratio of 3 : 4 : 5 resulting in a loss of Rs.9.4 lakhs. What is the actual value of diamond?

A) 28.8 lakh B) 13.5 lakh C) 14.4 lakh D) 18.8 lakh

$V \propto w^2$

$3x + 4x + 5x = 12x$

$V_S = (3x)^2 + (4x)^2 + (5x)^2$

$= 9x^2 + 16x^2 + 25x^2$

$= 50x^2$

$V_B = (12x)^2 = 144x^2$

$\text{Loss} = V_B - V_S = 9.4 \times 10^5$

$\Rightarrow 144x^2 - 50x^2 = 94 \times 10^4$

$\Rightarrow 94x^2 = 94 \times 10^4$

$x^2 = 10^4$

$V_B = 144 \times 10^4 = 14.4 \times 10^5$

$= 14.4$ Lakh

12. Weight of a sumo jointly varies as his height and his age. When height is 1.2 m and age is 20 years his weight is 48 kg. Find the weight of the sumo when his height is 1.5 m and age is 30 years:

A) 60 kg B) 72 kg C) 90 kg D) 58 kg

$W \propto HA$

$\frac{W_1}{W_2} = \frac{H_1}{H_2} \times \frac{A_1}{A_2}$

$\frac{48}{W_2} = \frac{1.2}{1.5} \times \frac{20}{30}$

$W_2 = \frac{48 \times 15 \times 3}{12 \times 2} = 90$

13. Distance covered by a train is directly proportional to the time taken and it also varies directly as the square root of fuel used and varies inversely as the number of wagons attached to it. A train covers 192 km journey in 20 hours when there are 10 wagons attached to it and total fuel consumption was 256 litres of diesel. Find the consumption of fuel per km when a train goes 200 km in 25 hours with 15 wagons attached to it:

A) 1.5 l/km B) 2 l/km C) 2.8 l/km D) 20 l/km

$D \propto \frac{T\sqrt{F}}{N}$

$\frac{D_1}{D_2} = \frac{T_1}{T_2} \times \frac{\sqrt{F_1}}{\sqrt{F_2}} \times \frac{N_2}{N_1}$

$\frac{192}{200} = \frac{20}{25} \times \frac{\sqrt{256}}{\sqrt{F_2}} \times \frac{15}{10}$

$\sqrt{F_2} = \frac{20 \times 16 \times 15 \times 200}{25 \times 10 \times 192} = 20$

$F_2 = 20^2 = 400\,L$

$F_2 \text{ per km} = \frac{400\,L}{200\,km} = 2\,L/km$

14. Wayne started a business by investing Rs. 36000. After 4 months Stark joined him with some investment. At the end of the year, the total profit was divided between them in the ratio of 9 : 7. How much capital was invested by Stark in the business?

A) 21000 B) 42000 C) 38000 D) 84000

Profit ∝ Investment × Time

$$\frac{P_W}{P_S} = \frac{I_W}{I_S} \times \frac{T_W}{T_S}$$

$$\frac{9}{7} = \frac{36000}{I_S} \times \frac{12}{8}$$

$$I_S = \frac{36000 \times 12 \times 7}{8 \times 9} = 42000$$

15. Elon and Jeff entered into a partnership just 5 months ago. The ratio of profit claimed by Elon and Jeff is 6 : 17. If Jeff had just started his business 12 months ago with Rs. 1275, what is the amount contributed by Elon?

A) Rs. 980 B) Rs. 1080 C) Rs. 1200 D) Rs. 998

$$\frac{P_E}{P_J} = \frac{I_E}{I_J} \times \frac{T_E}{T_J}$$

$$\frac{6}{17} = \frac{I_E}{1275} \times \frac{5}{12}$$

$$I_E = \frac{6 \times 1275 \times 12}{17 \times 5} = 1080$$

16. Three numbers are in the ratio 3 : 4 : 5. They increase by 40%, 30% and 20% respectively. Find the new ratio amongst them.

A) 21 : 26 : 30 B) 7 : 12 : 10 C) 6 : 6 : 5 D) 14 : 13 : 12

$$3 \times \frac{140}{100} : 4 \times \frac{130}{100} : 5 \times \frac{120}{100}$$

21 : 26 : 30

17. P, Q and R enter into a partnership with capitals in the ratio 3:2:1. After 4 months, P leaves the business and after 4 more months Q also leaves the business, and R continues till the end of the year. If R takes an additional 10% of the total profit for managing the business, then what part of the profit does R get?

A) 27% B) 37% C) 30% D) 36%

	P	Q	R
Inv	3	2	1
Time	4	8	12
Profit	3×4	2×8	1×12
	3	4	3

$P_R = 10\% + \frac{3}{3+4+3} \times 90\% = 10\% + \frac{3}{10} \times 90\% = 37\%$

18. Rachel purchased one dozen bangles. One day she slipped on the floor and fell down. What cannot be the ratio of broken to unbroken bangles?

A) 1 : 2 B) 1 : 3 C) 2 : 3 D) 1 : 5

12 → 1 : 2 → 4 : 8

12 → 1 : 3 → 3 : 9

12 → 2 : 3 → $\frac{2}{5} \times 12$ $\frac{3}{5} \times 12$

12 → 1 : 5 → 2 : 10

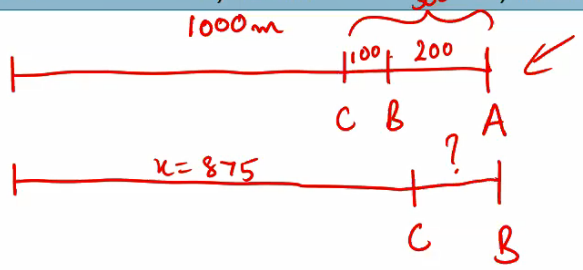
19. 50 liters of diesel is required to travel 500 km using an 800 cc engine. If the volume of diesel required to cover a distance varies directly as the capacity of the engine, then how many liters of diesel is required to travel 800 km using 1000 cc engine?

A) 80 B) 90 C) 100 D) 64

Fuel $\propto$ Dist x Capacity

20. In a 1000 m race, A beats B by 200 m and A beats C by 300 m. By how many meters will B beat C?

A) 100 m B) 125 m C) 150 m D) None of these



$\frac{D_B}{D_C} = \frac{800}{700} = \frac{1000}{x}$

$\Rightarrow x = \frac{1000 \times 700}{800} = 875$

Diff = 1000 − 875 = 125

D_B	Diff
800	100
1000	y

$y = \frac{100 \times 1000}{800} = 125$

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