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Test: GSA

Question # 2 (A)

Given DATA:

Ratio blw numbers = 3:5

when 9 is subtracted from each then = 12:23

To Find:

Smallest numbers = ?

Solution:

Let x, y be the two numbers. Then ratio blw them is

$$x : y = 3 : 5 \longrightarrow (1)$$

$$x - 9 : y - 9 = 12 : 23 \longrightarrow (2)$$

From (1)

$$\frac{x}{y} = \frac{3}{5} \longrightarrow \frac{x - 3}{5} = \frac{y}{5} \longrightarrow (a)$$

From (2)

$$x - 9 = 12 \longrightarrow (b)$$

$$y - 9 = 23$$

put eq (a) in (b)

$$\frac{x - 3}{5} = \frac{y}{5}$$

$$\frac{x - 3}{5} = \frac{12}{5}$$

$$y - 9 = 23$$

$$\frac{x - 3}{5} = \frac{12}{5}$$

$$\frac{3y - 9}{5} = \frac{12}{5}$$

$$3y - 9 = 12$$

$$y - 9 = 23$$

$$3y - 45$$

$$5 = 12$$

$$y - 9 = 23$$

$$\begin{aligned} 3y - 45 &= 12 \\ 5(y-9) &= 23 \\ 3y - 45 &= 12 \\ 5y - 45 &= 23 \\ 23(3y - 45) &= 12(5y - 45) \\ 69y - 1035 &= 60y - 540 \end{aligned}$$

$$\begin{aligned} 69y - 60y &= 1035 - 540 \\ 9y &= 495 \\ y &= \frac{495}{9} \end{aligned}$$

$$\boxed{y = 55}$$

put this in (a)

$$x = 3(55)$$

$$\boxed{x = 33}$$

Result:

The smallest number = 33

$$\begin{array}{r} 23 \overline{) 23} \\ \underline{23} \\ 0 \end{array}$$

$$\begin{array}{r} 23 \overline{) 45} \\ \underline{46} \\ -1 \end{array}$$

$$\begin{array}{r} 23 \overline{) 115} \\ \underline{69} \\ 46 \end{array}$$

$$\begin{array}{r} 23 \overline{) 925} \\ \underline{69} \\ 235 \end{array}$$

$$\begin{array}{r} 23 \overline{) 1035} \\ \underline{69} \\ 345 \end{array}$$

$$\begin{array}{r} 23 \overline{) 45} \\ \underline{46} \\ -1 \end{array}$$

$$\begin{array}{r} 23 \overline{) 115} \\ \underline{69} \\ 46 \end{array}$$

$$\begin{array}{r} 23 \overline{) 925} \\ \underline{69} \\ 235 \end{array}$$

$$\begin{array}{r} 23 \overline{) 1035} \\ \underline{69} \\ 345 \end{array}$$

$$\begin{array}{r} 9 \overline{) 495} \\ \underline{45} \\ 45 \\ \underline{45} \\ 0 \end{array}$$

(B)

Given DATA:

Profit ratio = 5:7:8

Partners for 14 months, 8 months, 7 months respectively.

To Find:

Ratio of their investment = ?

Solution:

Let A, B and C be the three partners, then ratio

$$A : B : C = 5 : 7 : 8$$

of profit

$$EC \text{ of A} = \text{Amount} \times 14$$

$$EC \text{ of C} = \text{Amount} \times 7$$

$$EC \text{ of B} = \text{Amount} \times 8$$

Profit

$$\text{Profit Ratio of A} = \frac{\text{Ratio of A in investment} \times \text{Total Profit}}{\text{Sum of ratios of A, B, C}} \rightarrow (1)$$

$$\text{Profit Ratio of B} = \frac{\text{Ratio of B in investment} \times \text{Total Profit}}{\text{Sum of ratio of A, B, C}} \rightarrow (2)$$

$$\text{Profit Ratio of C} = \frac{\text{Ratio of C in investment} \times \text{Total Profit}}{\text{Sum of ratio of A, B, C}} \rightarrow (3)$$

Dividing (2) by (1)

$$\text{Profit of A} = \frac{\text{Ratio of A in investment} \times \text{Total Profit}}{\text{Sum of ratios of A, B, C}}$$

$$\text{Profit of B} = \frac{\text{Ratio of B in investment} \times \text{Total Profit}}{\text{Sum of ratios of A, B, C}}$$

$$\frac{\text{Profit of B}}{\text{Profit of A}} = \frac{\text{Ratio of B in investment}}{\text{Ratio of A in investment}}$$

$$\text{Profit of A} = \frac{\text{Ratio of A in investment}}{\text{Ratio of B in investment}} \rightarrow (a)$$

$$\text{Profit of B} = \frac{\text{Ratio of B in investment}}{\text{Ratio of C in investment}}$$

Now, divide (3) by (1)

$$\text{Profit of A} = \frac{\text{Ratio of A in investment} \times \text{Total Profit}}{\text{Sum of ratios of A, B, C}}$$

$$\text{Profit of C} = \frac{\text{Ratio of C in investment} \times \text{Total Profit}}{\text{Sum of ratios of A, B, C}}$$

$$\frac{\text{Profit of C}}{\text{Profit of A}} = \frac{\text{Ratio of C in investment}}{\text{Ratio of A in investment}}$$

$$\text{Profit of A} = \frac{\text{Ratio of B in investment}}{\text{Ratio of C in investment}} \rightarrow (b)$$

$$\text{Profit of C} = \frac{\text{Ratio of C in investment}}{\text{Ratio of B in investment}}$$

Now, Find the combined ratio

$$\text{Profit of A} : \text{Profit of B}$$

$$\text{Profit of B} : \text{Profit of C}$$

$$5 : 7$$

$$= 35 : 49 : 56$$

$$= 5 : 7 : 8$$

Result:

The ratio of their investment = **5 : 7 : 8**



(C)

Given DATA:

$$A+B+C = 45 \text{ Kg} \rightarrow \textcircled{1}$$

3

$$A+B = 40 \text{ Kg} \rightarrow \textcircled{2}$$

2

$$B+C = 43 \text{ Kg} \rightarrow \textcircled{3}$$

2

To Find:

weight of B = ?

Solution:

From $\textcircled{1}$

$$A+B+C = 45$$

3

$$A+B+C = 45 \times 3$$

$$A+B+C = 135 \rightarrow \textcircled{a}$$

From $\textcircled{2}$

$$A+B = 40$$

2

$$A+B = 80 \rightarrow \textcircled{b}$$

From $\textcircled{3}$

$$B+C = 43$$

2

$$B+C = 86$$

put $B+C = 86$ in \textcircled{a}

$$A + 86 = 135$$

$$A = 135 - 86$$

$$A = 49 \text{ Kg}$$

put this in \textcircled{b}

$$A+B = 80$$

$$49+B = 80$$

$$B = 80 - 49$$

$$B = 311 \text{ kg}$$

Result:

The weight of B = 311 kg

(D)

Given DATA:

$$x + 17 = 60x \quad \rightarrow \textcircled{1}$$

To Find:

$$x = ?$$

Solution:

From $\textcircled{1}$

$$x + 17 = 60x$$

x

$$x(x + 17) = 60$$

$$x^2 + 17x = 60$$

$$x^2 + 17x - 60 = 0$$

$$~~x^2 + 12x + 5x - 60 = 0~~$$

$$~~x^2 + 12x + 5x - 60 = 0~~$$

By Quadratic Formula

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$a = 1, b = 17, c = -60$$

$$x = \frac{-17 \pm \sqrt{(17)^2 - 4(1)(-60)}}{2(1)}$$

$$x = \frac{-17 \pm \sqrt{289 + 240}}{2}$$

$$x = \frac{-17 \pm \sqrt{529}}{2}$$

$$x = \frac{-17 \pm 23}{2}$$

$$\begin{array}{r} 17 \\ \times 17 \\ \hline 119 \\ 1190 \\ \hline 289 \end{array}$$
$$\begin{array}{r} 23 \\ \times 23 \\ \hline 69 \\ 460 \\ \hline 529 \end{array}$$

$$x = \frac{-17+23}{2}, \quad x = \frac{-17-23}{2}$$

$$x = \frac{6}{2}, \quad x = \frac{-40}{2}$$

$$x = 3, \quad x = -20$$

Result:

The positive number = 3



Question # 3

(A)

Given DATA:

Profit earned when selling at = RS 1920

Loss earned when selling at = RS 1280

To Find:

Price to make 25% profit.

Solution:

$$\text{Profit \% percentage increase} = \frac{\text{New value} - \text{old value}}{\text{old value}} \times 100$$

$$\text{Loss \% percentage loss} = \frac{\text{old value} - \text{New value}}{\text{old value}} \times 100$$

By condition

$$\frac{\text{New value} - \text{old value}}{\text{old value}} \times 100 = \frac{\text{old value} - \text{New value}}{\text{old value}} \times 100$$

$$1920 - \text{old value} = \text{old value} - 1280$$

$$1920 + 1280 = \text{old value} + \text{old value}$$

$$3200 = 2(\text{old value})$$

$$\text{old value} = \frac{3200}{2}$$

2

$$\text{old/original value} = 1600$$

$$\frac{1}{1920}$$

$$1280$$

$$3200$$

Now to make 25% profit

we use

$$\text{percentage increase} = \frac{\text{New value} - \text{old value}}{\text{old value}} \times 100$$

$$\frac{25}{100} = \frac{\text{New value} - 1600}{1600}$$

$$0.25 (1600) = \text{New value} - 1600$$

$$\frac{25}{100} (1600) + 1600 = \text{New value}$$

$$\text{New value} = 400 + 1600$$

$$\boxed{\text{New value} = 2000 \text{ RS}}$$

$$\begin{array}{r} 25 \\ \times 16 \\ \hline 150 \\ 25 \times \\ \hline 400 \end{array}$$

Result:

To make 25% profit the article be sold at = 2000 RS

(B)

Given DATA:

A do work = 15 days

B do work = 20 days

worked together = 4 days

To Find:

Fraction of work left = ?

Solution:

The work rate of A = $\frac{1}{15}$

The work rate of B = $\frac{1}{20}$

The work rate of B = $\frac{1}{20}$

Their combined work rate = $\frac{1}{15} + \frac{1}{20}$

$\frac{4}{60} + \frac{3}{60} = \frac{7}{60}$

$\frac{7}{60} \times 4 = \frac{28}{15}$

$\frac{28}{15} = 1 \frac{8}{15}$

$1 \frac{8}{15} = 1 \frac{8}{15}$

$1 \frac{8}{15} = 1 \frac{8}{15}$

They work for 4 days then the fraction of work they do

$$= \frac{4 \times 7}{60 \times 15}$$

$$= \frac{7}{15}$$

Total amount of work = 1

Fraction of work left = $1 - \frac{7}{15}$

$$= \frac{15-7}{15}$$

$$= \frac{8}{15}$$

Result:

The fraction of work left is $\frac{8}{15}$

(c)

Given DATA:

A present age = $\frac{2}{5}$ of mother

After 8 years A = $\frac{1}{2}$ of mother

To Find:

Mother present age = ?

Solution:

Let the present age of A will be x and mother present age is y .

Then from given data-

$$x = \frac{2}{5}y \rightarrow \textcircled{1}$$

$$x + 8 = \frac{1}{2}(y + 8) \rightarrow \textcircled{2}$$

Then from $\textcircled{2}$

$$x+8 = \frac{2}{5}(y+8)$$

$$2(x+8) = y+8$$

$$2x+16 = y+8 \rightarrow \textcircled{1}$$

$$\text{put } x = \frac{2}{5}y \text{ in } \textcircled{1}$$

$$2\left(\frac{2}{5}y\right) + 16 = y+8$$

$$\frac{4y}{5} + 16 = y+8$$

$$4y + 80 = y + 8$$

$$4y - y = 8 - 80$$

$$3y = -72$$

$$y = -\frac{72}{3}$$

$$y = -24$$

$$y = -24$$

Age can never be negative, so $y = 24 \text{ yrs.}$

Result:

The present age of mother = 24 yrs.

(D)

Given DATA:

Student multiplied a number by 3 instead of 5

To Find:

Percentage calculation = ?

Solution:

Let the percentage error is x
 $= \frac{\text{old value} - \text{New value}}{\text{old value}} \times 100$

put the values

$$= \left(\frac{5 - 3}{3} \mid \frac{50}{30} \right) \times 100$$

$$\begin{aligned}
 &= \left(\frac{25-9}{15} \right) \times 100 \\
 &= \left(\frac{16 \times 3}{15 \times 3} \right) \times 100 \\
 &= \left(\frac{16}{5} \right) \times 100 \\
 &= (1.8) \times 100
 \end{aligned}$$

$$= \left(\frac{25-9}{15} \right) \times 100$$

$$= \left(\frac{16 \times 3}{15 \times 5} \right) \times 100$$

$$= \frac{48}{75} \times 100$$

$$= 0.6 \times 100$$

1%

$$= 60\%$$

$$\begin{array}{r}
 0.6 \\
 75 \overline{) 480} \\
 \underline{450} \\
 30
 \end{array}$$

$$\begin{array}{r}
 75 \\
 \overline{) 480} \\
 \underline{450} \\
 30
 \end{array}$$

Result:

The percentage error in the calculation = 60%