TIME AND WORK

A $\rightarrow$ x days, 1 day of work $= \frac{1}{x}$

B $\rightarrow$ y days, 1 day of work $= \frac{1}{y}$

1 day $(A+B) = \frac{1}{x} + \frac{1}{y} = \frac{x+y}{xy}$ th

$$\boxed{(A+B) = \frac{xy}{x+y} \text{ days}}$$ $< x$ days, $< y$ days

$(A+B) = x$ days

$A = y$ days

$B = ?$ $\quad y > x$

$$\boxed{B = \frac{xy}{y-x} \text{ days}}$$

A $\rightarrow$ x days, 1 day $= \frac{1}{x}$

B $\rightarrow$ y days, 1 day $= \frac{1}{y}$

C $\rightarrow$ z days, 1 day $= \frac{1}{z}$

1 day $(A+B+C) = \frac{1}{x} + \frac{1}{y} + \frac{1}{z}$

$= \frac{xy+yz+zx}{xyz}$ th

$$\boxed{\therefore (A+B+C) = \frac{xyz}{xy+yz+zx} \text{ days}}$$

P.9 NO:- 70

1. Given $x = 9$ min $\quad y = 6$ min

$$\frac{xy}{x+y} = \frac{9(6)}{9+6} = 3\frac{3}{5} \text{ min}$$

2. Given

4 hrs $(P+Q+R) = 216$ pages

1 hr $(P+Q+R) = 54$ pages

1 hour : $R - Q = Q - P$

$$2Q = R+P$$

$$\boxed{Q = \frac{R+P}{2}}$$

$$\boxed{5R = 7P} \longrightarrow \text{Another condition given}$$

$$Q = \frac{\frac{7P}{5} + P}{2}$$

$$\boxed{Q = \frac{12P}{10}}$$

$$\boxed{R = \frac{7P}{5}}$$

$$P + \frac{12P}{10} + \frac{7P}{5} = 54$$

$$P = 15 \text{ pages}$$

$$R = \frac{7(15)}{5} = 21 \text{ pages}$$

$$Q = \frac{12(15)}{10} = 18 \text{ pages}$$

$\therefore P : Q : R = 15 : 21 : 18$

3. $(A+B) = x$ hours $\Rightarrow$ For 1 hour $\rightarrow \frac{1}{x}$

$A = x+8$ hours $\Rightarrow$ for 1 hour $\rightarrow \frac{1}{x+8}$

$B = x + \frac{9}{2}$ hours $\Rightarrow$ for 1 hour $\rightarrow \frac{2}{2x+9}$

$$\frac{1}{x+8} + \frac{2}{2x+9} = \frac{1}{x}$$

$$x(2x+9+2x+16) = 2x^2+9x+16x+18$$

$$2x^2 + 9x + 2x^2 + 16x = 2x^2 + 9x + 16x + 18$$

$$2x^2 = 72$$

$$x = \sqrt{36}$$

$$x = 6 \text{ hours}$$

4. P → 12 days or 96 hours, 8 hours/day, For 1 hr → $\frac{1}{96}$

Q → 8 days (or) 80 hours, 10 hours/day, For 1 hr → $\frac{1}{80}$

(P+Q) → ? , 8 hours/day, For 1 hr → $\frac{1}{x \times 8}$

$$\frac{1}{96} + \frac{1}{80} = \frac{1}{8x}$$

$$x = \frac{60}{11}$$

$$= 5\frac{5}{11}$$

11) 60 (5
55
5

5. Given $A = B + C$

$A + B = 10$ days

$C = 50$ days

$B = ?$

~~$A + B + C = 10 + 50 = 60$~~, ~~For 1 day~~ → $\frac{1}{60}$

1 day $(A + \frac{B+C}{A}) = \frac{1}{10} + \frac{1}{50} = \frac{3}{25}$

1 day $(2A) = \frac{3}{25}$

1 day $A = \frac{3}{50}$

1 day $B = \frac{1}{10} - \frac{3}{50}$

1 day $B = \frac{1}{25}$ th

$B = 25$ days

6. A → 15 days

B → 10 days

After 2 days, B had to leave

1 day $(A+B) = \frac{1}{15} + \frac{1}{10} = \frac{1}{6}$ th

2 day $(A+B) = \frac{1}{6} \times 2 = \frac{1}{3}$ th

Remaining work $= 1 - \frac{1}{3} = \frac{2}{3}$ th by A alone

$A = \frac{2}{3} \times 15 = 10$ days

$\frac{1}{3} + \frac{2}{3} =$ whole work

↓ ↓

(A+B) A alone

↓ ↓

2 days + 10 days = 12 days

Level - 2

1. Given P ⟶ 8 hours
Q ⟶ 10 hours
R ⟶ 12 hours

$(Q+R) = \frac{xy}{x+y} = \frac{10 \times 12}{22} = \frac{60}{11}$ hrs

↓

$\frac{60}{11} \times \frac{23}{60} \cong 2$ hrs

@ 9 A.M, P is closed @ 11 A.M

$1 \text{ hr } (P+Q+R) = \frac{1}{8} + \frac{1}{10} + \frac{1}{12}$

$= \frac{37}{120}$ th

$2 \text{ hr } (P+Q+R) = \frac{37}{60}$ th

Remaining $= \frac{23}{60}$ th by (Q+R) only

∴ 9. A.M, P is closed @ 11. AM ≅ 2hrs
= 1. p.M.

3. First ir second

No. of garments 3 : 1

Only 1 garment 1 : 3

(2) parts

×40 ×40

= 40 days 120 days

$\frac{xy}{x+y} = \frac{40 \times 120}{160} = 30$ days

1 G ⟶ 80 days
2 parts = 80 days
1 part = 40 days

4. A B

16 days 18 days

2 : 3 ⟶ working performance is more in 'A'

3 : 2 ⟶ taking more wage A compare to B

3 × 45 ← 3

= 135 Rs.

5 parts = 225
1 part = 45

P·9 No:- 72

7. 5 skilled workers = 20 days → 1 skilled worker = 20×5
= 100 days

For 1 day = $\frac{1}{100}$ th

8 semi skilled worker = 25 days → 1 semi skilled = 8×25 = 200 da

For 1 day = $\frac{1}{200}$ th

10 unskilled worker = 30 days → 1 unskilled worker = 10×30 = 30

For 1 day = $\frac{1}{300}$ th

2 skilled + 6 semi skilled + 5 Unskilled

$= 2\left(\frac{1}{100}\right) + 6\left(\frac{1}{200}\right) + 5\left(\frac{1}{300}\right)$

$= \frac{6+9+5}{300}$

$= \frac{20}{300} = \frac{1}{15}$

∴ 15 days

GROUP (or) COMBINED WORK

$$\frac{N_1 \times D_1 \times R_1 \times E_1}{W_1} = \frac{N_2 \times D_2 \times R_2 \times E_2}{W_2}$$

N_1, N_2 = No. of workers (or) No. of machines

D_1, D_2 = Time of work

R_1, R_2 = Rate of work of worker or machines

E_1, E_2 = Efficiencies of machines

W_1, W_2 = Amount of work

P·9 No:- 71

5. $\frac{104 \times 30 \times 5}{\frac{2}{5}} = \frac{N_2 \times 26 \times 9}{\frac{3}{5}}$

$N_2 = 160$

∴ 160 − 104

= 56 days

56 days
104 mens, 8 hrs/da
30 days

6. $\frac{2 \times 8 \times 12 \times 90}{9000} = \frac{3 \times 6 \times R_2 \times 80}{12000}$

$R_2 = 16$ hrs/day

PIPES AND CISTERNS

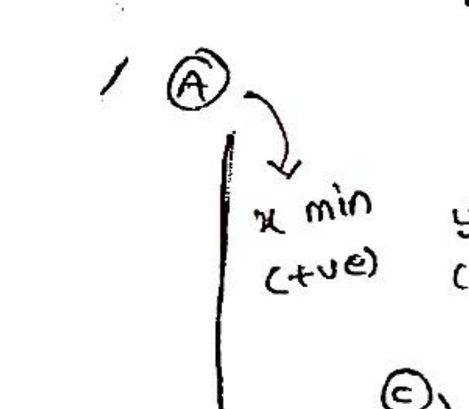
pipes :/ → taps → capacity → $\frac{m^3}{\text{sec (or) min (or) hour}}$

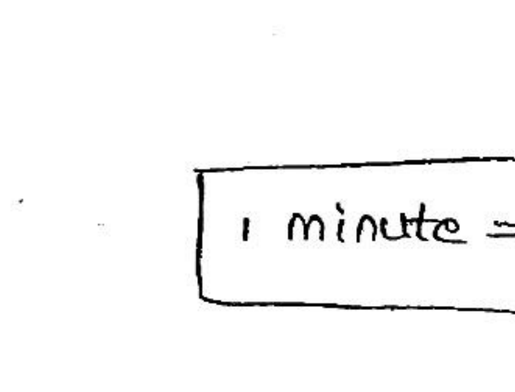
cistern : → volume (m^3)

pipes — inlet pipe → into the tank (+ve)

pipes — outlet pipe → From the tank (-ve)

pipes — Leakages → (-ve)





⇒ so it is empty

/ $\frac{xy}{x+y}$ min < x minutes, y minutes

$\frac{xy}{x-y}$ min > x minute, y minute

Functioning → $F \propto \frac{1}{t} \propto$ capacity

↓ time

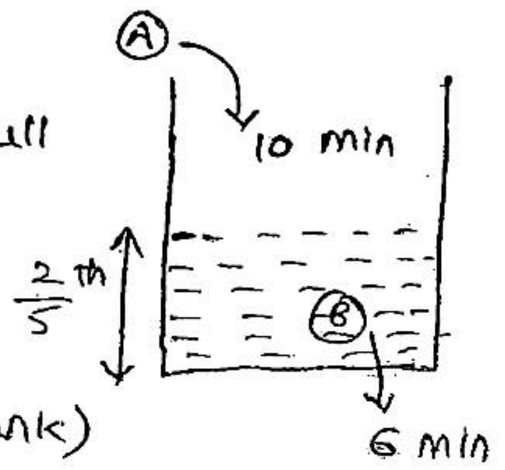
1 minute = $\frac{1}{x} + \frac{1}{y} - \frac{1}{z}$

P. 9 NO:- 73

10. $\frac{xy}{x-y} = \frac{10 \times 6}{10-6} = 15$ min to empty of full tank

⇒ $\frac{2}{5} \times 15$

⇒ 6 m to empty the ($\frac{2}{5}^{th}$ of tank)



Note :- 10 min to full, 6 min to empty. so if the tank is

2. After 3 min = $\frac{R}{\text{Total}}$

1 min (A+B+C) = $\frac{1}{30} + \frac{1}{20} + \frac{1}{10}$

= $\frac{11}{60}$ th

3 min (A+B+C) = $\frac{11}{60} \times 3$

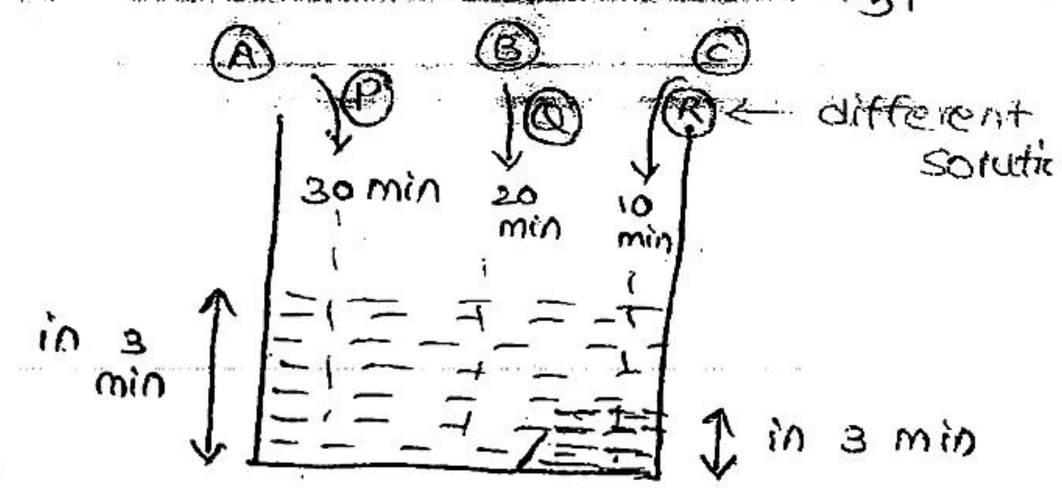
= $\frac{11}{20}$ th

1 min, R → $\frac{1}{10}$

3 min, R → $\frac{3}{10}$

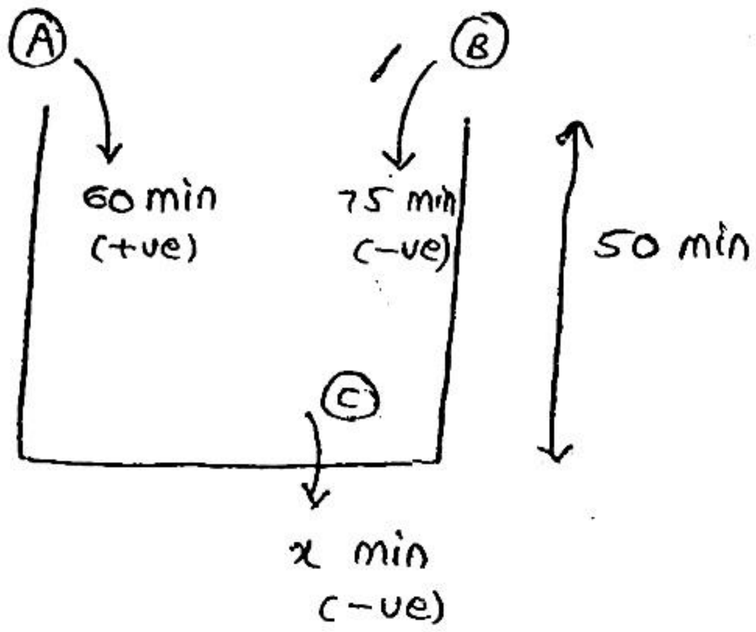
∴ After 3 min = $\frac{R}{T} = \frac{\frac{3}{10}}{\frac{11}{20}}$

= $\frac{3}{10} \times \frac{20}{11} = \frac{6}{11}$



3. 1 min (A+B−C) = $\frac{1}{60} + \frac{1}{75} - \frac{1}{x} = \frac{1}{50}$

x = 100 min

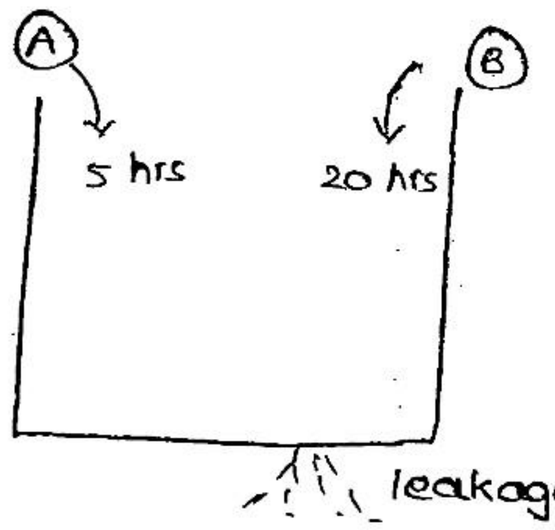


4. $\frac{xy}{x+y} = \frac{5 \times 20}{25} = 4$ hours

due to leakage = $4 + \frac{1}{2} = \frac{9}{2}$ hrs

1 hour → $\frac{1}{5} + \frac{1}{20} - \frac{1}{x} = \frac{2}{9}$

x = 36 hours

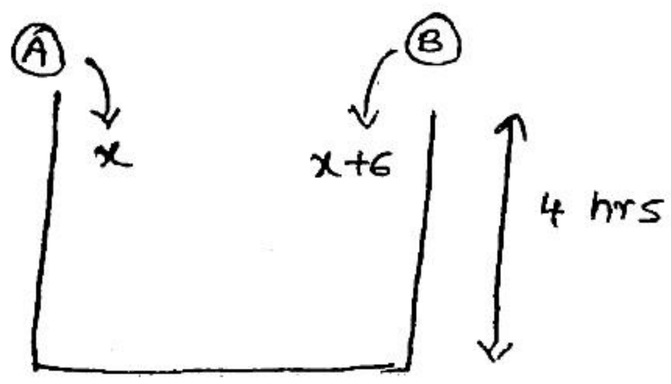


Level - 2

1. 1 hour → $\frac{1}{x} + \frac{1}{x+6} = \frac{1}{4}$

$\frac{x+6+x}{x^2+6x} = \frac{1}{4}$

x = 6, −4



∴ 6 hours to fill A alone

A + B = C

2. 1 hour = $\frac{1}{x} + \frac{1}{x-5} = \frac{1}{x-9}$

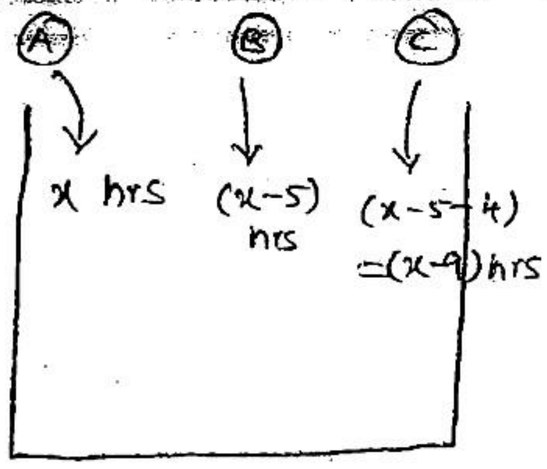
$$\frac{x-5+x}{x^2-5x} = \frac{1}{x-9}$$

$$x^2 - 18x + 45 = 0$$

$$x = +15, \quad +3$$

$\therefore$ 15 hours

$\therefore C \propto \frac{1}{t}$ ← capacity



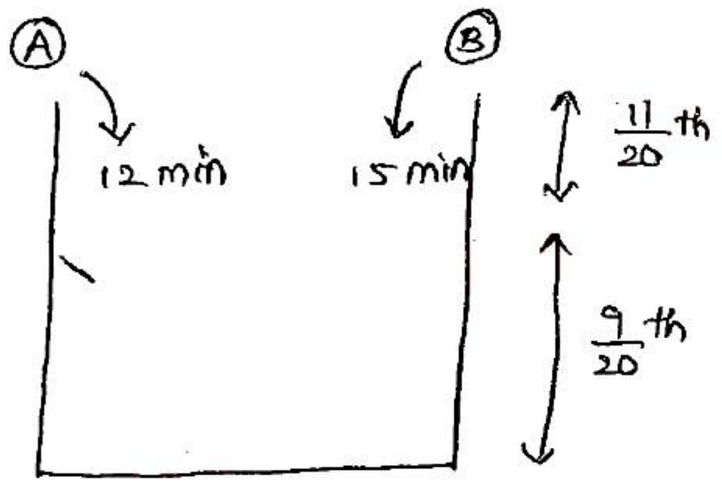
3. 1 min (A + B) = $\frac{1}{12} + \frac{1}{15} = \frac{3}{20}$ th

3 min (A + B) = $\frac{3}{20} \times 3$

$= \frac{9}{20}$ th

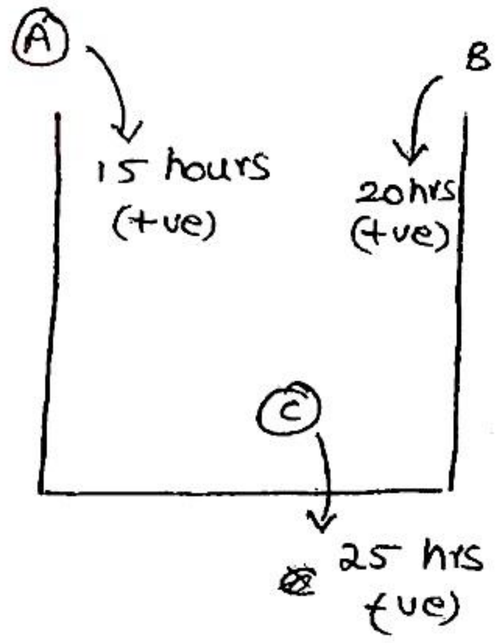
$B = \frac{11}{20} \times 15$

B = 8 min 15 sec



4. 1 hr (A + B − C) = $\frac{1}{15} + \frac{1}{20} - \frac{1}{25}$

=

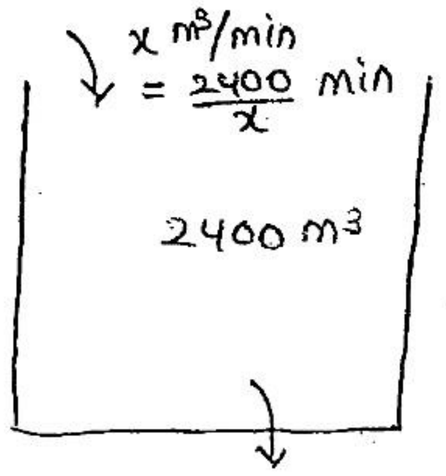


5. capacity $\propto \frac{1}{\text{time}}$

$$\frac{2400}{x} - \frac{2400}{(x+10)} = 8$$

$$x^2 + 10x - 3000 = 0$$

$x = -60, \quad 50 \ m^3/min$



$\frac{2400}{x+10} = \frac{2400}{50+10} = 40$ min

$\frac{2460}{x} = \frac{2400}{50} = 48$ min

} difference is 8 min, which is satisfied

$\therefore x = 50 \ m^3/min$

6. $1 \text{ min } (A+B-C) = \frac{1}{20} + \frac{1}{24} - \frac{1}{x} \Rightarrow$

$$\frac{1}{15} = \frac{1}{20} + \frac{1}{24} - \frac{1}{x}$$

$$x = 40 \text{ min}$$

$$\text{capacity} = 3 \times 40 = 120 \text{ gallons}$$