CHAPTER-7

RATIO & PROPORTION

Q.1.(2) A : B = 5 : 7
B : C = 6 : 11
A : B : C = 30 : 42 : 77

Q.2.(2) $\frac{4^{3.5}}{2^5} = \frac{\left[(2)^2\right]^{3.5}}{2^5} = \frac{2^{(2\times3.5)}}{2^5} = \frac{2^7}{2^5} = 2^2 = 4$

Q.3.(2) $\frac{a}{3} = \frac{b}{4} = \frac{c}{7} = k$ then
$a = 3k$
$b = 4k$
$c = 7k$

$$\frac{a+b+c}{c} = \frac{3k+4k+7k}{7k} = \frac{14k}{7k} = 2$$

Q.4.(4) $\frac{7}{15}=0.466$, $\frac{15}{23}=0.652$ $\frac{17}{25}=0.68$,

$\frac{21}{29}=0.724$

clearly, 0.724 is greatest and therefore 21 : 29 is greatest

Q.5.(2) 15% of x = 20% of y

$$\frac{15x}{100} = \frac{20y}{100} = \frac{x}{y} = \left(\frac{20}{100}\times\frac{100}{15}\right) = \frac{4}{3}$$

Q.6.(1) Let the third proportional to 0.36 and 0.48 be x
0.36 : 0.48 :: 0.48 : x

$$x = \frac{0.48\times0.48}{0.36} = 0.64$$

Q.7.(3) Let shares 5x, 2x, 4x, 3x respectively
4x - 3x = 1000 ⇒ x = 1000
B's share = 2x ⇒ 2× 1000 = Rs. 2000

Q.8.(4) Let two numbers are x and y
ratio of two numbers x : y = (30 + 12) : (30 - 12) = 42 : 18 = 7 : 3

Q.9.(4) Let the original earnings of A and B Rs. 4x and Rs. 7x
New earnings of A = 150% of Rs. 4x

$= \text{Rs.}\left(\frac{150}{100}\times4x\right) = \text{Rs. } 6x.$

New earning of B = 75% of Rs. 7x

$= \text{Rs.}\left(\frac{75}{100}\times7x\right) = \text{Rs. } \frac{21x}{4}$

$\therefore 6x : \frac{21x}{4} = 8 : 7 \Leftrightarrow \frac{6x\times4}{21x} = \frac{8}{7}$

This does not give x.
So, the given data is inadequate.

Q.10.(3) Let the required number be x.
Then, (14-x) : (17-x) :: (34-x) : (42-x)

$$\therefore \frac{14-x}{17-x} = \frac{34-x}{42-x}$$

$\Leftrightarrow (14-x)(42-x) = (17-x)(34-x)$
$\Leftrightarrow x^2 - 56x + 588 = x^2 - 51x + 578$
$\Leftrightarrow 5x = 10$
$\therefore$ Required number = 2

Q.11.(4) Quantity of milk = $\left(60\times\frac{2}{3}\right)$ = 40 litres.

Quantity of water in it = (60 - 40) litres = 20 litres
New Ratio required = 1 : 2
Let quantity of water to be added further be x litres.

Then, milk : water = $\frac{40}{(20+x)}$

Now, $\frac{40}{(20+x)} = \frac{1}{2} \Leftrightarrow 20+x=80 \Leftrightarrow x=60$ litres
Quantity of water to be further added = 60 litres

Q.12.(2) Let the required numbers be 3x and 4x.
Then, their L.C.M. is 12x.
$12x = 180 \Leftrightarrow x = 15$. Hence, the first number is 45.

Q.13.(1) Let the required quantity of copper be x kg
Then, 9 : 4 :: 24 : x $\Leftrightarrow 9x=4\times24$

$x = \frac{4\times24}{9} = 10\frac{2}{3}$

Hence, the required quantity of copper is $10\frac{2}{3}$ kg.

Q.14.(2) Quantity of tin in 60 kg of A = $\left(60\times\frac{2}{5}\right)$ kg
= 24 kg

Quanity of tin in 100 kg of B = $\left(100\times\frac{1}{5}\right)$ kg
= 20 kg
Quantity of tin in the new alloy
= (24 + 20) kg = 44 kg

Q.15.(4) G = 19 w and C = 9 W. (W = water)
Let 1 gm of gold be mixed x gm of copper to get (1+x)gm of the alloy.
(1gm gold)+(x gm copper) = (x+1) gm of alloy
19W+9Wx = (x+1) × 15W

$19 + 9x = 15(x+1) \Leftrightarrow 6x = 4 \Leftrightarrow x = \frac{2}{3}$

$\therefore$ Ratio of gold with copper = $1 : \frac{2}{3} = 3 : 2$

Q.16.(2) Alcohol in 15 litres of mix = 20% of 15 litres = $\left(\frac{20}{100}\times15\right)$ litres = 3 litres.

Water in it = (15 - 3) litres = 12 litres
New quantity of mix = (15+3) = 18 litres.
Quantity of alcohol in it = 3 litres.
Percentage of alcohol in new mix

$= \left(\frac{3}{18}\times100\right)\% = 16\frac{2}{3}\%$

Q.17.(2) Quantity of milk in 16(20 -4) litres of mix.

$= \left(16\times\frac{5}{8}\right)$ litres = 10 litres.

Quantity of milk in 20 litres of new mix .
= (10+4) litres.
Quantity of water in it = (20-14) = 6 litres.
$\therefore$ Ratio of milk and water in the new mix.
= 14 : 6 = 7 : 3

Q.18.(3) Total age of 3 boys = (25 × 3) = 75 years
Ratio of their ages = 3 : 5 : 7

Age of the youngest = $\left(75\times\frac{3}{15}\right)$ years
= 15 years

Q.19.(4) Ratio of time taken = $\frac{1}{5}:\frac{1}{4}:\frac{1}{6} = 12 : 15 : 10$

Q.20.(4) Let the number of boys and girls be 8x and 5x respectively. Then, 5x = 160
Total number of students = 13x
= (13 × 32) = 416

Q.21.(2) Ratio of sides = $\frac{1}{2}:\frac{1}{3}:\frac{1}{4} = 6 : 4 : 3$

Largest side = $\left(104\times\frac{6}{13}\right)$ cm = 48 cm.

Q.22.(2) 10% of Boys
$= \frac{1}{4}$ Girls $\Leftrightarrow \frac{10B}{100}$, $\Leftrightarrow$ Boys = $\frac{5}{2}$ Girls

$\therefore \frac{B}{G} = \frac{5}{2} \Leftrightarrow$ Boys : Girls = 5 : 2.

Q.23.(3) Let the three containers contain 3x, 4x and 5x litres of mixtures respectively.

Milk in 1st mix. = $\left(3x\times\frac{4}{5}\right)$ litres.

$= \frac{12x}{5}$ litres

Water in 1st mix. = $\left(3x-\frac{12x}{5}\right)$ litres

$= \frac{3x}{5}$ litres

Milk in 2nd mix. = $\left(4x\times\frac{3}{4}\right)$ litres
= 3x litres
Water in 2nd mix. = (4x-3x) litres = x litres.

Milk in 3rd mix. = $\left(5x\times\frac{5}{7}\right)$ litres

$= \frac{10x}{7}$ litres

Water in 3rd mix. = $\left(5x-\frac{25}{7}\right)$ litres

$= \frac{10x}{7}$ litres

Total milk in final mix.
$= \left(\frac{12x}{5}+3x+\frac{25x}{7}\right)$ litres $= \frac{314x}{35}$ litres

Total water in final mix
$= \left(\frac{3x}{5}+x+\frac{10x}{7}\right)$ litres $= \frac{106x}{35}$ litres

Required ratio of milk and water
$= \frac{314x}{35} : \frac{106x}{35} = 157 : 53$

Q.24.(2) 10% of x = 20% of y $\Leftrightarrow \frac{10x}{100} = \frac{20y}{100}$

$\frac{x}{10} = \frac{y}{5} \Leftrightarrow \frac{x}{y} = \frac{10}{5} = \frac{2}{1}$

x : y = 2 : 1

Q.25.(3) Let the income of A and B be Rs. 5x and Rs.4x respectively and let their expenditures be Rs. 3y and Rs. 2y respectively.

Then, 5x - 3y = 1600 .. (i) and 4x-2y = 1600

on multiplying (i) by 2, (ii) by 3 and subtracting . We get : 2x = 1600

x = 800

A's income = Rs. 5x = Rs. (5 × 800)

= Rs. 4000

Q.26.(5) Gold in C = $\left(\frac{7}{9} + \frac{7}{18}\right)$ units.

Copper in C = $\left(\frac{2}{9} + \frac{11}{18}\right)$ units = $\frac{5}{6}$

Gold : Copper = $\frac{7}{6} : \frac{5}{6} = 7 : 5$

Q.27.(4) $\frac{7}{15} = 0.466$, $\frac{15}{23} = 0.652$, $\frac{17}{25} = 0.68$ and $\frac{21}{29} = 0.724$

Clearly, 0.724 is greatest and therefore, 21 : 29 is greatest.

Q.28.(1) If B's share is Rs. 3, total amount = Rs. 7

If B's share is Rs. 4800, total amount

= Rs. $\left(\frac{7}{3} \times 4800\right)$ = Rs. 11200

Q.29.(5) Suppose C gets Rs. x

Then, B gets Rs. (x+8) and A gets Rs. (x + 15)

Then, X + (x+ 8) + (x+15) = 53 $\Leftrightarrow$ x = 10

A : B : C = (10 + 15) : (10 + 8) : 10

= 25 : 18 : 10

Q.30.(3) $\frac{1}{5} : \frac{1}{x} = \frac{1}{x} : \frac{100}{125}$

$\left(\frac{1}{x} \times \frac{1}{x}\right) = \frac{1}{5} \times \frac{100}{125} = \frac{4}{25}$

$\Rightarrow \frac{1}{x^2} = \frac{4}{25} \Rightarrow x^2 = \frac{25}{4}$

$\Rightarrow x = \frac{5}{2} = 2.5$

CHAPTER-8

PROBLEMS BASED ON AGES

Q.1.(5) Let Rahul's age be x years. Then, Sachin's age = (x–7) years.

$\therefore \frac{x-7}{x} = \frac{7}{9} \Rightarrow 9x - 63 = 7x \Rightarrow 2x = 63$

$\Rightarrow x = 31.5$

Hence, Sachin's age = (x–7) = 24.5 years

Q.2.(5) Let P's age and Q's age be 6x years and 7x years respectively.

Then, 7x – 6x = 4 $\Leftrightarrow$ x = 4

$\therefore$ Required ratio

= (6x + 4) : (7x + 4)

= 28 : 32 = 7 : 8.

Q.3.(1) Let the present ages of P and Q be 5x years and 7x years respectively.

Then, 7x - (5x + 6) = 2 $\Leftrightarrow$ 2x = 8 $\Leftrightarrow$ x = 4.

$\therefore$ Required sum = 5x + 7x = 12x = 48 years.

Q.4.(2) Let the present ages of Arun and Deepak be 4x years and 3x years respectively.

Then, 4x + 6 = 26 $\Leftrightarrow$ 4x = 20 $\Leftrightarrow$ x = 5.

Deepak's age = 3x = 15 years.

Q.5.(1) Let the present ages of X and Y be 5x years and 6x years respectively.

Then, $\frac{5x+7}{6x+7} = \frac{6}{7} \Leftrightarrow 7(5x+7) = 6(6x+7)$

$\Leftrightarrow$ x =7.

$\therefore$ X's present age = 5x = 35 years.

Q.6.(4) Let the school ages of Neelam and Shaan be 5x and 6x years respectively.

Then,

$\frac{\frac{1}{3} \times 5x}{\frac{1}{2} \times 6x} = \frac{5}{9} \Leftrightarrow \left(\frac{1}{3} \times 9 \times 5x\right) - \left(\frac{5}{2} \times 6x\right) = 15.$

Thus, Shaan's age cannot be determined.

Q.7.(3) Let the present ages of A and B be 5x and 3x years respectively.

Then,

$\frac{5x-4}{3x+4} = \frac{1}{1} \Leftrightarrow 5x-4 = 3x+4 \Leftrightarrow 2x = 8 \Leftrightarrow x = 4.$

$\therefore$ Required ratio = (5x + 4) : (3x - 4) = 24 : 8 = 3 : 1.

Q.8.(4) Let the son's present age be x years.

Then, man's present age = (x + 24) years.

$\therefore$ (x + 24) + 2 = 2 (x + 2) $\Leftrightarrow$ x + 26 = 2x + 4 $\Leftrightarrow$ x = 22.

Q.9.(4) Let the present ages of the father and son be 2x and x years respectively.

Then, (2x - 18) = 3 (x – 18) $\Leftrightarrow$ x = 36.

Required sum = (2x + x) = 3x = 108 years.

Q.10.(3) Let the mother's present age be x years.

Then, the person's present age = $\left(\frac{2}{5}x\right)$ years.

$\therefore \left(\frac{2}{5}x + 8\right) = \frac{1}{2}(x+8) \Leftrightarrow 2(2x + 40)$

= 5 (x + 8) $\Leftrightarrow$ x = 40.

Q.11.(5) 16 years ago, let T = x years and G = 8x years.

After 8 years from now, T = (x + 16 + 8) years and G = (8x +16 + 8) years.

$\therefore$ 8x + 24 =3 (x + 24) $\Leftrightarrow$ 5x = 48.

8 years ago,

$\frac{T}{G} = \frac{x+8}{8x+8} = \frac{\frac{48}{5}+8}{8 \times \frac{48}{5}+8} = \frac{88}{424} = \frac{11}{53}$

Q.12.(2) Let the ages of father and son 10 years ago be 3x and x years respectively.

Then, (3x + 10) + 10 = 2 [(x + 10) +10] $\Leftrightarrow$ 3x + 20 = 2x + 40 $\Leftrightarrow$ x = 20.

$\therefore$ Required ratio = (3x + 10) : (x + 10)

= 70 : 30 = 7 : 3.

Q.13.(4) Let the ages of Promila and Sakshi 1 year ago be 4x and x years respectively.

Then, [(4x + 1) + 6] - [(x + 1) + 6] = 9 $\Leftrightarrow$ 3x = 9 $\Leftrightarrow$ x = 3.

Required ratio = (4x + 1) : (x + 1)

= 13 : 4.

Q.14.(4) Let the present ages of son and father be x and (60 - x) years respectively.

Then, (60 - x) - 6 = 5 (x - 6) $\Leftrightarrow$ 54 - x = 5x - 30 $\Leftrightarrow$ 6x = 84 $\Leftrightarrow$ x = 14.

$\therefore$ Son's age after 6 years = (x + 6) = 20 years.

Q.15.(1) (A + B) - (B + C) = 12 $\Leftrightarrow$ A - C = 12.

Q.16.(4) R–Q = R–T $\Leftrightarrow$ Q=T. Also, R + T = 50 $\Leftrightarrow$ R + Q = 50.

So, (R - Q) cannot be determined.

Q.17.(2) Let the sum of present ages of the two sons be x years.

Then, father's present age = 3x years.

$\therefore$ (3x + 5) = 2 (x + 10) $\Leftrightarrow$ 3x + 5 = 2x + 20 $\Leftrightarrow$ x = 15.

Hence, father's present age = 45 years.

Q.18.(1) Let the ages of father and son be x and (45 – x) years respectively.

Then, (x – 5) (45 - x - 5) = 34 $\Leftrightarrow$

(x – 5) (40 – x) = 34 $\Leftrightarrow x^2 - 45x + 234 = 0$

$\Leftrightarrow$ (x - 39) (x - 6) = 0 $\Leftrightarrow$ x = 39 or x = 6.

Father's age = 39 years and son's age = 6 years.

Q.19.(1) Let the ages of the children be x, (x + 3), (x + 6), (x + 9) and (x + 12) years.

Then, x + (x + 3) + (x + 6) + (x + 9) + (x + 12) = 50 $\Leftrightarrow$ 5x = 20 $\Leftrightarrow$ x = 4.

$\therefore$ Age of the youngest child = x = 4 years.

Q.20.(1) Let Ronit's present age be x years. Then, father's present age = (x + 3x) years

= 4x years.

$\therefore (4x + 8) = \frac{5}{2}(x+8) \Leftrightarrow 8x + 16 = 5x + 40 \Leftrightarrow 3x = 24 \Leftrightarrow x = 8.$

Hence, required ratio

$= \left(\frac{4x+16}{x+16}\right) = \frac{48}{24} = 2$

Q.21.(2) Let their ages be x years and (x + 10) years respectively.

Then, (x + 10) - 15 = 2 (x - 15) $\Leftrightarrow$ x - 5

$= 2x - 30 \Leftrightarrow x = 25.$

Present age of the elder person = (x + 10) = 35 years.

Q.22.(3) Let B's present age = x years. Then, A's present age = (x + 9) years.

$(x + 9) + 10 = 2(x - 10) \Leftrightarrow x + 19 = 2x - 20 \Leftrightarrow x = 39.$

Q.23.(4) Vimal's age after 10 years = (8 + 2 + 10) years = 20 years.

Sneh's father's age after 10 years

$= 2 \times 20 = 40$ years.

Sneh's father's present age = 40-10 = 30 years.

Sneh's age $= \left(\frac{1}{6} \times 30\right)$ years = 5 years.

Q.24.(2) Anup's age = (5 - 2) years = 3 years. Let Gagan's age be x years.

Then, $\frac{x-6}{18} = 3 \Leftrightarrow x - 6 = 54 \Leftrightarrow x = 60.$

Q.25.(1) Clearly, my brother was born 3 years before I was born and 4 years after my sister was born.

So, father's age when brother was born

= (28 + 4) years = 32 years

mother's age when brother was born

= (26 - 3) years = 23 years.

Q.26.(2) Let Priya age be x years. Then Aneeta's age $= \frac{240}{x}$ years.

$\therefore 2 \times \frac{240}{x} - x = 4$

$480 - x^2 = 4x$

$x^2 + 4x - 480 = 0$

$(x+24)(x-20) = 0$

$x = 20$

Hence, Aneeta's age $= \left(\frac{240}{20}\right)$ years

= 12 years

Q.27.(5) 14 Years

diffrence between their present age is 6 years

Samir present age is = 6 x 3/2 = 9

after 5 years their age is 14 years

Q.28.(5) 18 years

$\frac{P+Q+R}{3} = 26$

P + Q + R = 78 .....(I)

$\frac{P+R}{2} = 30$

P + R = 60 .....(II)

Q + 60 = 78, Q = 18Years

Q.29.(3) 51 years

difference of father and son's ages is 27 and ratio of their is 5 : 2

Father age is = $27 \times \frac{5}{3} = 45$ years

after 6 years father age is 51 years

Q.30.(3) 126 years

Let the age of husband 5 years ago was x, age of wife 5 years ago is y and age of son 5 years ago is Z

$\frac{x}{y} = \frac{11}{9}$ .....(I)

$\frac{x}{Z} = \frac{5}{1}$ .....(II)

After 5 years from the present ,According to question $\frac{x+5+5}{y+5+5} = \frac{13}{11}$

11x + 110 = 13y + 130 ------- III

$x = \frac{11}{9}y - (\text{from I})$

Putting the value of x in eqⁿ III

$11 \times \frac{11}{9} y + 110 = 13y + 130$

y = 45

Age of husband 5 year ago was

$= 45 \times \frac{11}{9}$

= 55 year

and age of son was $55 \times \frac{1}{5} = 11$ years

sum of present age of family is

= 50 + 60 + 16 = 126 years

CHAPTER-9

PARTNERSHIP

Q.1.(2) Aman : Rakhi : Sagar = (70000 x 36) : (105000 x 30) : (140000 x 24) = 12 : 15 : 16.

Q.2.(1) Arun : Kamal : Vinay = (8000 x 6) : (4000 x 8) : (8000 x 8) = 48 : 32 : 64 = 3 : 2 : 4.

$\therefore$ Kamal's share = Rs. $\left(4005 \times \frac{2}{9}\right)$

= Rs. 890.

Q.3.(4) A : B : C = (25 lakhs x 1) + (35 lakhs x 2) : (35 lakhs x 2 + 25 lakhs x 1) : (30 lakhs x 3)

= 95 lakhs : 95 lakhs : 90 lakhs = 19 : 19 : 18.

Q.4.(2) Shekhar : Rajeev : Jatin

= (25000 x 12 + 35000 x 12 + 45000 x 12) : (35000 x 24) : (35000 x 12)

= 1260000 : 840000 : 420000 = 3:2:1.

$\therefore$ Rajeev's share = Rs. $\left(150000 \times \frac{2}{6}\right)$

= Rs. 50000.

Q.5.(2) A : B : C = (5000 x 4 + 2500 x 8) : (4500 x 6 + 3000 x 6) : (7000 x 6) = 40000 : 45000 : 42000 = 40 : 45 : 42.

$\therefore$ A's share = Rs. $\left(5080 \times \frac{40}{127}\right)$

= Rs. 1600;

B's share = Rs. $\left(5080 \times \frac{45}{127}\right)$

= Rs. 1800;

C's share = Rs. $\left(5080 \times \frac{42}{127}\right)$

= Rs. 1680.

Q.6.(5) Let C = x. Then, B = 4x and 2A = 3 x 4x = 12x or A = 6x.

$\therefore$ A : B : C = 6x : 4x : x = 6 : 4 : 1.

So, B's capital = Rs. $\left(16500 \times \frac{4}{11}\right)$

= Rs. 6000.

Q.7.(2) A : B : C = 7 : 8 : 11.

Hire charges paid by B

= Rs. $\left(520 \times \frac{8}{26}\right)$ = Rs. 160.

Q.8.(1) A : B : C = 10 x 7 : 12 x 5 : 15 x 3 = 70 : 60 : 45 = 14 : 12 : 9.

$\therefore$ C's rent = Rs. $\left(175 \times \frac{9}{35}\right)$ = Rs. 45.

Q.9.(3) A : B = 3 : 2 $\Leftrightarrow$ B : A = 2 : 3 = 4 : 6 and A : C = 2:1 = 6:3.

So, B : A : C = 4 : 6 : 3 or A : B : C = 6 : 4 : 3.

$\therefore$ B's share = Rs. $\left(157300 \times \frac{4}{13}\right)$

= Rs. 48400.

Q.10.(3) Let the initial investments of A and B be 3x and 5x.

A : B : C = (3x x 12) : (5x x 12) : (5x x 6) = 36 : 60 : 30 = 6 : 10 : 5.

Q.11.(2) Ratio of initial investments = $\frac{1}{2} : \frac{1}{3} : \frac{1}{4}$

= 6 : 4 : 3.

Let their initial investments be 6x, 4x and 3x respectively.

A : B : C = (6x × 2 + 3x × 10) : (4x × 12) : (3x × 12) = 42 : 48 : 36 = 7 : 8 : 6.

B's share = Rs. $\left(378 \times \frac{8}{21}\right)$ = Rs. 144.

Q.12.(2) Let their initial investments be x, 3x and 5x respectively.

Then, A : B : C = (x x 4+ 2x x 8) :

$\left(3x\times 4\times\frac{3x}{2}\times 8\right)\left(5x\times 4+\frac{5x}{2}\times 8\right)$

= 20x : 24x : 40x = 5 : 6 : 10

Q.13.(2) Suppose A invests Rs. $\frac{x}{6}$ for $\frac{y}{6}$ months.

Then, B invests Rs. $\frac{x}{3}$ for $\frac{y}{3}$ months.

C invests $\left[x-\left(\frac{x}{6}+\frac{x}{3}\right)\right]$ i.e., Rs. $\frac{x}{2}$ for y months.

∴ A : B : C

$= \left(\frac{x}{6}\times\frac{y}{6}\right):\left(\frac{x}{3}\times\frac{y}{3}\right):\left(\frac{x}{2}\times y\right) = \frac{1}{36}:\frac{1}{9}:\frac{1}{2}$

= 1 : 4 : 18.

Hence, B's share = Rs. $\left(4600\times\frac{4}{23}\right)$

= Rs. 800.

Q.14.(4) Suppose B joined for x months. Then,

$\frac{85000\times 12}{42500\times x}=\frac{3}{1}$ or $x=\frac{85000\times 12}{42500\times 3}=8$

So, B joined for 8 months.

Q.15.(4) Let B's capital be Rs. x. Then,

$\frac{3500\times 12}{7x}=\frac{2}{3}\Leftrightarrow 14x=126000\Leftrightarrow x$

= 9000.

Q.16.(3) Let the total profit be Rs. x. Then, B

$=\frac{2x}{7}$ and A $=\left(x-\frac{2x}{7}\right)=\frac{5x}{7}$

So, A : B $=\frac{5x}{7}:\frac{2x}{7}$ = 5 : 2.

Let B's capital be Rs. y. Then,

$\frac{16000\times 8}{y\times 4}=\frac{5}{2}\Leftrightarrow y$

$=\left(\frac{16000\times 8\times 2}{5\times 4}\right)=12800$

Q.17.(3) Let the total profit be Rs. z.

Then, 20% of x = 98000 ⇔ x

$=\left(\frac{98000\times 100}{20}\right)=490000$

Let the capitals of P, Q and R be Rs. 5x, Rs. 6x and Rs. 6x respectively. Then,

(5x x 12) + (6x x 12) + (6x x 6)

= 490000 x 12

⇔ 168x = 490000×12 ⇔ x

$=\left(\frac{490000\times 12}{168}\right)=35000$

∴ R's investment = 6x

= Rs.(6 x 35000) = Rs. 210000.

Q.18.(5) **T and K**

Both or only P.

L share = $88000\times\frac{20}{44}$

= Rs. 40,000/-

Q.19.(5) **600 Rs.**

Profit ratio of Vikas, Rakesh & Sunil

= 2 x 12 : 3 x 12 : 4 x 12

= 2 : 3 : 4

Total profit (2 + 3 + 4) = 2700

then diff. in profit of Vikas & Sunil (4 - 2)

$=\frac{2700\times 2}{9}=600$ Rs.

Q.20.(4) **1600 Rs.**

Investment ratio of Praveen & Naveen

= 18 × 12 : 16 × 6 = 9 : 4

Then profit of Naveen

$=5200\times\frac{4}{13}=1600$ Rs.

(Note : No need to take common zero)

CHAPTER-10
TIME & WORK

Q.1.(2) Formula

(A+B)'s work together $=\frac{A\times B}{(A+B)}$

A's 1 day's work = $\frac{1}{10}$ and B's 1 day's work = $\frac{1}{15}$

(A+B)'s 1 day's work = $\left(\frac{1}{10}+\frac{1}{15}\right)=\frac{1}{6}$

So, both together will finish the work in 6 days.

Q.2.(3) Formula

(A+B +C)'s work together

$=\frac{A\times B\times C}{(AB+BC+CA)}$

(A+B +C)'s 1 day's work

$=\left(\frac{1}{24}+\frac{1}{6}+\frac{1}{12}\right)=\frac{7}{24}$

So, A, B and C together will complete the job in $\frac{24}{7}=3\frac{3}{7}$ days.

Q.3.(3) 1 day's work of the three persons

$=\left(\frac{1}{15}+\frac{1}{20}+\frac{1}{25}\right)=\frac{47}{300}$

So, all the three together will complete the work in $\frac{300}{47}\approx 6\frac{18}{47}$ days

Q.4.(3) Formula

Son's 1 day's work

$=\frac{(S+F)\text{no. of days}\times\text{father no. of days}}{(\text{father's 1day work}-\text{both work together})}$

Son's 1 day's work = $\left(\frac{1}{3}-\frac{1}{5}\right)=\frac{2}{15}$

The son alone can do the work in $\frac{15}{2}=7\frac{1}{2}$ days

Q.5.(3) (A+B+C)'s 1 day's work = $\frac{1}{4}$, A's 1 day's work = $\frac{1}{16}$, B's 1 day work = $\frac{1}{12}$

∴ C's 1 day's work = $\frac{1}{4}-\left(\frac{1}{16}+\frac{1}{12}\right)$

$=-\left(\frac{1}{4}-\frac{7}{48}\right)=\frac{5}{18}$

So, C alone can do the work in $\frac{48}{5}=9\frac{3}{5}$ days.

Q.6.(4) Suppose A, B and C take x, $\frac{x}{2}$ and $\frac{x}{3}$ day respectively to finish the work

Then, $\left(\frac{1}{x}+\frac{2}{x}+\frac{3}{x}\right)=\frac{1}{2}\Rightarrow\frac{6}{x}=\frac{1}{2}\Rightarrow 12$

So, A takes 12 days to finish the work.

Q.7.(3) Number of pages typed by Rohan in 1 hour

$=\frac{32}{6}=\frac{16}{3}$

Number of pages typed by Sohan in 1 hour

$=\frac{40}{5}=8$

Number of pages typed by both in 1 hour

$=\left(\frac{16}{3}+8\right)=\frac{40}{3}$

∴ Time taken by both to type 110 pages

$=\left(110\times\frac{3}{40}\right)\text{hrs}=8\frac{1}{4}\text{hrs}=8\text{ hrs }15\text{ min.}$

Q.8.(3) Let A and B together take x hours to complete the work. Then,

A alone takes (x+8) hrs and B alone takes $\left(x+\frac{9}{2}\right)$ hrs to complete the work

$\frac{1}{(x+8)}+\frac{1}{\left(x+\frac{9}{2}\right)}=\frac{1}{x}\Rightarrow\frac{1}{(x+8)}+\frac{2}{(2x+9)}=\frac{1}{x}$

$\Rightarrow x(4x+25) = (x+8)$

$\Rightarrow 2x^2 = 72 \Rightarrow x^2 = 36 \Rightarrow x = 6$ hours

Q.9.(1) P can complete the work in (12×8) hrs $= 96$ hrs.

Q can complete the work in (8×10) hrs. $= 80$ hrs.

$\therefore$ P's 1 hour's work $= \frac{1}{96}$ and Q's 1 hour's work $= \frac{1}{80}$.

(P + Q)'s 1 hour's work

$= \left(\frac{1}{96} + \frac{1}{80}\right) = \frac{11}{480}$.

So, both P and Q will finish the work in $\left(\frac{480}{11}\right)$ hrs.

$\therefore$ Number of days of 8 hours each

$= \left(\frac{480}{11} \times \frac{1}{8}\right) = \frac{60}{11}$ days $= 5\frac{5}{11}$ days

Q.10.(3) (A +B)'s 1 day's work $= \frac{1}{12}$,

(B + C)'s 1 day's work $= \frac{1}{15}$,

(A+C)'s 1 day's work $= \frac{1}{20}$

Adding, we get : 2 (A+B+C)'s 1 day's work

$= \left(\frac{1}{12} + \frac{1}{15} + \frac{1}{20}\right) = \frac{12}{60} = \frac{1}{5}$

$\therefore$ (A + B + C)'s 1 day's work $= \frac{1}{10}$

So, A,B and C together can complete the work in 10 days

Q.11.(3) (A+B)'s 1 day's $= \frac{1}{72}$,

(B + C)'s 1 day work $= \frac{1}{120}$,

(A + C)'s 1 day's work $= \frac{1}{90}$

Adding, we get : 2 (A+ B +C)'s 1 day's work $= \left(\frac{1}{72} + \frac{1}{120} + \frac{1}{90}\right) = \frac{12}{360} = \frac{1}{30}$

$\Rightarrow$ (A + B +C)'s 1 day's work $= \frac{1}{60}$

So, A's 1 day's work $= \left(\frac{1}{60} - \frac{1}{120}\right) = \frac{1}{120}$

$\therefore$ A alone can do the work in 120 days.

Q.12.(1) (A + B)'s 1 day's work $= \frac{1}{5}$,

(B + C)'s 1 day's work $= \frac{1}{7}$,

(A+C)'s 1 day's work $= \frac{1}{4}$.

Adding we get : 2 (A +B +C)'s 1 day's work $= \left(\frac{1}{5} + \frac{1}{7} + \frac{1}{4}\right) = \frac{83}{140}$

(A +B + C)'s 1 day's work $= \frac{83}{280}$

A's 1 day's work $= \left(\frac{83}{280} - \frac{1}{7}\right) = \frac{43}{280}$,

B's 1 day's work $= \left(\frac{83}{280} - \frac{1}{4}\right) = \frac{13}{280}$,

C's 1 day's work $= \left(\frac{83}{280} - \frac{1}{5}\right) = \frac{27}{280}$

Thus time taken by A,B, C is $\frac{280}{43}$ days, $\frac{280}{13}$ days and $\frac{280}{27}$ days respectively.

Clearly, the time taken by A is least.

Q.13.(3) A's 1 hour's work $= \frac{1}{4}$'(B+C)'s 1 hour's work $= \frac{1}{3}$' (A+C)'s 1 hour's work $= \frac{1}{2}$.

(A+B+C)'s 1 hour's work $= \left(\frac{1}{4} + \frac{1}{3}\right) = \frac{7}{12}$.

B's 1 hour's work $= \left(\frac{7}{12} - \frac{1}{2}\right) = \frac{1}{12}$

$\therefore$ B alone will take 12 hours to do the work.

Q.14.(3) (A+B)'s 1 day's work $= \frac{1}{10}$,

C's 1 day's work $= \frac{1}{50}$.

(A+B+C)'s 1 day's work

$= \left(\frac{1}{10} + \frac{1}{50}\right) = \frac{6}{50} = \frac{3}{25}$

Also, A's 1 day's work = (B +C)'s 1 days work.

Then, we get : 2 × (A's 1 day's work) $= \frac{3}{25}$

$\Rightarrow$ A's 1 day's work $= \frac{3}{50}$.

$\therefore$ B's 1 day's work

$= \left(\frac{1}{10} - \frac{3}{50}\right) = \frac{2}{50} = \frac{1}{25}$

So, B alone could do the work in 25 days.

Q.15.(1) Ratio of rates of working of A and B $= 2 : 1$. So, ratio of times taken $= 1 : 2$

$\therefore$ A's 1 day's work $= \frac{1}{6}$, B's 1 day's work $= \frac{1}{12}$, (A+B)'s1 day's work

$= \left(\frac{1}{6} + \frac{1}{12}\right) = \frac{3}{12} = \frac{1}{4}$

So, A and B together can complete the same work in 4 days

Q.16.(2) Ratio of times taken by A and B = 100 : 130 = 10 : 13.

Suppose B takes x days to the work

Then, $10 : 13 :: 23 : x \Rightarrow \left(\frac{23 \times 13}{10}\right)$

$\Rightarrow x = \frac{299}{10}$

A's 1 day's work $= \frac{1}{23}$' B's 1 days work

$= \frac{10}{299}$ (A +B)'s 1 day's work

$= \left(\frac{1}{23} + \frac{10}{299}\right) = \frac{23}{299} = \frac{1}{13}$

$\therefore$ A and B together can complete the job in 13 days

Q.17.(1) Suppose B takes x days to do the work.

$\therefore$ A takes $\left(2 \times \frac{3}{4}x\right) = \frac{3x}{2}$ days to do it

(A + B)'s 1 day's work $= \frac{1}{18}$

$\therefore \frac{1}{x} + \frac{2}{3x} = \frac{1}{18}$ or $x = 30$

So, B can do the same work in 30 days.

Q.18.(3) B's 10 day's work $= \left(\frac{1}{15} \times 10\right) = \frac{2}{3}$.

Remaining work $= \left(1 - \frac{2}{3}\right) = \frac{1}{3}$

Now, $\frac{1}{18}$ work is done by A in 1 day.

$\therefore \frac{1}{3}$ work is done by A in $\left(18 \times \frac{1}{3}\right) = 6$ days

Q.19.(3) (Ram+Mohan)'s 1 days work $= \left(\frac{1}{15} + \frac{1}{10}\right) = \frac{1}{6}$

Work done by Ram and Mohan in 2 days

$= \left(\frac{1}{6} \times 2\right) = \frac{1}{3}$, Remaining work $= \left(1 - \frac{1}{3}\right)$

Now, $\frac{1}{15}$ work is done by Ram in 1 day.

$\therefore \frac{2}{3}$ work will be done by Ram in $\left(15 \times \frac{2}{3}\right)$ = 10 days

Hence, total time taken = (10+2) = 12 days.

Q.20.(3) (B + C)'s 1 day's work $= \left(\frac{1}{9} + \frac{1}{12}\right) = \frac{7}{36}$

Work done by B and C in 3 days

$= \left(\frac{7}{36} \times 3\right) = \frac{7}{12}$

Remaining work $= \left(1 - \frac{7}{12}\right) = \frac{5}{12}$

Now, $\frac{1}{24}$ work is done by A in 1 day.

So, $\frac{5}{12}$ work is done by A in $\left(24 \times \frac{5}{12}\right) = 10$ days.

Q.21.(4) (P +Q +R)'s 1 hours' work

$= \left(\frac{1}{8} + \frac{1}{10} + \frac{1}{12}\right) = \frac{37}{120}$

Work done by P,Q and R in 2 hours

$= \left(\frac{37}{120} \times 2\right) = \frac{37}{60}$

Remaining work $= \left(1 - \frac{37}{60}\right) = \frac{23}{60}$.

(Q+R)'s 1 hour's work $= \left(\frac{1}{10} + \frac{1}{12}\right) = \frac{11}{60}$.

Now, $\frac{11}{60}$ work is done by Q and R in 1 hour.

So, $\frac{23}{60}$ work will be done by Q and R in $\left(\frac{60}{11} \times \frac{23}{60}\right) = \frac{23}{11}$ hours $\approx$ 2 hours.

So, the work will be finished approximately in 2 hours after 11 a.m., i.e., around 1 pm.

Q.22.(1) 2(A+B+C)'s 1 day's work

$= \left(\frac{1}{30} + \frac{1}{24} + \frac{1}{20}\right) = \frac{15}{120} = \frac{1}{8}$.

$\Rightarrow$ (A+B+C)'s 1 day's work $= \frac{1}{16}$.

Work done by A,B and C in 10 days $= \frac{10}{16} \Rightarrow \frac{5}{8}$. Remaining work $= \left(1 - \frac{5}{8}\right) = \frac{3}{8}$.

A's 1 day's work $= \left(\frac{1}{16} - \frac{1}{24}\right) = \frac{1}{48}$.

Now, $\frac{1}{48}$ work is done by A in 1 day.

So, $\frac{3}{8}$, work will be done by A in $\left(48 \times \frac{3}{8}\right) = 18$ days.

Q.23.(2) Work done by X in 4 days

$= \left(\frac{1}{20} \times 4\right) = \frac{1}{5}$. Remaining work

$= \left(1 - \frac{1}{5}\right) = \frac{4}{5}$. (X+Y)'s 1 day work

$= \left(\frac{1}{20} + \frac{1}{12}\right) = \frac{8}{60} = \frac{2}{15}$.

So, $\frac{2}{15}$ work is done by X and Y in 1 day.

So, $\frac{4}{5}$ work is done by X and Y in $\left(\frac{15}{2} \times \frac{4}{5}\right) = 6$ days

Hence, total time taken = (6 +4) days = 10 days.

Q.24.(1) Work done by A in 8 days

$= \left(\frac{1}{40} \times 8\right) = \frac{1}{5}$.

Remaining work $= \left(1 - \frac{1}{5}\right) = \frac{4}{5}$.

Now, $\frac{4}{5}$ work is done by B in 16 days.

Whole work will be done by B in $\left(16 \times \frac{5}{4}\right) = 20$ days.

A's 1 day's work $= \frac{1}{40}$,

B's 1 day's work $= \frac{1}{20}$.

A+B's 1 day's work $= \left(\frac{1}{40} + \frac{1}{20}\right) = \frac{3}{40}$

Hence, A and B will together complete the work in $\frac{40}{3} = 13\frac{1}{3}$ days.

Q.25.(4) 5 m or 9 w $\Rightarrow$ 19 days $\Rightarrow$ 5 m = 9 m = 19 days

3m and 6 w $\Rightarrow$? $\Rightarrow$ 3m + 6w $\Rightarrow$?

Formula -

$m_1 d_1 = m_2 d_2$

$5m \times 19 = (3m + 6w) \times d_2$

$5m \times 19 = \left(3m + \frac{5}{9} \times 6\right) \times d_2$

$95m = \left(\frac{27m + 30m}{9}\right) \times d_2$

$95m \times 9 = 57m \times d_2$

$\frac{95 \times 9}{57} = d_2 \Rightarrow 15$ days

CHAPTER-11

PIPES & CISTERNS

Q.1.(1) Here, X = 2 and Y = 3

Part of the cistern filled in 1 hour

$= \frac{1}{x} - \frac{1}{y}$

$= \frac{1}{2} - \frac{1}{3} = \frac{1}{6}$

$\therefore$ Total time taken to fill the cistern = 6 hours.

Q.2.(1) Here, X = 25 and Y = 50

Part of the tank filled or emptied in 1 minute

$= \frac{1}{X} - \frac{1}{Y} = \frac{1}{25} - \frac{1}{50} = \frac{1}{50}$

Sign is positive, therefore the tank will be filled.

$\therefore$ Total time taken to fill the tank = 50 minutes.

Q.3.(2) Here, X = 10 Y = 15

$\therefore$ The tank will be full in

$= \left(\frac{xy}{x+y}\right)$ hours

$= \left(\frac{10 \times 15}{10 + 15}\right)$ hours $\Rightarrow$ 6 hours

Q.4.(3) Here, X = 12 and Y = 15

$\therefore$ The cistern will be empty in

$= \left(\frac{xy}{x+y}\right)$ hours

$= \left(\frac{12 \times 15}{12 + 15}\right)$ hours

$= \frac{20}{3}$ hours or 6 hours 40 minutes.

Q.5.(1) Here, X = 10, Y = 12 and Z = 20

$\therefore$ The tank will be filled in

$= \left(\frac{X \times Y \times -Z}{XY - YZ - ZX}\right)$ hours

$= \left(\frac{10 \times 12 \times -20}{10 \times 12 - 12 \times 20 - 20 \times 10}\right)$ hours

$= \left(\frac{15}{2}\right)$ hours or, 7 hours 30 minutes.

Q.6.(2) Here, X = 24, Y = 30 and Z = 20

$\therefore$ The total time taken by C to empty the full cistern

$= \left(\frac{XYZ}{XZ + YZ - XY}\right)$ minutes

$= \left(\frac{24 \times 30 \times 20}{24 \times 20 + 30 \times 20 - 24 \times 30}\right)$ minutes

= 40 minutes

Q.7.(3) Here, X = 8, Y = 6 × 60 = 360 and Z = 12

$\therefore$ The capacity of the cistern is

$= \left(\frac{XYZ}{Z - X}\right)$ litres

$= \left(\frac{8 \times 360 \times 12}{12 - 8}\right)$ litres

= 8640 litres.

Q.8.(2) Let one pipe take x hours to fill the reservoir.

Then, another pipe takes (x - 10) hours.

$\therefore \frac{1}{x} + \frac{1}{x - 10} = \frac{1}{12} \Rightarrow (2x - 10)12 = x(x - 10)$

$24x - 120 = x^2 - 10x$

$x^2 - 34x + 120 = 0$

$x^2 - 30x - 4x + 120 = 0$

$(x - 30)(x - 4) = 0$

$x = 30, 4$

Reqd.time =30 hrs.

Q.9.(2) Here, K = 3 and x =32

$\therefore$ Cistern will be filled in $\frac{kx}{(k-1)^2}$ min

$= \frac{3 \times 32}{(3-1)^2}$ min

= 24 minutes

Q.10.(1) As the pipes are operating alternately its 2 minutes job is $\frac{1}{4}+\frac{1}{6}=\frac{5}{12}$.

In the next 2 minutes the pipes can fill another $\frac{5}{12}$ of cistern. Therefore, in 4 minutes the two pipes are operating alternately will fill $\frac{5}{12}+\frac{5}{12}=\frac{10}{12}=\frac{5}{6}$

The part of the cistern left unfilled = $1-\frac{5}{6}$

Pipe A can fill $\frac{1}{4}$ of the cistern in 1 min.

Pipe A can fill $\frac{1}{6}$ of the cistern in $4\times\frac{1}{6}-\frac{2}{3}$ min.

Total time taken to fill the cistern $4+\frac{2}{3}=4\frac{2}{3}$ min or, 4 minutes 40 seconds.

Q.11.(3) Part emptied by the third pipe in 1 min.

$= \left(\frac{1}{10}+\frac{1}{12}\right)-\frac{1}{15}=\frac{7}{60}$

So, the full tank will be emptied by third pipe $\left(\frac{60}{7}\right)$ minutes = 8 minutes 34 seconds

Q.12.(1) Part filled in 1 minute

$= \frac{1}{20}+\frac{1}{25}=\frac{9}{100}$

Part filled in 5 minutes

$= \frac{9}{100} \times 5$

$= \frac{9}{20}$

Unfilled part = $1-\frac{9}{20}=\frac{11}{20}$

This is to be filled by A alone and hence will be filled in $20\times\frac{11}{20}$ =11 minutes

Q.13.(2) (A+B)'s 1 $\frac{1}{2}$ hours job

$= \frac{3}{2}\left(\frac{1}{6}+\frac{1}{8}\right)=\frac{7}{16}$

Part unfilled = $1-\frac{7}{16}=\frac{9}{16}$

B can fill $\frac{1}{8}$ of the tank in = 1 hour

B can fill $\frac{9}{16}$ th of the tank in

$= 8 \times \frac{9}{16}=\frac{9}{2}$ hours

Total time taken to fill the tank $\left(\frac{3}{2}+\frac{9}{2}\right)$ hours

= 6 hours

Q.14.(2) Work done by waste pipe in 1 minute

$= \left(\frac{1}{12}+\frac{1}{15}\right)-\frac{1}{20}$

$= \left(\frac{3}{20}-\frac{1}{20}\right)-\frac{1}{10}$

∴ Waste pipe can empty the cistern in 10 minutes

Q.15.(2) Work done by waste pipe in 1 minute

$= \left(\frac{1}{10}+\frac{1}{15}\right)-\frac{1}{18}$

$= \left(\frac{1}{6}-\frac{1}{18}\right)=\frac{1}{9}$

∴ Waste pipe can empty the cistern in 9 minutes

Q.16.(1) Pipe A in 1 minute fills $\frac{1}{10}$ part and pipe B in 1 minute empties $\frac{1}{6}$ part

∴ Pipe (A +B) in 1 minute fill $\frac{1}{10}-\frac{1}{6}=\frac{-1}{15}$ part

∴ $\frac{1}{15}$ part gets emptied in 1 minute

∴ $\frac{2}{5}$ part gets emptied in $15\times\frac{2}{5}$ minute

= 6 minutes

Q.17.(5) $\frac{1}{25}+\frac{1}{40}-\frac{1}{30}=\frac{19}{600}$

$= \frac{600}{19}$

Q.18.(3) Required time = $\frac{5\times4}{5-4}$ = 20 hours

Q.19.(4) Required time $\frac{2\times\frac{7}{3}}{\frac{7}{3}-2}$ = 14 hours

Q.20.(2) Let the third pipe empty the cistern in K minutes

i.e. $\frac{1}{60}+\frac{1}{75}-\frac{1}{K}=\frac{1}{50}$

or $\frac{1}{60}+\frac{1}{75}-\frac{1}{50}=\frac{1}{K}$ or, K

= 100 minutes

Q.21.(4) Half of the tank is filled in $\frac{1}{2}\times6$ = 3 hours.

Now, we have four taps and each tap can fill the tank in 6 hours.

When all the four taps are opened, then they can fill

$\frac{1}{2}$ of the tank in $\frac{6}{4}\times\frac{1}{2}=\frac{3}{2}$ hours

= 45 minutes

∴ Total time = 3 hours 45 minutes

Q.22.(4) Work done by the leak in 1 hour

$= \left(\frac{1}{2}-\frac{3}{7}\right)=\frac{1}{14}$

∴ Leak will empty the tank in 14 hrs.

Q.23.(3) A's work in 1 hour = $\frac{1}{6}$,

B's work in 1 hour = $\frac{1}{4}$.

(A+B)'s 2 hour's work when opened alternately = $\left(\frac{1}{6}+\frac{1}{4}\right)=\frac{5}{12}$.

(A+B)'s 4 hour's work when opened alternately = $\frac{10}{12}=\frac{5}{6}$.

Remaining part = $\left(1-\frac{5}{6}\right)=\frac{1}{6}$.

Now, it is A's turn and $\frac{1}{6}$ part is filled by A in 1 hour.

∴ Total time taken to fill the tank = (4+1) hrs. = 5 hrs.

Q.24.(5) (A + B)'s 1 hour's work

$= \left(\frac{1}{12}+\frac{1}{15}\right)=\frac{9}{60}=\frac{3}{20}$

(A+C)'s 1 hour's work

$= \left(\frac{1}{12}+\frac{1}{20}\right)=\frac{8}{60}=\frac{2}{15}$.

Part filled in 2 hrs. = $\left(\frac{3}{20}+\frac{2}{15}\right)=\frac{17}{60}$,

Part filled in 6 hrs. = $\left(3\times\frac{17}{60}\right)=\frac{17}{20}$

Remaining part = $\left(1-\frac{17}{20}\right)=\frac{3}{20}$.

Now, it is the turn of A and B and $\frac{3}{20}$ part is filled by A and B in 1 hour.

∴ Total time taken to fill the tank = (6+1) hrs. = 7 hours

Q.25.(3) Work done by the waste pipe in 1 minute

$= \frac{1}{15}-\left(\frac{1}{20}+\frac{1}{24}\right)=\left(\frac{1}{15}-\frac{11}{120}\right)=-\frac{1}{40}$

(–sign means emptying)

Volume of $\frac{1}{40}$ part = 3 gallons.

Volume of whole = (3 ×40) gallons

= 120 gallons. .

CHAPTER-12

TIME, SPEED & DISTANCE

Q.1.(4) Speed $= \left(5 \times \frac{5}{18}\right)$ m/ sec $= \frac{25}{18}$ m/sec.

Distance covered in 15 minutes

$= \left(\frac{25}{18} \times 15 \times 60\right)$ m = 1250 m.

Q.2.(3) Speed = 108 kmph $= \left(108 \times \frac{5}{18}\right)$ m/sec

= 30 m/sec.

∴ Distance covered in 15 sec. = (30×15) = 450 m/sec.

Q.3.(3) Ratio of speeds $= \left(300 \times \frac{2}{15}\right) : \left(\frac{450}{9}\right)$

= 40 : 50 = 4: 5.

Q.4.(1) Ratio of speeds $= \left(\frac{550}{60} \times \frac{18}{5}\right) : \left(\frac{33}{45} \times 60\right)$

= 33 : 44 = 3 :4.

Q.5.(5) Total distance travelled

$= 50 \times 2\frac{1}{2} = 125$ miles

= (125+105) miles. = 230.

Q.6.(3) Number of gaps between 21 telephone posts = 20.

Distance travelled in 1minute = (50×20) m = 1000 m = 1 km.

∴ Speed = 60 km/hr.

Q.7.(2) Distance $= \left(1100 \times \frac{11}{5}\right)$ feet = 2420 feet.

Q.8.(1) Time taken to cover 600 km $= \left(\frac{600}{100}\right)$ hrs = 6 hrs.

Number of stoppages $= \frac{600}{75} - 1 = 7$.

Total time of stoppage = (3 × 7) min = 21 min.

Hence total time taken = 6 hrs 21 min.

Q.9.(3) Total distance travelled in 12 hours = (35+37+39+....up to 12 terms)

This is an A.P. with first term, a = 35, number of terms, n = 12, common difference, D = 2

Required distance $= \frac{12}{2}[2\times35+(12-1)\times2]$

= 6 (70+22) = 552 km.

Q.10.(4) Speed $= \left(10 \times \frac{60}{12}\right)$ km/hr = 50 km/hr.

New speed = (50-5) km/hr = 45 km/hr.

Time taken

$= \left(\frac{10}{45}\right)$ hr $= \left(\frac{2}{9} \times 60\right)$ min $= 13\frac{1}{3}$ min

= 13 min, 20 sec.

Q.11.(2) Let A's speed = x km/hr. Then, B's speed = (7-x) km/hr.

So, $\frac{24}{x} + \frac{24}{7-x} = 14$

24 (7-x) +24x = 14x (7-x)

$14x^2 - 98x + 168 = 0$

$x^2 - 7x + 12$

(x-3) (x-4) = 0

x = 3 or x = 4

Since, A is faster than B, so A's speed = 4 km/hr

Q.12.(3) Speed on return trip = 150% of 40 = 60 kmph.

∴ Average speed =

$= \left(\frac{2 \times 40 \times 60}{40+60}\right)$ km / hr $= \left(\frac{4800}{100}\right)$ km/hr

= 48 km/hr.

Q.13.(4) Speed from A to B $= \left(250 \times \frac{2}{11}\right)$ kmph

$= \left(\frac{500}{11}\right)$ kmph.

Speed from B to A

$= \left(250 \times \frac{2}{9}\right)$ kmph $= \left(\frac{500}{9}\right)$ kmph.

∴ Average speed

$= \left(\frac{2 \times \frac{500}{11} \times \frac{500}{9}}{\frac{500}{11} + \frac{500}{9}}\right)$ kmph

$= \left(\frac{500000}{4500+5500}\right)$ kmph = 50 kmph.

Q.14.(3) Average speed $= \left(\frac{2 \times 3 \times 2}{3+2}\right)$ km/hr

$= \frac{12}{5}$ km / hr.

Distance travelled $= \left(\frac{12}{5} \times 5\right)$ km = 12 km.

∴ Distance between house and school

$= \left(\frac{12}{2}\right)$ km = 6 km.

Q.15.(4) Let the speed in return journey be x km/hr. Then, speed in onward journey

$= \frac{125}{100}x = \left(\frac{5}{4}x\right)$ km/hr.

Average speed $= \left(\frac{2 \times \frac{5}{4}x \times x}{\frac{5}{4}x + x}\right)$ km/hr

$= \frac{10x}{9}$ km/hr. $\left(800 \times \frac{9}{10x}\right) = 16$

$x = \left(\frac{800 \times 9}{16 \times 10}\right) = 45$

So, speed in onward journey $= \left(\frac{5}{4} \times 45\right)$ km/hr = 56.25 km/hr.

Q.16.(1) Time taken = 5 hrs 25 min. $= \frac{65}{12}$ hrs.

Let the required distance be x km.

Then, $\frac{x}{10} + \frac{x}{1} = \frac{65}{12}$

$= 11x = \frac{650}{12} \Leftrightarrow x = \frac{325}{66} = 4\frac{61}{66}$ km.

Q.17.(3) Total distance travelled = (50×1+48×2+52×3)km = 302 km.

Total time taken = 6 hrs.

Mean speed $= \left(\frac{302}{6}\right)$ km/hr $= 50\frac{1}{3}$ km/hr.

Q.18.(2) Total distance travelled = (10+12)km/hr = 22 km/hr.

Total time taken $= \left(\frac{10}{12} + \frac{12}{10}\right)$ hrs.

$= \frac{61}{30}$ hrs.

Average speed $= \left(22 \times \frac{30}{61}\right)$ km/hr.

=10.8 km/hr.

Q.19.(5) Total distance travelled = (600+800+500+100)km =2000 km.

Total time taken

$= \left(\frac{600}{80} + \frac{800}{40} + \frac{500}{400} + \frac{100}{50}\right)$ hrs.

$= \frac{123}{4}$ hrs.

∴ Average speed $= \left(2000 \times \frac{4}{123}\right)$ km/hr $= \left(\frac{8000}{123}\right)$ km/hr $= 65\frac{5}{123}$ km/hr.

Q.20.(1) Let the whole distance travelled be x km and the average speed of the car for the whole journey be y km/hr.

Then, $\frac{(x/3)}{10} + \frac{(x/3)}{20} + \frac{(x/3)}{60} = \frac{x}{y}$

$= \frac{x}{30} + \frac{x}{60} + \frac{x}{180} = \frac{x}{y}$

$\frac{1}{18}y = 1$, Y = 18km / hr.

Q.21.(3) Difference between timings = 15 min

$= \frac{1}{4}$ hr.

Let the length of journey be x km.

Then, $\frac{x}{35} - \frac{x}{40} = \frac{1}{4} = 8x - 7x = 70$

x = 70 km.

Q.22.(5) Req. distance $= \frac{T1+T2}{60} \times \frac{S1S2}{S2 \sim S1} = \frac{(11+5)}{60} \times \frac{40x50}{(50-40)}$

Distance $= \frac{16}{60} \times \frac{40x50}{10} = \frac{160}{3}$ km

Actual time $= \frac{160}{3x40} - \frac{11}{60} = \frac{4}{3} - \frac{11}{60}$

$= \frac{80-11}{60} = \frac{69}{60}$ hr. = 69 min.

Q.23.(4) Let distance = x km and usual rate = y kmph. $\frac{x}{y} - \frac{x}{y+3} = \frac{40}{60}$ or $2y(y+3) = 9x$.

and, $\frac{x}{y-2} - \frac{x}{y} = \frac{40}{60}$ or $y(y-2) - 3x$

on dividing (i) by (ii) we get , x=40 km.

Q.24.(3) Let the original speed be x km/hr. Then,

$\frac{715}{x} - \frac{715}{x+10} = 2 = 2x(x+10) = 7150$

$= x^2 + 10x - 3575 = 0 \Rightarrow (x+65)(x-55) = 0$

x = 55 km/hr.

Q.25.(3) Ratio of speeds = 3 : 4

Ratio of time taken = 4 : 3.

Suppose A takes 4x hrs and B takes 3x hrs to reach the destination. Then,

$4x - 3x = \frac{30}{60} = \frac{1}{2}$ or $x = \frac{1}{2}$

Time taken by A = 4x hrs $= \left(4 \times \frac{1}{2}\right)$ hrs. = 2 hrs.

CHAPTER-13

PROBLEMS ON TRAINS

Q.1.(3) $33\frac{1}{3}$ metres/sec $= \left(\frac{100}{3} \times \frac{18}{5}\right)$ km/hr. = 120 km/hr.

Q.2.(4) Rate of running $= \left(15 \times \frac{5}{18}\right)$ m/sec. $= \frac{25}{6}$ m/sec.

Length of bridge = (speed × time)

$= \left(\frac{25}{6} \times 5 \times 60\right)$ metres = 1250m

Q.3.(1) Speed of train $= \left(30 \times \frac{5}{18}\right)$ m/sec. $= \frac{25}{3}$ m/sec.

Required time $= \left(\frac{150 \times 3}{25}\right)$ sec. = 18 sec.

Q.4.(5) Speed of train $= \left(60 \times \frac{5}{18}\right)$ m/sec. $= \frac{50}{3}$ m/sec.

Time taken by the train to cover (220 + 280) metres

$= \left(500 + \frac{50}{3}\right)$ sec. $= \left(\frac{500 \times 3}{50}\right)$ sec.

= 30 sec.

Q.5.(4) The train covers 150 metres in 10 seconds. So, its speed is 15 metres/sec.

Q.6.(3) Speed of train $= \left(36 \times \frac{5}{18}\right)$ metres/sec.

= 10 m/sec.

Length of train = (speed × time) = 80 metres.

Q.7.(4) Speed of train relative to man

= (60-6) km/hr. $= \left(54 \times \frac{5}{18}\right)$ m/sec. = 15 m/sec.

Time taken by the train to cross the man

$= \left(\frac{120}{15}\right)$ sec. = 8 seconds.

Q.8.(1) Speed of train relative to man = 27 km/hr.

$= \left(27 \times \frac{5}{18}\right)$ metres/sec.

$= \left(\frac{15}{2}\right)$ metres/sec.

Required time $= \left(270 \times \frac{2}{15}\right)$ sec. = 36 sec.

Q.9.(2) In 6 seconds, the man walking at rate of 6 km. per hour, covers 10 metres.

So, the train has to move actually (150 - 10) i.e. 140 metres in 6 seconds to cross the man.

Hence, speed of the train $= \frac{140}{6}$ m/sec.

$= \left(\frac{140}{3} \times \frac{18}{5}\right)$ km/hr = 84

Q.10.(5) Speed of train $= \left(\frac{150}{5}\right)$ m/sec. = 30m/sec.

Time taken to cross the bridge $= \left(\frac{330}{30}\right)$ sec. = 11 sec.

Q.11.(2) Speed of train = 36 km/hr $= \left(36 \times \frac{5}{18}\right)$ m/sec. = 10 m/s

Length of train = (10×10) metres = 100 metres.

Sum of lengths of train & platform = 155 metres.

∴ Time taken to cross the platfrom

$= \left(\frac{155}{10}\right)$ sec. $= 15\frac{1}{2}$

Q.12.(2) Sum of lengths of train and bridge = 400 metres

Speed of train $= \left(\frac{400}{30}\right)$ m/sec.

$= \left(\frac{40}{3}\right)$ m/sec.

Time taken to pass a telegraph pole

$= \left(100 \times \frac{3}{40}\right)$ sec. $= 7\frac{1}{2}$ seconds.

Q.13.(3)

Q.14.(3) Req. time $= \frac{90+120}{\frac{5}{18}(60+30)} = \frac{210}{\frac{5}{18} \times 90}$

$= \frac{210}{25} = 8.4$ sec.

Q.15.(2) Let the speed of second train be x km/hr.

Then, relative speed = (30 +x) km/hr.

∴ Time taken to cover (150 + 100) metres at (30 +x) km/hr.

= 10 sec.

$\therefore \frac{250}{(30+x) \times \frac{5}{18}} = 10$

$\frac{250 \times 18}{150 + 5x} = 10 \Rightarrow x = 60$ km/hr.

Q.16.(1) Relative speed = (90 -60) km/h = 30 km/h.

$\left(30 \times \frac{5}{18}\right)$ m/sec. $= \frac{25}{3}$ m/sec.

Time taken to cover (300 + 200) m at $\frac{25}{3}$ m/sec.

$= \left(\frac{500 \times 3}{25}\right) = 60$ sec.

Q.17.(3) The man is moving with the slower train at the rate of 30 km/hr.

Relative speed of faster train w.r.t. man

= (50-30) km/hr $= \left(20 \times \frac{5}{18}\right)$ m/sec.

$= \frac{50}{9}$ m/sec.

Time taken to cross the man =Time taken to cover the length of faster train at relative speed.

$= \frac{9}{50} \times l = 18$ or $l = \left(\frac{50 \times 18}{9}\right) = 100$ metres.

Q.18.(4) $\frac{x\text{'s rate}}{y\text{'s rate}} = \sqrt{\frac{\text{Time taken by Y to reach A}}{\text{Time taken by X to reach B}}}$

or $\frac{40}{Y\text{'s rate}} = \sqrt{\left(\frac{10}{3} \times \frac{5}{24}\right)} = \frac{5}{6}$

∴ Y's rate $\left(\frac{40 \times 6}{5}\right)$ km/hr. = 48 km/hr.

Q.19.(5) Relative speed of faster train = (40 - 22) km/hr.

$= \left(18 \times \frac{5}{18}\right)$ m/sec. = 5 m/sec.

Now, $\frac{125+l}{5} = 60$ or l = (300 - 125)

= 175 metres.

Q.20.(2) Relative speed = (36+54)km/hr. = 90 km/hr.

$= \left(90 \times \frac{5}{18}\right)$ m/sec. = 25 m/sec.

= let l metre be the length of slower train.

Now, $\left(\frac{l+\frac{l}{2}}{25}\right)$ =12 or l = 200 m

Also, speed of slower train

$= \left(36 \times \frac{5}{18}\right)$ m/sec. = 10m/sec.

Now, if x metre be the length of platform, then

$\frac{x+200}{10}$ =90 or x = 700 metres.

Q.21.(2) Suppose they meet x hours after 7 A.M.
Distance travelled by train from A in x hours. = (20x) km.
Distance travelled by train from B in (x-1) hours, = 25 (x-1) km.
∴ 20x +25 (x-1) = 110 or x = 3 hours. So, the trains meet at 10 A.M.

Q.22.(2) Let the speed of each train be (x) m/sec.
Then, $\frac{135+135}{x+x} = 18$

$\therefore x = \frac{15}{2}$ m/sec. $= \left(\frac{15}{2} \times \frac{18}{5}\right)$ km/hr.

= 27 km/hr.

Q.23.(4) Let the distance be 720 km. (L.C.M of 90 and 80)
Time taken to cover it (without stoppages) = 8 hrs.
Time taken to cover it (with stoppages) = 9 hrs.
So, during 9 hours, it stops for 1 hour.
During 1 hour, it stops for $\left(\frac{1}{9} \times 60\right)$ min

$= 6\frac{2}{3}$ min.

Q.24.(1)
Length of Ist Train = S x T
$= 63 \times \frac{5}{18} \times 6 = 105$ metre
Length of IInd Train $= 94.5 \times \frac{5}{18} \times 4 = 105$ Metre
Time Taken to cross each other Train

$= \frac{\text{Total length}}{\text{Relative speed}}$

$= \frac{105+105}{(63+94.5) \times \frac{5}{18}}$

$= \frac{210}{43.75}$

= 4.80 second

Q.25.(4) **Data inadiquate**
In this question both train starts from Hyderabad so we can find the distance from Hyderabad not from new Delhi. If total distance has given then we could find distance from Delhi.
Therefore data inadequate

CHAPTER-14
BOAT & STREAM

Q.1.(3) Speed of boat in still water = $\frac{1}{2}$(11+5) kmph
= 8 kmph.

Q.2.(2) Rate downstream = $\left(\frac{16}{2}\right)$ kmph = 8 kmph,

Rate upstream = $\left(\frac{16}{4}\right)$ kmph = 4 kmph

Speed of still water = $\frac{1}{2}$(8+4) kmph
= 6 kmph.

Q.3.(3) Rate downstream = $\left(\frac{1}{10} \times 60\right)$ km/hr
= 6 km/hr, Rate upstream = 2 km/hr.

Speed of boat in still water = $\frac{1}{2}$(6+2) km/hr = 4 km/hr.

∴ Required time = $\left(\frac{5}{4}\right)$ hrs = $1\frac{1}{4}$ hrs. = 1 hrs 15 min.

Q.4.(4) Rate upstream = $\left(\frac{750}{675}\right)$ m/sec.

$= \frac{10}{9}$ m/sec.

Rate downstream = $\left(\frac{750}{450}\right)$ **m/sec.**

$= \frac{5}{3}$ **m/sec.**

∴ Rate in still water = $\frac{1}{2}\left(\frac{10}{9}+\frac{5}{3}\right)$ m/sec.

$= \frac{25}{18}$ m/sec. $= \left(\frac{25}{18} \times \frac{18}{5}\right)$ km/hr

= 5 km/hr.

Q.5.(3) Let man's rate upstream be x kmph. Then, his rate downstream = 2x kmph.
(Speed in still water). (Speed of stream)

$= \left(\frac{2x+x}{2}\right):\left(\frac{2x-x}{2}\right) = \frac{3x}{2}:\frac{x}{2} = 3:1$

Q.6.(5) Let the man's rate upstream be x kmph and that downstream be y kmph
Distance covered upstream in 8 hrs. 48 min. = Distance covered downstream

$\Rightarrow \left(x \times 8\frac{4}{5}\right) = (y \times 4) \Rightarrow \frac{44}{5}x = 4y \Rightarrow y$

$= \frac{11}{55}x.$

∴ Required ratio =

$\left(\frac{y+x}{2}\right):\left(\frac{y-x}{2}\right) = \left(\frac{16x}{5} \times \frac{1}{2}\right):\left(\frac{6x}{5} \times \frac{1}{2}\right)$

$= \frac{8}{5}:\frac{3}{5}$

Q.7.(2) Rate upstream = $\left(\frac{7}{42} \times 60\right)$ kmph = 10 kmph
Speed of stream = 3 kmph.
let speed in still water be x km/hr. Then,
speed upstream = (x-3) km/hr
∴ x -3 = 10 or x = 13 km/hr

Q.8.(3) Man's rate in still water = (15 - 2.5) km/hr = 12.5 km/hr.
Man's rate against the current = (12.5-2.5) km/hr = 10 km/hr

Q.9.(3) Let the rate along the current be x km/hr.
Then, $\frac{1}{2}$(x+3.5) = 5 or x = 6.5 km/hr.

Q.10.(5) Speed downstream = (13 +4) km/hr = 17 km/hr.
Time taken to travel 68 km downstream
$= \left(\frac{68}{17}\right)$ hrs. = 4 hrs.
We have, 15 = 8 + y
∴ y = 15 - 8 =7 km/hr.

Q.11.(1) Speed of the boatman upstream = $\frac{2}{20}$ x 60 = 6 km/hr.
Speed of the boatman downstream
$= \frac{2}{18} \times 60 = \frac{20}{3}$ km/hr.
Let the speed of the man upstream = x km/hr we have,
∴ Rate of current
$= \frac{1}{2}$(Downstream Speed + Upstream Speed)

$= \frac{1}{2}\left(\frac{20}{3}-6\right) = \frac{1}{3}$ km/hr.

Q.12.(2) Speed of the boatman downstream
$= \frac{48}{4} = 12$ km/hr.
Speed of the current = 5 km/hr.
Let the boatman takes t hours to cover 8 km upstream.
Then, speed of the current
$= \frac{1}{2}$(Downstream Speed + Upstream Speed)

$5 = \frac{1}{2}\left(12-\frac{8}{t}\right)$ km/hr.

∴ t = 4 hours.

Q.13.(2) Average Speed
$= \frac{\text{Upstream} \times \text{Downstream}}{\text{Man's rate in still water}}$

$= \frac{(10-4)(10+4)}{10} = 8\frac{2}{5}$ km/hr.

Q.14.(3) The distance between A and B is

$$= \frac{t(x^2 - y^2)}{2x} \text{ km}$$

$$= \frac{3(81-9)}{2x9} = 12 \text{ km.}$$

Q.15.(2) Let the speed of the boat be x km/hr.
We have,

$$d = \frac{t(x^2 - y^2)}{2x}$$

$$\Rightarrow 2 = \frac{1/2(x^2 - 9)}{2x}, \text{i.e.} 2 = \frac{x^2 - 9}{4x}$$

$x^2 - 8x - 9 = 0$

$(x-9)\quad (x+1) = 0$

$x = -1$ or 9.

Since the speed cannot be negative, we neglect-1

Therefore, speed of the boat in still water = 9 km/hr.

Q.16.(1) Speed of man

$$= \left(\frac{n+1}{n-1}\right) \text{ speed fo stream}$$

$$= \left(\frac{2+1}{2-1}\right) \times \frac{3}{2} = \frac{9}{2} \text{or} 4\frac{1}{2} \text{ km/hr}$$

Q.17.(4) Speed downstream = (9 + 3) km/hr
= 12 km/hr
Speed upstream = (9-3) km/hr = 6 km/hr
Let the distance AB = x km

Then, $\frac{x}{6} + \frac{x}{12} = 3 \Rightarrow 2x + x = 36$

$\Rightarrow x = 12$

$\therefore$ Distance AB = 12 km.

Q.18.(4) Let man's rowing speed in still water km/hr and speed of current = y km/hr
Speed upstream = (x-y) km/hr
Speed downstream = (x+y) km/hr
$5(x - y) = 12$ and $5(x + y) = 28$
Subtracting we get
$10y = 16$

$$y = \frac{8}{5} = 1\frac{3}{5} \text{ km/hr.}$$

Q.19.(2) Let speed in still water = x km/hr.
Speed of current = y km/hr
Speed downstream = (x+y) + km/hr
Speed upstream = (x-y) km/hr
$\therefore 2(x+y) = 3(x - y)$
$\therefore x = 5y$

or, $\frac{x}{y} = \frac{5}{1}$ or 5 : 1

Q.20.(4) Speed upstream = (3 - 2) km/hr = 1km/hr
Speed downstream = (3 +2) km/hr
= 5 km/hr

Total time taken = $\left(\frac{10}{1} + \frac{10}{5}\right)$ hr

= 12 hr

Q.21.(3) Let the speed upstream be x km/hr and the speed downstream be y km/hr. Then,

$$\frac{24}{x} + \frac{36}{y} = 6 \Rightarrow 24u + 36v = 6$$

Where $\frac{1}{x} = u$ and $\frac{1}{y} = v$

And, $\frac{36}{x} + \frac{24}{y} = \frac{13}{2} \Rightarrow 36u + 24v = \frac{13}{2}$

Adding these equations, we get

$$60(u + v) = \frac{25}{2} \text{ or } u + v = \frac{5}{24}$$

Subtracting, we get $12(u - v) = \frac{1}{2}$ or

$$u - v = \frac{1}{24}$$

Solving $(u + v) = \frac{5}{24}$ and $(u - v) = \frac{1}{24}$, we get

$$u = \frac{1}{8} \text{ and } v = \frac{1}{12}$$

$\therefore$ x = 8 km/hr and y = 12 km/hr

$\therefore$ Velocity of current = $\frac{1}{2}(12 - 8)$

= 2 km/hr

Q.22.(2) Upstream speed = 2 km/hr
Downstream speed = 6 km/hr

$\therefore$ Speed in still water = $\frac{2+6}{2}$ =4km/hr

$\therefore$ Time required to go 5 km in still water

$= \frac{5}{4}$ hr = 1hr 15 min.

Q.23.(1) **4 km./h**
Let the speed of current = xkm/hr
According to question

By $T = \frac{D}{S}$

$$\frac{6}{8+x} + \frac{6}{8-x} = 2$$

$$\frac{48 - 6x + 48 + 6x}{(8+x)(8-x)} = 2$$

$$\frac{96}{64 - x^2} = 2$$

$64 - x^2 = 48$

$x^2 = 16$

$x = 4$km/h

Hence speed of current = 4km/h

Q.24.(2) **8 km.**
Let speed of boat = x km/h
& speed of current = y km / h
Relative speed up ward (U) = x - y
Relative speed down ward (v) = x + y
According to question

$$\frac{40}{U} + \frac{55}{V} = 13 \text{.....(i)}$$

&

$$\frac{30}{U} + \frac{44}{V} = 10 \text{.....(ii)}$$

by eq. (i) & (ii)
V = 11
& U = 5

speed of boat = $\left(\frac{u+v}{2}\right)$

$= \left(\frac{11+5}{2}\right) = 8$ km/hr.

Q.25.(2) **2km/hour.**
Let x is the speed of boat and Y is the speed of current X + Y = man rate with current X - Y = man rate against current
let X + Y = V and X - Y = U

$$\frac{24}{V} + \frac{36}{U} = 24 \text{ ——————(I)}$$

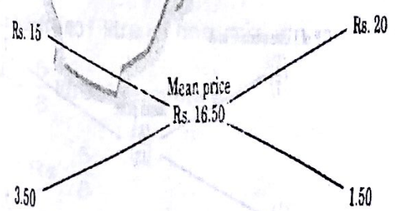
$$\frac{36}{V} + \frac{24}{U} = 21 \text{ ——————(II)}$$

By eq- I and II
U = 2
that means X - Y = 2
hence difference between speed of boat and current = 2 km/hr.

CHAPTER-15

MIXTURE AND ALLIGATION

Q.1.(3) By the rule of alligation:
Cost of 1 kg pulse of 1st kind
Cost of 1 kg pulse of 2nd kind

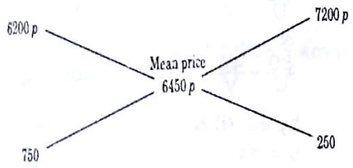


$\therefore$ Required rate = 3.50 : 1.50 = 35 : 15 = 7 : 3.

Q.2.(2) By the rule of alligation:
Cost of 1 kg rice of 1st kind
Cost of 1 kg rice of 2nd kind

∴ Required rate = 60 : 90 = 2 : 3.

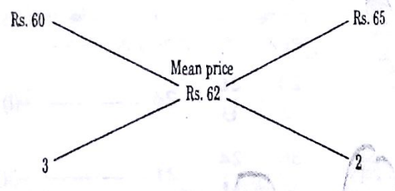
Q.3.(1) By the rule of alligation:
Cost of 1 kg tea of 1st kind
Cost of 1 kg tea of 2nd kind



∴ Required rate = 750 : 250 = 3 : 1.

Q.4.(1) S.P. of 1 kg of the mixture = Rs. 68.20, Gain = 10%.
C.P. of 1 kg of the mixture = Rs. $\left(\frac{100}{110}\times 68.20\right)$ = Rs. 62

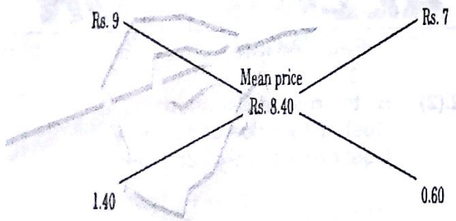
By the rule of alligation, we have
Cost of 1 kg tea of 1st kind
Cost of 1 kg tea of 2nd kind



∴ Required ratio = 3 : 2

Q.5.(4) S.P. fo 1 kg of mixture = Rs. 9.24, Gain = 10%
∴ C.P. of 1 kg of mixture = Rs. $\left(\frac{100}{110}\times 9.24\right)$ = Rs. 8.40

By the rule fo alligation, we have :
C.P. fo 1 kg sugar of 1st kind
Cost of 1 kg sugar of 2nd kind

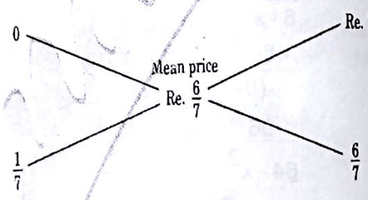


∴ Ratio of quantities of 1st and 2nd kind = 14 : 6 = 7 : 3.
Let x kg of sugar of 1st kind be mixed with 27 kg of 2nd kind.

Then, 7 : 3 = x : 27 or x = $\left(\frac{7\times 27}{3}\right)$ = 63 kg

Q.6.(1) Let C.P. of 1 litre milk be Re 1.
S.P. of 1 litre of mixture = Re. 1, Gain = $\frac{50}{3}$ %.
∴ C.P. of 1 litre of mixture = Rs. $\left(100\times\frac{3}{350}\times 1\right)$ = Re. $\frac{6}{7}$.

By the rule of alligation, we have :
C.P. of 1 litre of water
C.P. of 1 litre of milk



∴ Ratio of water and milk = $\frac{1}{7}:\frac{6}{7}$ = 1 : 6.

Q.7.(4) Let the C.P. of spirit be Rs. 1 per litre.

Spirit in 1 litre mixture of A = $\frac{5}{7}$ litre, C.P. of 1 litre mixture in A = Rs $\frac{5}{7}$.

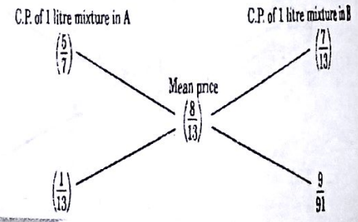
Spirit in 1 litre mixture of B = $\frac{7}{13}$ litre,

C.P. of 1 litre mixture in B = Rs. $\frac{7}{13}$.

Spirit in 1 litre mixture of C = $\frac{8}{13}$ litre,

Mean price = Rs. $\frac{8}{13}$

By the rule of alligation, we have :



∴ Required Ratio = $\frac{1}{13}:\frac{9}{91}$ = 7 : 9

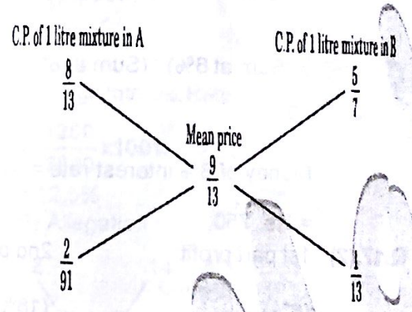
Q.8.(1) Let cost of 1 litre milk be Rs. 1.

Milk in 1 litre mixture in A = $\frac{8}{13}$ litre, C.P. of 1 litre mixture in A = Rs. $\frac{8}{13}$

Milk in 1 litre mixture in B = $\frac{5}{7}$ litre, C.P. of 1 litre mixture in B = Rs. $\frac{5}{7}$

Milk in 1 litre of final mixture = $\left(\frac{900}{13}\times\frac{1}{100}\times 1\right)$ = $\frac{9}{13}$ litre, Mean price = Re. 1

By the rule of alligation, we have:



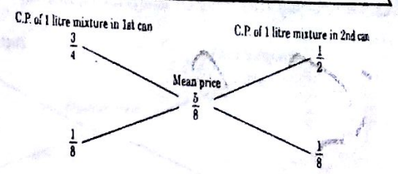
∴ Required ratio = $\frac{2}{91}:\frac{1}{13}$ = 2 : 7

Q.9.(2) Let cost of 1 litre milk be Rs 1.
Milk in 1 litre mix. in 1st can = $\frac{3}{4}$ litre, C.P. of 1 litre mix in 1st can

Milk in 1 litre mix. in 2nd can = $\frac{1}{2}$ litre, C.P. of 1 litre mix. in 2nd can

Milk in 1 litre of final mix = $\frac{5}{8}$ litre, Mean price = Rs. $\frac{5}{8}$

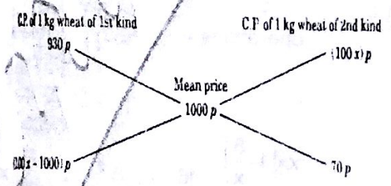
By the rule of alligation, we have



∴ Ratio of two mixtures = $\frac{1}{8}:\frac{1}{8}$ = 1 : 1

So, quantity of mixture taken from each can = $\left(\frac{1}{2}\times 12\right)$ = 6 litres.

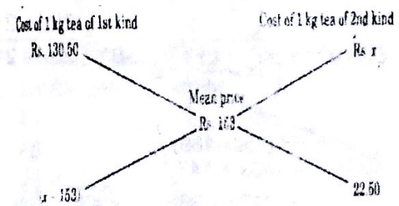
Q.10.(3) Let the rate of the second quality be Rs. x per kg.
By the rule of alligation, we have :



∴ $\frac{100x-1000}{70}=\frac{8}{7}$ = 700x - 7000 = 560
⇒ 700x = 7560 ⇒ x = Rs. 10.80

Q.11.(3) Since first and second varieties are mixed in equal proportions, so their average price = Rs. $\left(\frac{126+135}{2}\right)$ = Rs. 130.50

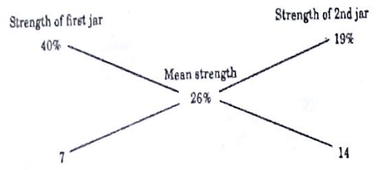
So, the mixture is formed by mixing two varieties, one at Rs. 130.50 per kg and the other at say, Rs. x per kg in the ratio 2 : 2, i.e., 1 : 1. We have to find x.
By the rule of alligation, we have :



∴ $\frac{x-153}{22.50}=1 \Rightarrow x-153=22.50 \Rightarrow x$ = 175.50

Hence, price of the third variety = Rs. 175.50 per kg.

Q.12.(2) By the rule of alligation, we have :



So, ratio of 1st and 2nd quantities = 7 : 14 = 1 : 2.

$\therefore$ Required quantity replaced = $\frac{2}{3}$.

Q.13.(2) Let the quantity of the wine in the cask originally be x litres.

Then, quantity of wine left in cask after 4 operations = $\left[x\left(1-\frac{8}{x}\right)^4\right]$ litres.

$\therefore$

$$\frac{x\times\left(1-\frac{8}{x}\right)^4}{x}=\frac{16}{81}\Rightarrow\left(1-\frac{8}{x}\right)^4=\left(\frac{2}{3}\right)^4\Rightarrow\left(\frac{x-8}{x}\right)=\frac{2}{3}$$

$\Rightarrow 3x - 24 = 2x \Rightarrow x = 24$

Q.14.(3) Suppose the can initially contains 7x and 5x litres of mixtures A and B respectively.

Quantity of A in mixture left

$= \left(7x-\frac{7}{12}\times 9\right)$ litres $= \left(7x-\frac{21}{4}\right)$ litres.

Quantity of B in mixture left

$= \left(5x-\frac{5}{12}\times 9\right)$ litres $= \left(5x-\frac{15}{4}\right)$ litres.

$$\therefore \frac{\left(7x-\frac{21}{4}\right)}{\left(5x-\frac{15}{4}\right)+9}=\frac{7}{9}\Rightarrow\frac{28x-21}{20x+21}=\frac{7}{9}$$

$\Rightarrow$ (252x-189)
= 140x + 147
$\Rightarrow 112x = 336 \Rightarrow x = 3$

So, the can contained 21 litres of A.

Q.15.(3) Suppose the vessel initially contains 8 litres of liquid.

Let x litres of this liquid be replaced with water.

Quantity of water in new mixture

$= \left(3-\frac{3x}{8}+x\right)$ litres.

Quantity of syrup in new mixture

$= \left(5-\frac{5x}{8}\right)$ litres.

$$\therefore \left(3-\frac{3x}{8}+x\right)=\left(5-\frac{5x}{8}\right)\Rightarrow 5x + 24$$

$= 40 - 5x \Rightarrow 10x = 16 \Rightarrow x = \frac{8}{5}$

So, part of the mixture replaced

$= \left(\frac{8}{5}\times\frac{1}{8}\right)=\frac{1}{5}$.

Q.16.(3) Total interest = Rs. 75.

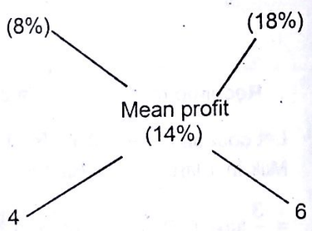
Average rate = $\left(\frac{100\times 75}{1000\times 1}\right)\% = 7\frac{1}{2}\%$

$\therefore$ (Sum at 6%) : (Sum at 8%) = $\frac{1}{2}:\frac{3}{2}=1$: 3.

Money of 8% interest rate = $1000\times\frac{3}{4}$

= Rs. 750

Q.17.(2) 1st part profit 2nd part profit



Ratio of 1st and 2nd part = 4 : 6 = 2 : 3.

$\therefore$ Quantity sold at 18% = $\left(50\times\frac{3}{5}\right)$kg.

= 30 kg.

Q.18.(1) In first mixture:

water = $\left(\frac{10}{100}\times 20\right)$kg. and spirit

= 18 kg.

In second mixture :

75 kg. spirit is contained in a mix. of 100 kg.

$\therefore$ 18 kg spirit is contained in a mix. of

$= \left(\frac{100}{75}\times 18\right) = 24$ kg.

So, water to be added = (24 - 20) kg.
= 4 kg.

Q.19.(2) Total C.P. of 200 kg. of mixture
= Rs. (80 ×6.75 + 120 ×8) = Rs. 1500
Average rate = Rs. 7.50 per kg
Required rate = Rs. 120% of Rs. 7.50
= Rs. 9 per kg.

Q.20.(3) Using the method of alligation.
Required ratio = 7 : 14 = 1 : 2

$\therefore$ Required quantity = $\frac{2}{3}$

Q.21.(3) **3 : 1**

Short Cut :

Interest - on Rs.9600
for 1 year

$= \frac{1800}{1.5}\times 1$

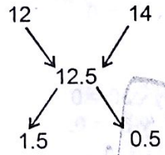
= 1200

Average Interest Rate

$= \frac{1200}{7600}\times 100\%$

= 12.5%

By Allegation



Ratio is - 3:1

Q.22.(1) **10% Profit**

Let the profit percentage be x

$$\frac{2\times 34+1\times 30}{3}\times\frac{100+x\%}{100}=36$$

$$\frac{68+30}{3}\times\frac{100+x\%}{100}=36$$

$$100+x\%=\frac{36\times 100\times 3}{98}$$

100 + x% = 110.20
x% = 110.20 - 100
= 10.20 or 10

By Alligation Method

C.P of mixture = x Rs.

Mustard oil		Rapeseed Oil
34		30
	x	
2		1

$$\frac{34-x}{x-30}=\frac{1}{2}$$

x = 32.67 Rs.
Profit = 36 - 32.67 = 3.33

Profit Percent = $\frac{3.33}{32.67}\times 100$

= 10% (Approx.)

Q.23.(2) **Rs. 15000/-**

Interest at 15 % =3750 Rs.
Interest at 18 % = 4500 Rs.
Average Inetrest = 4050 Rs.
By Alligation Method
3750
4500
4050
450
300
Ratio 3:2

Sum invested on 15% = 25000 x $\frac{3}{5}$

=15000 Rs.

Q.24.(4) **3 litre**

By alligation method

20%		100% (Pure water added)
	25%	
75%		5%

Ratio = 15:1
Quantity of water added to make water 25% in new mixture = $\frac{1}{15}\times 45$ =3 litre

Q.25.(3) **129 : 101**

Average Cost Price = 100 x 100 /115

By Allegation method

I		II
65		115

$\frac{2000}{23}$

$\frac{645}{23}$: $\frac{505}{23}$

or 645 : 505
or 129 : 101

CHAPTER-16
INEQUALITY

Q.1.(1) (I) $5x^2 - 18x+9 = 0$
$5x^2 - 15x - 3x + 9 = 0$
$5x(x-3) - 3(x-3) = 0$
$(5x-3)(x-3) = 0$
$x = \frac{3}{5}, 3$
(II) $20y^2 - 13y + 2 = 0$
$20y^2 - 8y - 5y + 2 = 0$
$4y(5y-2) - 1(5y-2) = 0$
$(4y-1)(5y-2) = 0$
$y = \frac{1}{4}, \frac{2}{5}$
$\therefore x > y$

Q.2.(2) (I) $x^3 - 878 = 453$
$x^3 = 453 + 878$
$x = \sqrt[3]{1331}$
$x = 11$
(II) $y^2 - 82 = 39$
$y^2 = 39 + 82 = 121$
$y = \pm 11$
$\therefore x \geq y$

Q.3.(5) (I) $\frac{3}{\sqrt{x}} + \frac{4}{\sqrt{x}} = \sqrt{x}$
$\frac{7}{\sqrt{x}} = \sqrt{x}$
$x = 7$
(II) $y^{2} \cdot \frac{(7)^{\frac{5}{2}}}{\sqrt{y}} = 0$
$\frac{y^2 - (7)^{\frac{5}{2}}}{\sqrt{y}} = 0$
$\frac{y^{\frac{5}{2}} - 7^{\frac{5}{2}}}{\sqrt{y}} = 0$
$y^{\frac{5}{2}} = 7^{\frac{5}{2}}$. $y = 7$, $\therefore x = y$

Q.4.(5) (I) $9x - 15.45 = 54.55 + 4x$
$9x - 4x = 70$
$5x = 70$
$x = 14$
(II) $\sqrt{y+155} - \sqrt{36} = \sqrt{49}$
$\sqrt{y+155} = 7 + 6 = 13$
square in both side
$y + 155 = 169$
$y = 14$
$x = y$

Q.5.(1) (I) $x^2 + 11x + 30 = 0$
$x^2 + 6 + x + 5x + 30 = 0$
$x(x+6) + 5(x+6) = 0$
$(x+6)(x+5)$
$x = -5, -6$
(II) $y^2 + 7y + 12 = 0$
$y^2 + 4y + 3y + 12 = 0$
$y(y+4) + 3(y+4) = 0$
$y = -3, -4$
$\therefore x < y$

Q.6.(5) (I) $x^2 + x - 20 = 0$
$x^2 + 5x - 4x - 20 = 0$
$x(x+5) - 4(x+5) = 0$
$x = 4, -5$
(II) $y^2 - y - 30 = 0$
$y^2 - 6y + 5y - 30 = 0$
$y(y-6) + 5(y-6) = 0$
$(y-6)(y+5)$
$y = 6, -5$
So, relationship cannot be setup.

Q.7.(4) (I) $225x^2 - 4 = 0$
$225x^2 = 4$
$x^2 = \frac{4}{225}$
$x = \pm \frac{2}{15}$
(II) $\sqrt{225y} = -2$
$225y = 4$
$y = \frac{4}{225}$
So, relationship cannot be setup.

Q.8.(5) (I) $x^2 - x - 12 = 0$
$x^2 - 4x + 3x - 12 = 0$
$x(x-4) + 3(x-4) = 0$
$(x-4)(x+3) = 0$
$x = 4, -3$
(II) $y^2 + 5y + 6 = 0$
$y^2 + 3y + 2y + 6 = 0$
$y(y+3) + 2(y+3) = 0$
$(y+3)(y+2) = 0$
$y = -2, -3$
so, relationship can not be established.

Q.9.(3) (I) $x^2 - 32 = 112$
$x^2 = 144$
$x = \pm 12$
(II) $y - \sqrt{169} = 0$
$y = 13$
$x < y$

Q.10.(2) (I) $x - \sqrt{121} = 0$
$x = 11$
(II) $y^2 - 121 = 0$
$y = \pm 11$
$x \geq y$

Q.11.(4) (I) $x^2 - 16 = 0$
$x = \pm 4$
(II) $y^2 - 9y + 20 = 0$
$y^2 - 5y - 4y + 20 = 0$
$y(y-5) - 4(y-5) = 0$
$(y-5)(y-4) = 0$
$y = 4, 5$
$\therefore x \leq y$

Q.12.(2) (I) $x^2 - 7x + 12 = 0$
$x^2 - 4x - 3x + 12 = 0$
$x(x-4) - 3(x-4) = 0$
$(x-4)(x-3) = 0$
$x = 3, 4$
(II) $y^2 + y - 12 = 0$
$y^2 + 4y - 3y - 12 = 0$
$y(y+4) - 3(y+4) = 0$
$(y-3)(y+4) = 0$
$y = 3, -4$
$x \geq y$

Q.13.(3) (I) $2x^2 + 11x + 14 = 0$
$2x^2 + 7x + 4x + 14 = 0$
$x(2x+7) + 2(2x+7) = 0$
$(x+2)(2x+7) = 0$
$x = -2, -\frac{7}{2}$
(II) $4y^2 + 12y + 9 = 0$
$4y^2 + 6y + 6y + 9 = 0$
$2y(2y+3) + 3(2y+3) = 0$
$(2y+3)(2y+3) = 0$
$y = -\frac{3}{2}$
$y > x$

Q.14.(5) (I) $x^4 - 227 = 398$
$x^4 = 625$
$x = \sqrt[4]{625}$
$x = \pm 5$
(II) $y^2 + 321 = 346$
$y^2 = 25$
$y = \sqrt{25}$
$y = \pm 5$
so,relationship can not be established.

Q.15.(1) (I) $x^2 - 4 = 0$
$x^2 = 4$
$x = \pm 2$
(II) $y^2 + 6y + 9 = 0$
$y^2 + 3y + 3y + 9 = 0$
$y(y+3) + 3(y+3) = 0$
$(y+3)^2 = 0$
$y = -3$
$x > y$

Q.16.(5) (I) $x^2 = 729$
$x = \pm 27$
(II) $y = \sqrt{-729}$
Relationship can not be established.

Q.17.(2) (I) $x^2 - 1 = 0$
$x^2 = 1$
$X = \pm 1$
(II) $y^2 + 4y + 3 = 0$
$y^2 + 3y + y + 3 = 0$
$y(y+3) + 1(y+3) = 0$
$(y+3)(y+1) = 0$
$y = -1, -3$
$x \geq y$

Q.18.(4) (I) $x^2 - 7x + 12 = 0$
$x^2 - 4x - 3x + 12 = 0$
$x(x-4) - 3(x-4) = 0$
$(x-4)(x-4) = 0$
$x = 3, 4$
(II) $y^2 - 12y + 32 = 0$
$y^2 - 8y - 4y + 32 = 0$
$y(y-8) - 4(y-8) = 0$
$(y-8)(y-4) = 0$
$y = 4, 8$
$y \geq x$

Q.19.(3) (I) $x^3 - 371 = 629$

$x^3 = 629 + 371$

$x = \sqrt[3]{1000}$

$x = 10$

(II) $y^3 - 543 = 788$

$y^3 = 788+543$

$y = \sqrt[3]{1331}$

$y = 11$

$y > x$

Q.20.(1) (I) $5x - 2y = 31$ ---------(I)

(II) $3x + 7y = 36$ -------(II)

from equation (I) and (II)

$x = \frac{289}{41}$ $y = \frac{87}{41}$

$x > y$

Q.21.(5) (I) $2x^2 + 11x + 12 = 0$

$2x^2 + 8x + 3x + 12 = 0$

$2x(x+4) + 3(x+4) = 0$

$(x+4)(2x+3) = 0$

$x = -4, -\frac{3}{2}$

(II) $5y^2 + 27y + 10 = 0$

$5y^2 + 25y + 2y + 10 = 0$

$5y(y+5) + 2(y+5) = 0$

$(y+5)(3y+2) = 0$

$y = -5, -\frac{2}{5}$

relationship cannot be established.

Q.22.(1) (I) $x^2 - 14x + 48 = 0$

$x^2 - 8x - 6x + 48 = 0$

$x(x-8) - 6(x-8) = 0$

$(x - 8)(x - 6) = 0$

$x = 8, 6$

(II) $y^2 + 6 = 5y$

$y^2 - 5y + 6 = 0$

$y^2 - 3y - 2y + 6 = 0$

$y(y-3) - 1(y-3) = 0$

$(y-3)(y-1) = 0$

$y = 3, 1$

$x > y$

Q.23.(4) (I) $x^2 + 9x + 20 = 0$

$x^2 + 4x + 5x + 20 = 0$

$x(x+4) + 5(x+4) = 0$

$(x+4)(x+5)$

$x = -4, -5$

(II) $y^2 + 7y + 12 = 0$

$y^2 + 4y + 3y + 12 = 0$

$y(y+4) + 3(y+4) = 0$

$y = -4, -3$

$x \leq y$

Q.24.(4) (I) $x^2 = 529$

$x = +23, -23$

(II) $y = \sqrt{529}$

$y = \sqrt{529}$

$y = 23$

$x \leq y$

Q.25.(2) (I) $x^2 + 13x = -42$

$x^2 + 13x + 42 = 0$

$x^2 + 7x + 6x + 42$

$x(x+7) + 6(x+7) = 0$

$(x+7)(x+6) = 0$

$x = -7, -6$

(II) $y^2 + 16y + 63 = 0$

$y^2 + 9y + 7y + 63 = 0$

$y(y+9) + 7(y+9) = 0$

$(y+9)(y+7) = 0$

$y = -9, -7$

$x \geq y$

Q.26.(3) (I) $2x + 3y = 14$ -------(I)

$4x + 2y = 16$ ----------(II)

From equation (I) and (II)

$x = \frac{5}{2}$ $y = 3,$ $x < y$

Q.27.(2) (I) $x = \sqrt{81}$

$x = 9$

(II) $y^2 = 81$

$Y = \pm 9$

$x \geq y$

Q.28.(5) (I) $x^2 = 144$

$x = \pm 12$

(II) $y = \sqrt{81}$

$y = +9$

Relationship cannot be established.

Q.29.(3) (I) $x^2 - 15x + 56 = 0$

$x^2 - 8x - 7x + 56 = 0$

$x(x-8) - 7(x-8) = 0$

$(x-8)(x-2) = 0,$ $x = 7, 8$

(II) $y^2 - 23y + 132 = 0$

$y^2 - 12y - 11y + 132 = 0$

$y(y-12) - 11(y-12) = 0$

$(y-12)(y-11) = 0$

$y = 11, 12,$ $x < Y$

Q.30.(5) (I) $x^2 + 7x + 12 = 0$

$x(x+4) + 3(x+4) = 0$

$x = -3, -4$

(II) $y^2 + 6y + 8 = 0$

$y^2 + 4y + 2y + 8 = 0$

$y(y+4) + 2(y+4) = 0$

$(y+4)(y+2) = 0$

$y = -2, -4$

Relationship cannot be established.

CHAPTER-17

PERMUTATION AND COMBINATION

Q.1.(1) **Solution**

The 1st post can be filled up in 6 ways.
The 2nd post can be filled up in 5 ways and the 3rd post can be filled up in 4 ways.
By the principle of association, the three posts can be filled up in $6 \times 5 \times 4 = 120$ ways.

Q.2.(2) **Solution**

There are 36 teachers and every one has equal chance of being selected as a principal. Hence, the principal can be appointed in 36 ways. When one person is appointed as principal, we are left with 35 teachers. Out of these 35 teachers, we can select one vice-principal. So, a vice-principal can be selected in 35 ways. Hence, the number of ways in which a principal and vice-principal can be selected = $36 \times 35 = 1260$.

Q.3.(4) **Solution**

The first event of going from Lucknow to Kanpur can be performed in 15 ways as he can go by any of the 15 buses. But the event of coming back from Kanpur can be performed in 14 ways (a different bus is to be taken).
Hence, both the events can be performed in $15 \times 14 = 210$ ways.

Q.4.(4) **Solution**

$(n+1)! = 6[(n-1)!]$

$\Rightarrow (n+1)n[(n-1)!] = 6[(n-1)!]$

$\Rightarrow n^2 + n = 6 \Rightarrow n^2 + n - 6 = 0$

$\Rightarrow (n-2)(n+3) = 0$

Either $n - 2 = 0$ or $n + 3 = 0$

$\Rightarrow n = 2$ or $n = -3$

n being natural number, so $n \neq -3$, $n = 2$

Q.5.(3) **Solution -**

${}^nP_4 = 18\,{}^{n-1}P_2$

$\Rightarrow \frac{n!}{(n-4)!} = 18\frac{(n-1)!}{(n-1-2)!}$

$\Rightarrow \frac{n!}{(n-4)!} = 18\frac{(n-1)!}{(n-3)!}$

$\Rightarrow \frac{n(n-1)!}{(n-4)!} = 18\frac{(n-1)!}{(n-3)(n-4)!}$

$\therefore n = \frac{18}{n-3}$

i.e. $n^2 - 3n - 18 = 0 \Rightarrow (n-6)(n+3) = 0$

$\Rightarrow n = 6, -3$

But n cannot be negative.

$\therefore n = 6$

Q.6.(2) Total no. of ways $= \frac{\lfloor 6}{\lfloor 2 \times \lfloor 2} = \frac{720}{4} = 180$

Q.7.(5) **Solution -**

The word EQUATION has exactly 8 letters which are all different.

$\therefore$ Number of words that can be formed = number of permutations of 8 letters taken all at a time.

$= P(8, 8) = 8!$

$= 8 \times 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1$

$= 40320.$

Q.8.(4) **Solution** :

Out of 10 students, the first three prizes can be won in.

${}^{10}P_3 = \frac{10!}{(10-3)!} = \frac{10!}{7!}$

$= 10 \times 9 \times 8$

$= 720$ ways.

Q.9.(1) **Solution**

Total number of candidates = 5 + 4 = 9.
In the row of 9 positions, the even places are 2nd, 4th, 6th and 8th.
Now, number of even places = 4. Number of women to occupy the even places = 4.
$\therefore$ Even places can be filled = P (4, 4) ways
Number of men = 5
$\therefore$ The remaining 5 places can be filled by 5 men
= P (5, 5) ways
By the fundamental principle of counting:
$\therefore$ The required number of seating arrangements
$= P(4, 4) \times p(5, 5) = 4! \times 5!$
$= 24 \times 120 = 2880.$

Q.10.(5) **Solution** 4 different books can be arranged among themselves, in a shelf,