Pipes & Cisterns

Invert it

$N \quad \frac{1}{N}$

Pipe fills tank in 8 hours, then in 1 hours, $\frac{1}{8}$ amount is filled

filling +, removing -

1) Two pipes M and N can fill a tank in 22 hours and 33 hours respectively. In how much time will tank be full if both pipes are opened simultaneously

$M - 22hrs = \frac{1}{22} \quad N = 33hrs = \frac{1}{33}$

$M+N = \frac{1}{22} + \frac{1}{33} = \frac{55}{22 \times 33} = \frac{5}{66}$

simply invert again

$\frac{66}{5}$ hours

2) P fills tank in 35 hrs. Q alone fills in 14 hrs R empties in 133 hours. If all pipes are open together. How much time will be needed to fill tank.

P → 38 → 1/38 Q → 19 → 1/19 R → 133 → 1/133

P+Q−R = $\frac{1}{38} + \frac{1}{19} - \frac{1}{133} = \frac{1}{14}$ } 14 hrs

3) A tap fills a tab in 24 hrs. Due to leak it takes 36 hours. If the tub is full, how much time will the leak take to empty it

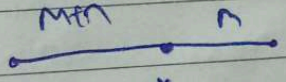
Tap − leak = Total work

$\frac{1}{24} - \text{leak} = \frac{1}{36}$

$\text{leak in 1hr} = \frac{3-2}{72} = \frac{1}{72}$

Time to leak = 72 hrs

4) Two pipes M and N can fill a tak in 22.5 and 15min. If both pipes are opened simultaneously after how many times should N be closed So that tank is full in 18 minutes



here everything is in 1/22.5

M stopped first

$M = \frac{1}{22.5}$ $N = \frac{1-18}{22.5} = \frac{4.5}{22.5} = N$

$18M = \frac{18}{22.5}$ $N = \frac{1}{15} \times x = \frac{x}{15} = \frac{4.5}{22.5}$

$x = 3m^2$

5. Pipe A can fill a tank 5 times faster than pipe B and takes 32 minutes less than pipe B to fill the tank. If both the pipes are opened together, in how much time tank would be full

$A = 5B$

$5(T-32) = T$

$T_A = 8 \text{ min}$

$T_B = 5 \times 8 = 40 \text{ min}$

Then when both are open

$\frac{1}{8} + \frac{1}{40} = \frac{6}{40}$

$3/10$ - Per minute

$20/3$ min stuffs will be done

6. A tank has 3 taps P, Q and R. Taps P and Q can fill tank in 1.5 and 2 hours respectively. Tap R can empty the tank completely in just half hour. Tapp's opened at 8 am, tap Q at 9 am tap R is opened at 10 am. At what time tank will be empty

$P = T, \quad Q = T-1 \quad R = T-2$

$P = 1/1.5 = 2/3 \text{ hrs}$

$Q = 1/2 \text{ hr}$

$R = \frac{1}{1/2} \quad 2 \text{ hrs}$

so final work done here is 0

$T_P + T_Q - T_R = 0$

$\left(\frac{2}{3}T\right) + \left(\frac{1}{2}\right)(T-1) - 2(T-2) = 0$

$T = 21/5 = 4.2$

4 hrs and 12 min

by 12pm 12min

the boy or girl

12 min

1) A cistern can be filled in 6 hours by taps P and Q. If tap R also joins then then cistern is filled in 5 hours. Tap P can fill cistern 2 at rate of tap Q. In what time Q and R fill the cistern

P → 1/P Q → 1/Q R → 1/R

$\frac{1}{P} + \frac{1}{Q} = \frac{1}{6}$ → (1) $\frac{1}{P} + \frac{1}{Q} + \frac{1}{R}$ → (2)

Q and R

$\frac{1}{6} + \frac{1}{R} = \frac{1}{5}$ $\frac{1}{R} = \frac{1}{30}$ $\frac{1}{18} + \frac{1}{30}$

$P = 2Q$ $QR = \frac{4}{4}$

$\frac{2}{Q} + \frac{1}{Q} = \frac{1}{6}$ $\frac{1}{Q} = \frac{1}{18}$ hours = 4)/4 - total

8) A cistern is filled by pipe A and pipe B together in 2.4 hours. Pipe A alone can fill cistern at rate of 100 litres per hour. Pipe B alone can fill the cistern in 4 hours. what is the capacity of cistern

$A \rightarrow 1/A$, $B = 1/A$

$\frac{1}{A} + \frac{1}{A} = \frac{1}{2.4}$

$\frac{1}{A} = \frac{1}{6}$ - 6hrs of A

The capacity will be

$6 \times 100 = 600$ litres

9) Pipe R can empty a full tank in 30 hours. But 2 pipes P and Q can fill in 15 hours and 10 hours. Ram unknowingly opened all 3 taps. After 2 hours Shyam realised it and closed Pipe R. Due to this mistake how much more time it took to fill tank

$P \rightarrow 1/15$ $Q \rightarrow 1/10$ $R \rightarrow 1/30$

$P+Q = \frac{1}{15} + \frac{1}{10} = \frac{5}{30} = \frac{30}{5}$ - overall

6hrs

P + Q − R = $\frac{1}{15} + \frac{1}{10} - \frac{1}{30} = \frac{4}{30}$

he opened for 2 hrs

$\frac{2 \times 4}{30} = \frac{8}{30}$

Total work done

$1 - \frac{8}{30} = \frac{22}{30}$

1 hr) 5/30 : ? = $\frac{22}{5}$ = 4.4 hrs
? 24/30

2 + 4.4 = 6.4 hrs

6 − 6.4 hrs : .4 hrs × 60 = 24 min