Ratio & proportions

Ans: Given, Ratio of incomes A : B = 3 : 5
→ Let A's income = 3x, B's Income = 5x

• Ratio of expenditures A : B = 2 : 3
A's expenediture = 2y, B's expenditure = 3y

• A saves 20% of his income → Savings
= 20% of 3x = 0.6x

∴ Savings = Income − Expenditure
0.6x = 3x − 2y
⇒ 2y = 3x − 0.6x
⇒ 2y = 2.4x ⇒ y = 1.2x

B's expenditure = 3y = 3 × 1.2x = 3.6x
B's Saving = 5x − 3.6x = 1.4x

Percetage = $\frac{1.4x}{5x} \times 100 = 28\%$

$^8P_8 = 8!$

$^8C_5 = \frac{8 \times 7 \times 6 \times 5!}{5! \times 3!}$

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Continuation of ~~Ratio & Proportion~~

2 Ans:- Given,

Milk : Water = 4 : 1

$\Rightarrow$ milk = $4x$, water = x

10 liters of water is added $\rightarrow$ New water = $x + 10$

New ratio becomes 2 : 1

$\Rightarrow \frac{4x}{x+10} = \frac{2}{1}$

$4x = 2(x+10)$

$4x = 2x + 20 \Rightarrow 2x = 20 \Rightarrow \boxed{x = 10}$

$\therefore$ Milk = $4 \times 10 = 40$ litres,

3 Ans:- Given, intial ratio : Boys : Girls = 5 : 3

$\rightarrow$ Boys = $5x$, Girls = $3x$

After change: $\frac{5x-4}{3x+2} = \frac{3}{2}$

$\Rightarrow 2(5x-4) = 3(3x+2)$

$10x - 8 = 9x + 6$

$10x - 9x = 6 + 8$

$\boxed{x = 14}$

$\therefore$ Total initial students = $5x + 3x = 8x$

$= 8 \times 14 = 112$

4 Ans:- Ratio : A : B : C = 2 : 3 : 5, Share are 2x, 3x, 5x

Diff = $5x - 2x$ = Rs 1500

$\Rightarrow 3x = 1500 \Rightarrow \boxed{x = 500}$

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Total Sum = 2x + 3x + 5x = 10x = 10 × 500

= Rs 5000

5Ans:- Given,

Alloy1: Copper:zinc = 3:2 → Copper fraction = $\frac{3}{5}$

Alloy2: Copper: Zinc = 1:1 → Copper fraction = $\frac{1}{2}$

Desired ratio: 7:3 → Copper fraction = $\frac{7}{10}$

Allegation:- $\frac{1}{2} - \frac{7}{10} = \frac{5}{10} - \frac{7}{10} = \frac{1}{10}$

Ratio of mixing = 1:1

6Ans:- Given,

Speed ratio: Fast:Slow = 5:4

Faster train covers 360km in 3hrs

→ Speed = 360 ÷ 3 = 120km/h

So, Slower train's speed = $\frac{4}{5} \times 120 = 96$ km/h

Time = $\frac{320}{96} = 3.33$ hrs (taken by slow train to cover 320km)

7Ans:- Initial ratio: A:B:C = 4:5:6 → Amount be 4x, 5x, 6x

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Transactions: A gives Rs 200 to B, B gives Rs 300 to C

New amounts:

A: $4x - 200$

B: $5x + 200 - 300 = 5x - 100$

C: $6x + 300$

New ratio: $(4x - 200) : (5x - 100) : (6x + 300)$

$= 3 : 4 : 5$

$$\frac{4x - 200}{3} = \frac{5x - 100}{4}$$

$\Rightarrow 4(4x - 200) = 3(5x - 100)$

$\Rightarrow 16x - 800 = 15x - 300$

$\Rightarrow \boxed{x = 500}$

∴ Initial Amt $= 4x = 4 \times 500 = Rs\ 2000$

8 And 9: Initial ratio: $x : y = 7 : 3 \rightarrow$ Total $= 7x + 3x = 10x \rightarrow x = 7x, y = 3x$

20 liters removed $\rightarrow$ removed $x = \frac{7}{10} \times 20 = 14$ liters

removed $y = \frac{3}{10} \times 20 = 6$ liters

Remaining:

$x = 7x - 14$

$y = 3x - 6 + 20$

New ratio:

$$\frac{7x - 14}{3x - 6 + 20} = \frac{7}{5}$$

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$\frac{7x-14}{3x+11} = \frac{7}{5} \Rightarrow 5(7x-14) = 7(3x+11)$

$\Rightarrow 35x - 70 = 21x + 98$

$\Rightarrow 14x = 168 \Rightarrow \boxed{x = 12}$

∴ Total Capacity $= 10x = 10 \times 12 = 120$ litres

9Ans:- Given,

Current age ratio: A : B : C = 2 : 3 : 5

$\Rightarrow$ A = 2x, B = 3x, C = 5x

After 5 years : (2x+5) : (3x+5) : (5x+5)

= 5 : 7 : 11

$\Rightarrow \frac{2x+5}{5} = \frac{3x+5}{7} \Rightarrow 7(2x+5) = 5(3x+5)$

$14x + 35 = 15x + 25$

$14x - 15x + 25 - 35$

$-x = -10 \Rightarrow \boxed{x = 10}$

A's current ~~age~~ = 2x = 2 × 10 = 20 yrs

10Ans:- Given,

A's Share = 2 × B's Share

B's Share = 3 × C's Share

Let C's Share = x

B's Share = 3x

$\Rightarrow$ A's Share = 2 × 3x = 6x

∴ T.A = $6x + 3x + x = 1200 \Rightarrow 10x = 1200 \Rightarrow \boxed{x = 120}$

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B's Share = $3x = 3 \times 120 = Rs\ 360$

11Ans: Ratio of Two no = 4 : 5 → 4x & 5x

LCM = 180

LCM of 4x & 5x is:

$LCM = \frac{4x \times 5x}{HCF} = \frac{20x^2}{x} = 20x$

$HCF = x = 9$

12Ans: Rice type mixed in ratio 3:2 → Total parts = 3 + 2 = 5 parts

price per kg: First type = Rs 40, Second type = Rs 50

∴ Average price per kg:

$= \frac{(3 \times 40) + (2 \times 50)}{5} = \frac{120 + 100}{5}$

$= 44$ //

13Ans: Initial ratio: Milk : water = 5 : 2

⇒ 5x & 2x

14 liters removed → Milk removed

$= \frac{5}{7} \times 14 = 10$ litres, Water removed

$= 2/7 \times 14 = 4$ litres

Remaining: Milk = $5x - 10$, Water = $2x - 4 + 6$

New ratio:

$$\frac{5x-10}{2x-4+6} = \frac{3}{2}$$

$$\Rightarrow 10x - 20 = 6x + 6 \Rightarrow 4x = 26$$

$$\Rightarrow x = 6.5$$

$\therefore$ Initial mixture $= 7x = 7 \times 6.5 = 45.5$ lit

Ans:- Given,

Initial investment ratio: A : B : C = 3 : 4 : 5

Total profit = Rs 4800 $\Rightarrow$ profit Shared in 3 : 4 : 5

(1) Sum of ratio's = 3 + 4 + 5 = 12 parts

A's Initial Share $= \frac{3}{12} \times 4800 = 1200$

B's Initial Share $= \frac{4}{12} \times 4800 = 1600$

C's initial Share $= \frac{5}{12} \times 4800 = 2000$

(2) profit is reinvested, invested ratio becomes 4 : 5 : 6

Total parts $= 4 + 5 + 6 = 15$ parts

$\therefore$ A's new Share $= \frac{4}{15} \times 4800 =$ Rs 280