Imp Points

Tuesday, June 8, 2021 10:18 AM

1. Pipe → medium of transfer of water

2. Inlet → to fill

3. Outlet → to empty.

(1) If an Inlet can completely fill the empty tank in x hours. the part of the tank filled in 1 hour $= 1/x$

(2) If an outlet can empty the full tank in y hours. so the part of tank to empty in 1 hour $= 1/y$.

(3) If both Inlet and outlet are open, net part of the tank filled 1 hour $= \left(\frac{1}{x}\right) - \left(\frac{1}{y}\right)$.

(4) If a pipe A alone can fill the tank in x hours and pipe B can fill or empty the tank in y hours. If both pipe working

simultaneously then tank to fill or empty.

$$\left(\frac{xy}{x \pm y}\right) \text{ hours}$$

+ for filling

− for emptying.

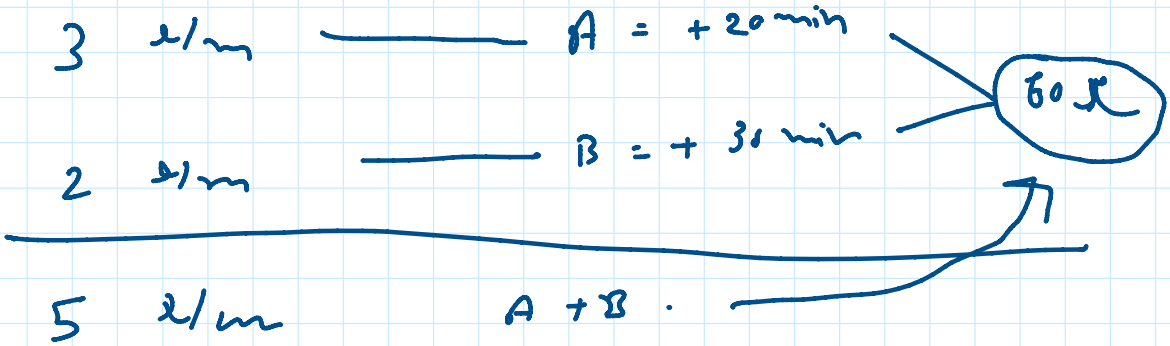
Ex = Two pipes A & B can fill a tank in 20 mins and 30 mins respectively. If both the pipes are opened simultaneously. How much time will be taken to fill the tank?

A = 20 mins & B = 30 mins.

$$\frac{1}{20} + \frac{1}{30} = \frac{5}{60} = \frac{1}{12}$$

Ans. is 12 mins.

OR



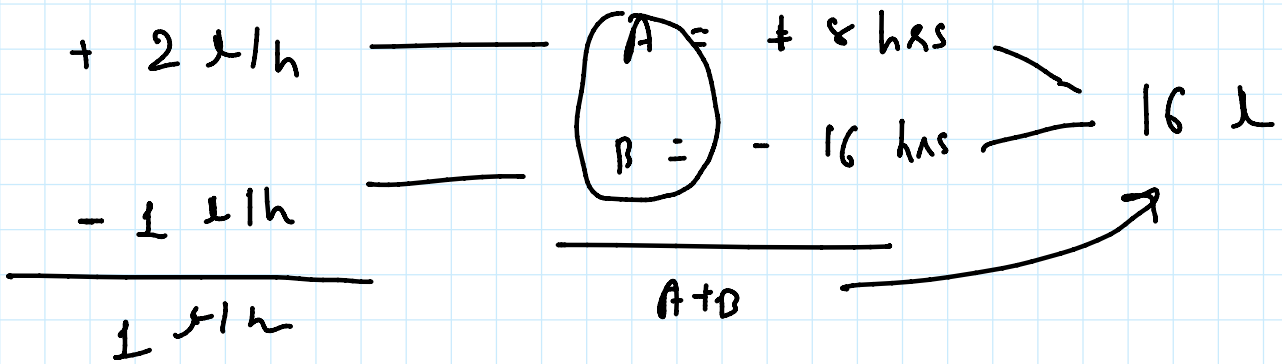
$$\frac{60}{5} = 12 \text{ mins} //$$

OR

$$\frac{xy}{x+y} = \frac{20 \times 30}{20+30} = \frac{600}{50} = 12 \text{ mins} //$$

Sol: If pipe 'A' can fill a tank in 8 hrs & pipe 'B' can empty a tank in 16 hrs when both pipes are opened simultaneously How much time will be taken to fill the tank

$$\frac{xy}{x-y} = \frac{16 \times 8}{16-8} = 16 \text{ hrs} //$$



$$\frac{16}{1\frac{1}{2}} = 16 \text{ hours}$$

(5) Three pipes A, B, C can fill the tank in x, y & z hours respectively. If all three pipes opened simultaneously the time taken to fill the cisterns is

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

Ex Three ~~pipes~~ taps A, B, C can fill an over tank in 4, 6 and 12 hours respectively. What happened to fill together? $x = 4,\ y = 6,\ z = 12$

$$\frac{xyz}{xy + yz + zx} = \frac{4 \times 6 \times 12}{(4\times6) + (6\times12) + (12\times4)}$$

$$= 2 \text{ hours.}$$

Or.

+ 3 hr — A = + 4 hrs

+ , hr — B = + 6 hrs — 12 hr.

$+2$ l/h — B = + 6 hrs — 12 l.

$+1$ l/h — C = + 12 hrs.

$+3$ l/h — A + B + C

$$\frac{12\ l}{6\ l/h} = 2 \text{ hours}$$

$$\frac{1}{4} + \frac{1}{6} + \frac{1}{12} = \frac{3+2+1}{12} = \frac{6}{12} = \frac{1}{2}$$ Ans. = 2 hours

(7) Two pipes (A & B) can fill the tank in x, y respectively. There is also an outlet pipe (C). If all three pipe opened simultaneously tank will fill in 2 hours the time taken by C to empty the full tank is given by

$$\frac{2xy}{y^2 + 2x - xy}$$

Q2 Two taps A & B, can fill an over tank in 30 mins and 60 mins respectively. There is a third exhaust pipe C at the bottom of the tank. If all taps

are opened together then tank will be full in 45 mins. find C to empty the full tank ?

(n+1) - (n+1B-C)

L.C.M.

6 l/m ← A → +30 min

+ 3 l/m ← B → +60 min — 180 l

− 4 l/m ← A+B−C → +45 min

+5 l/m ← C

$$C = \frac{180\ l}{5\ l/m} = 36\ min$$

or

$$\frac{1}{30} + \frac{1}{60} - \frac{1}{hr} = \frac{1}{36}$$ Ans. 36 mins.

(c) one fill pipe A is K time faster than the other fill pipe B.

(a) If B can fill a cistern in x hrs, then the time in which the cistern will be full, if both the fill pipes are opened together

$\left(\frac{x}{k+1}\right)$ hrs

(b) If A can fill a cistern in y hrs, then the time in which the cistern will be full. if both the fill pipes are opened

$\left(\frac{k}{k+1}\right) \cdot y$ hrs.

(9) one fill pipe A is k times faster and takes x mins less time than the other fill pipe B, then

(a) the time taken to fill a cistern, if both the pipes are opened together

$\left(\frac{kx}{(k^2-1)}\right)$ mins.

(b) A will fill the cistern $\left(\frac{x}{k-1}\right)$ mins

(c) B will fill the cistern in $\left(\frac{kx}{k-1}\right)$ mins.

Ex one fill pipe A is 9 times faster than second pipe B. If B can fill a cistern in 40 mins, then find the time when the cistern will be full if both pipes are opened.

$$\frac{x}{k+1} = \frac{40}{9+1} = \frac{40}{10} = 4 \text{ mins}$$

Ex one fill pipe A is 3 times faster than pipe B. If A can fill a cistern in 16 mins. then cistern will full if both together opened then ----

→ $k = 3$ $\quad y = 16$

$$\left(\frac{k}{k+1}\right) y = \frac{3}{4} \times 16 = 3 \times 4 = 12 \text{ mins}$$

Ex the fill pipe A is 2 times faster than second fill pipe B. if together can fill the tank in 36 mins. then how many time slower pipe

can fill the tank.

→ faster will take x min - slower pipe take = 3x

$$\frac{1}{x} + \frac{1}{3x} = \frac{1}{36}$$

$$\frac{3+1}{3x} = \frac{1}{36} \Rightarrow x = \frac{36 \times 4}{3} = 48 \text{ mins}$$

$$3x = 3 * 48 = 144 \text{ mins}$$

formula

$$= \frac{x}{k+1}$$

both pipes fill the tank = 36 mins

$k = 3$

$$36 = \frac{x}{3+1} \Rightarrow x = 4 \times 36 = 144 \text{ mins}$$

Ex one fill pipe A is 5 times faster than second fill pipe B and take 32 mins less than the fill

fill pipe B and take 32 mins less than the fill pipe B. When will the cistern be full if both pipes are opened together?

$\Rightarrow k = 5, \quad x = 32$

Cistern will be full in $= \dfrac{kx}{k^2 - 1}$

$= \dfrac{5 * 32}{25 - 1}$

$= \dfrac{5 * 32}{24} = \dfrac{20}{3}$ mins

$= 6.666\ldots$ mins //