

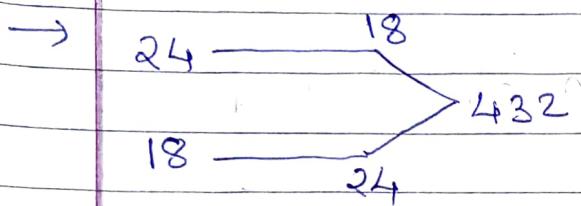
Time & Work

Q. Ram work for 16 hrs at rate of whole work can be done in 24 hrs and then he work at rate of whole work can be completed in 18 hrs. What is the time required if he work at stretched?

$$n \times t = \text{Workdone}$$

$$18 \times 16 = 288$$

$$\text{Remaining} 432 - 288 = 150$$

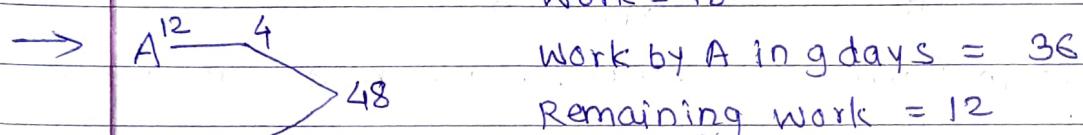


$$\frac{150}{24} \approx 6 \text{ hrs}$$

$$\boxed{\text{total time. } 16 + 6 = 22 \text{ hrs}}$$

Q. A can do work in 12 days B in 16 days if to complete work in 9 days, in how many days B should join A?

$$\text{work} = 48$$



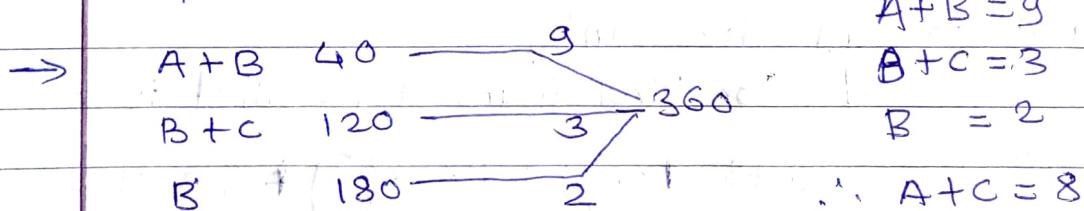
$$\text{work by A in 9 days} = 36$$

$$\text{Remaining work} = 12$$

B complete this in 4 days

$$\therefore \boxed{\text{B should join in } (9-4) = 5 \text{ days}}$$

Q. A & B can do in 40 days, B & C in 120 days & B alone in 180 days, then A and C in how many days?



$$A+B = 9$$

$$B+C = 3$$

$$B = 2$$

$$\therefore A+C = 8$$

$$t \times n = W$$

$$t \times 8 = 360$$

$$\boxed{t = 45 \text{ days}}$$

Q. A, B, C, D do in 20 days, A, B do in 50 days, C does 15 days
how many D will do?

$$\begin{array}{r} \text{A B C D} \\ \text{A B} \\ \text{C} \end{array} \begin{array}{r} 20 \\ 50 \\ 60 \end{array} \begin{array}{r} 15 \\ 6 \\ 5 \end{array}$$

$$A + B + C + D = 15$$

$$A + B = 6$$

$$C = 5$$

$$\therefore D = 4$$

$$\boxed{\text{Work done by D in } \frac{300}{4} = 75 \text{ days}}$$

Q. A, B take 450₹ to complete work in 20 days
B can do 40 days with C they together complete 8 days
What is the C's share?

$$\begin{array}{r} \text{A - 20} \\ \text{B - 40} \\ \text{ABC - 8} \end{array} \begin{array}{r} 2 \\ 40 \\ 5 \end{array} \begin{array}{l} n_A = 2 \\ n_B = 1 \\ n_C = 2 \end{array}$$

Share is in terms of efficiency hence we get

$$2x + x + 2x = 450 \text{ ₹}$$

$$5x = 450 \text{ ₹}$$

$$\boxed{C's \text{ share} = 2 \times x = 180 \text{ ₹}}$$

Q. Pipes A, B, C fill tank in 5 hr, 10 hr, 15 hr resp. If A is left open with $\left(\frac{3}{4}\right)^{\text{th}}$ of rate for 1 hr and C with $\left(\frac{2}{3}\right)^{\text{th}}$ for 2 hrs then fill normal rate? What is time required to fill the tank?

$$\begin{array}{r} \text{A - 5} \\ \text{B - 10} \\ \text{C - 15} \end{array} \begin{array}{r} 6 \\ 3 \\ 2 \end{array}$$

For first hours tank filled is -

$$(6+3) \times 1 \times \left(\frac{3}{4}\right) + 2 \times 2 \times \left(\frac{2}{3}\right) = (6+3) \times 1 = \frac{9}{6}$$

Remaining work = $30 - \frac{9}{6} = \frac{86}{6}$

Time required to do filling for $\frac{86}{6}$ by efficiency $(6+3+2)$ is

$$= \frac{86}{6 \times 11} \approx 1$$

Now total time required is $2+1 \approx 3 \text{ hrs}$

Q. Renold types 34 pages in 8 hrs, Elen 42 pages in 6 hrs how long will they take to write 100 page

$$\rightarrow n_A = \frac{34}{8} = 4.25 \quad n_B = \frac{42}{6} = 7$$

$$n_A + n_B = 11.25$$

$$\text{time} = \frac{W}{n} = \frac{100}{11.25} = 8.89$$

Q. A is twice good of B together they complete work in 16 days A will complete in?

$$\begin{array}{|c|c|c|c|c|} \hline & A & x & x & 32x \\ \hline & B & 4 & 2x & 32x^2 \\ \hline & C & x+4 & 16 & 2x^2 \\ \hline \end{array} \quad n_A + n_B = n_{A+B}$$

$$32x + 16x = 2x^2$$

$$x = 24$$

A will complete in 24 Days

Q. A do job in 8 days, B is 60% more efficient than A
together they complete job in?

$$\rightarrow n_A \times 1.6 = n_B$$

$$n_A \times t_A = n_B \times t_B$$

$$n_A \times 8 = 1.6 \times n_A \times t_B$$

$$t_B = 5 \text{ Days}$$

Q. A can do work in 60 day, he work for 10 days and then leave remaining work completed by B in 40 days together they complete work in

\rightarrow out of 60, 10 days of work done hence 50 days of work remain for A, and completed by B in 40 days.

i.e. A took 50 days and B took 40 for same

$$\begin{array}{r} \text{A } 50 \\ \text{B } 40 \end{array} \xrightarrow{\begin{array}{l} 4 \\ 5 \end{array}} 200$$

$$n_A = 4 \quad n_B = 5$$

$$n_A + n_B = 9$$

Now to find efficiencies at initial states of A & B

$$\frac{x}{60} = \frac{40}{50} \quad x = 48$$

$$\begin{array}{r} \text{A } 60 \\ \text{B } 48 \end{array} \xrightarrow{\begin{array}{l} 4 \\ 6 \end{array}} 288$$

$$\boxed{\text{time} = \frac{288}{108} \approx 25 \text{ days}}$$

Q. 3 men, 4 boys can do the work in 15 days while 4 men, 3 boys do in 10 days then in how much time 2 men & 1 boy do work?

→

$$t \times n_1 = t_1 \times n_1$$

$$\therefore 15(3M+4B) = 10(4M+3B)$$

$$\therefore M = 6B$$

$$\therefore 15(3M+4B) = x(2M+1B)$$

$$\therefore \boxed{x = \frac{22 \times 15}{13} \text{ Days}}$$

OR

$$3M+4B = 15$$

$$4M+3B = 10$$

Find x, y

and then $2x+y = \text{no. of days}$

Q.

A is twice good of B together they complete in 25 days
A alone do in?

$$n_A \times t_A = n_B \times t_B$$

$$n_A = 2n_B$$

$$\text{Work is} = (n_A + n_B) \times 25$$

$$\text{A do work in} = \frac{WL}{n_A} = \frac{(n_A + n_B) 25}{n_A} = \frac{3n_B \times 25}{2n_B} = \frac{375}{2}$$

[A do in 37.5 days]

Q.

A do work in 8 day B is 50% more efficient together takes?

→

$$t_A \times n_A = t_B \times n_B$$

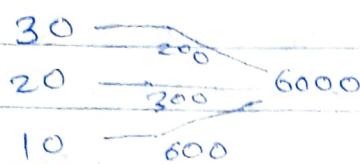
$$8 \times n_A = t_B \times n_A \times 1.50$$

$$t_B \approx 5.8$$

Pipes and Cisterns

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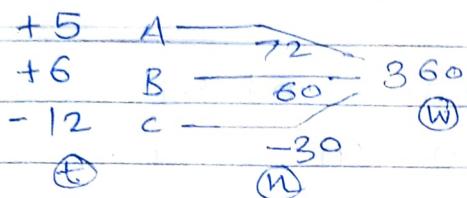
Q. three pipes A, B & C (with 30, 20, & 10 min to fill tank) what is proportion of solution B in the liquid in tank after 3 min?



$$3(600) + 3(300) + 3(200) = 3300$$

$$\text{proportion} = \frac{3 \times 600}{3300} = \frac{6}{11}$$

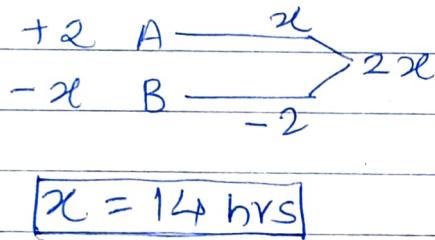
Q. Pipes A, B fill tank in 5 & 6 hours c empty it in 12 if all three opened tank will be filled in?



$$n = 72 + 60 - 30 = 102$$

$$\text{time} = \frac{W}{n} = \frac{360}{102} = \frac{60}{17} = 3\frac{9}{17}$$

Q. Pump fill in 2 hrs and with leak in $2\frac{1}{3}$ hrs. leak drain all water in hrs?

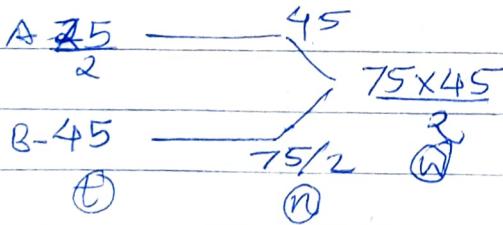


$$n = (2x - 2)$$

$$\text{time} = \frac{2x}{(2x-2)} = \frac{7}{3}$$

$$x = 14 \text{ hrs}$$

Q. A, B fill cistern in $37\frac{1}{2}$ min & 45 min both opened cistern filled in half hour is B closed after



$$x[(45) + (\frac{75}{2})] + (30-x)(\frac{75}{2}) = \frac{75 \times 45}{2}$$

$$x(165) + (30-x)(\frac{75}{2}) = \frac{75 \times 45}{2}$$

$$165x + 2250 - 75x = 75 \times 45$$

$$90x = 75 \times 45 - 2250$$

$$x = \frac{75 \times 45 - 2250}{90}$$

Q. first two pipes filled tank in same time as third
second pipe fills 5 hrs faster than first and 4 hrs slower
than third. time require by first?

$$\rightarrow \text{time for first is } x \text{ then} \quad | \quad n_A + n_B = n_C$$

$$\begin{array}{c|c}
x & \frac{(x-5)(x-9)}{x} \\
(x-5) & \frac{x(x-5)(x-9)}{x} \\
(x-9) & \frac{x(x-5)}{x}
\end{array} \quad | \quad \begin{array}{l}
(x-5)(x-9) + (x-9)x = x(x-5) \\
x^2 - 9x - 5x + 45 + x^2 - 9x = x^2 - 5 \\
x^2 - 18x - 45 = 0
\end{array}$$

$$x = 15 \text{ or } 3$$

Q. two pipes fills tank 20 & 24 min and third removes at 3 gallons/min if all are open tank filled in 15 min.
capacity is?

$$\rightarrow \begin{array}{c|c}
20 & \frac{24x}{20x} \\
24 & \frac{20x}{20x} \\
-x & -480
\end{array} \quad | \quad \begin{array}{l}
\text{time} = \frac{480x}{(44x+480)} \\
15 = \frac{480x}{44x+480}
\end{array}$$

$$660x - 7200 = 480x$$

$$180x = 7200$$

$$x = 4$$

Q. tank fill in 5 hours by three pipes A, B & C, the pipe C twice as fast as B and B is twice as fast as A, find time for A alone

$$\rightarrow \begin{array}{c|c}
A x & \frac{x^2/8}{x^3} \\
B x/2 & \frac{x^2/4}{x^3} \\
C x/4 & \frac{x^2/2}{x^3}
\end{array} \quad | \quad \begin{array}{l}
\text{time} \times n = W \\
5 \times \frac{7x^2}{8} = \frac{x^3}{8} \\
x = 35
\end{array}$$

$$A = 35$$

Q. two pipes A and B together can fill cistern in 4 hr
Had they been opened separately then B would have taken 6 hrs. more than A to fill the cistern How much time will be taken by A to fill the cistern separately?

$$\begin{array}{c}
 \xrightarrow{x} (x) - (x+6) \\
 (x+6) - (x) \\
 \hline
 x^2 + 6x
 \end{array}$$

$$\begin{aligned}
 (2x+6) \times 4 &= x^2 + 6x \\
 x^2 - 2x - 24 &= 0 \\
 (x-6)(x+4) &= 0
 \end{aligned}$$

$$\boxed{x = 6}$$

Q. Tap fill tank in 6 hrs. After half the tank is filled three more similar taps are opened. What is total taken to fill the tank completely?

\rightarrow Half tank filled in 3 hrs.

for half tank four taps opened hence filled in $\frac{3}{4}$
 \therefore total time $(3 + \frac{3}{4})$ hrs.

$$\therefore \boxed{\frac{15}{4} = 3\frac{3}{4} \text{ hrs}}$$

$$\boxed{3 \text{ hrs } 45 \text{ min}}$$

Q. Three taps A, B and C can fill a tank in 12, 15 & 20 hrs. respectively. If A is open all the time and B and C are open for one hour each alternately tank will be full in?

$$\begin{array}{c}
 12 - 300 \\
 15 - 240 \\
 20 - 180 \\
 \hline
 3600
 \end{array}$$

$$\begin{aligned}
 x(300) + x(240) + x(180) &= 3600 \\
 51x &= 3600
 \end{aligned}$$

$$\boxed{x = 7 \text{ hrs}}$$

Q. Three pipes A, B & C fill tank 6 hrs. After working as it together for 2 hours, C is closed and A and B can fill the remaining part in 7 hours. The number of hours taken by C alone to fill tank is?

\rightarrow

Q. Two pipe fills in 12 & 20 hrs and 30 min more require due to leaks, time to empty tank by leaks?

→

$$\begin{array}{ccc} 12 & \xrightarrow{5} & 60 \\ & \searrow 3 & \\ 20 & & \end{array}$$

$$\text{time} = \frac{60}{8} = \frac{15}{2}$$

$$\begin{array}{ccc} 12 & \xrightarrow{20x} & 60x \\ 20 & \xrightarrow{12x} & \\ -x & & -60 \end{array}$$

$$\left(\frac{15}{2} + \frac{1}{2}\right)(32x - 60) = 60x \\ (32x - 60) = \frac{60x \times 2}{16}$$

$$x = 120 \text{ hrs}$$

Q. Three pipes A, B and C fill tank 8 hours if all left open for 4 hrs then C closed for 8 hrs tank gr filled how much time required by only C.

→

$$\begin{array}{ccc} A & \xrightarrow{n_A} & \\ B & \xrightarrow{n_B} & ABC \\ C & \xrightarrow{n_C} & \end{array}$$

$$3(n_A + n_B + n_C) = 4(n_A + n_B + n_C) + 8(n_C)$$

$$4(n_A + n_B + n_C) = 8n_A + 8n_B$$

$$n_C = n_A + n_B$$

During 4 hrs half work done half done by A, B if C done work half it take time equal to A, B i.e. 8 hrs and another 8 hrs for remaining half
 $\therefore [16 \text{ hrs}]$

Q. tank empty in 6 hrs if kept ~~open~~ open the outlet. pipe A fills tank at 4 litre/min if tank full water kept open both pipes tank emptied in $\frac{3}{2}$ hrs. what is capacity of tank.

→

Let x lit be tank capacity then

Rate of filling 4 lit/min

Rate of emptying $x/6 \text{ lit}/6 \times 60 \text{ min}$

Water filled in 10 hrs = extra time to empty tank

$$\therefore 10 \times 4 \times 60 = \frac{x \times 4}{6}$$

$$\therefore [x = 3600 \text{ lit}]$$