

# Time & Work

Q1: If A and B take 20 days, B and C take 10 days and C and A take 12 days to finish a job, in how many will they finish a job working together?

$$\text{Sol: } \left. \begin{array}{l} \frac{1}{A} + \frac{1}{B} = \frac{1}{20} \\ \frac{1}{B} + \frac{1}{C} = \frac{1}{10} \\ \frac{1}{C} + \frac{1}{A} = \frac{1}{12} \end{array} \right\} \quad \left. \begin{array}{l} 2 \left( \frac{1}{A} + \frac{1}{B} + \frac{1}{C} \right) = \frac{1}{20} + \frac{1}{10} + \frac{1}{12} \\ \frac{1}{A} + \frac{1}{B} + \frac{1}{C} = \frac{7}{60} \\ A + B + C = (60) = 8 \frac{4}{7} \text{ days} \end{array} \right.$$

Ques. A takes 10 days and B takes 20 days to finish a job. They start together, but A leaves 2 days before completion. Whole work is completed in how many days?

Sol: Work done = time  $\times$  efficiency.

Total work done by A alone = 5

$$\text{L.C.M}(10, 20) = 20$$

$$\text{Remaining work} = 20 - 5 = 15$$

$$\text{Total time is taken to finish remaining work} = \frac{15}{3} = 5$$

$$\text{Total time} = 5 + 5 = 10 \text{ days}$$

Ques- A and B takes 8 days while B alone takes 12 days to finish a job. They start together, but B leaves after 4 days. C completes the remaining work in how many days?

$$\text{Sol: } A + B = 8$$

$$B + C = 12$$

$$\text{One day work of } (A+B) = \left(\frac{24}{8}\right) = 3 \quad (1)$$

$$\text{One day work of } (B+C) = \left(\frac{24}{12}\right) = 2 \quad (2)$$

$$4 \times A + 7 \times B + 9 \times C = \text{Total work}$$

$$\Rightarrow 4A + 7B + 9C = 24 \quad \text{eq 1 for work of A}$$

$$\Rightarrow 4(A+B) + 3B + 9C = 24 \quad \text{eq 2 for work of B}$$

$$\Rightarrow 4(A+B) + 3(B+C) + 6C = 24 \quad \text{eq 3 for work of C}$$

$$4(3) + 3(2) + 6C = 24$$

$$12 + 6 + 6C = 24$$

$$\text{or } 6C = 24 - 18 = 6 \quad (6, 1) = H.C.F$$

$$\therefore C = \frac{6}{6} = 1 \quad (1, 2) = 12 - 10 = \text{drawn pair in Q}$$

Ques:- A, B, C take 24, 36, 48 days respectively to complete a job. They start together but C leaves after 4 days. A leaves 3 days before completion. In how many days is completed?

$$\text{Sol: } 2 | 24, 36, 48$$

$$2 | 12, 18, 24$$

$$2 | 6, 9, 12$$

$$3 | 3, 9, 6$$

$$2 | 1, 3, 2$$

$$L.C.M = 144.$$

A eats 6 chocolates per day. B eats 4 chocolates per day and C eats 3 chocolates per day. Together they will eat 13 chocolates per day.

$$\text{No. of chocolates left} = 144 - 52 = 92$$

A left 3 days before completion so B had to work alone, so he ate  $3 \times 4 = 12$  chocolates alone.

$$\text{no. of chocolates left} = 92 - 12 = 80$$

A and B eat 10 chocolates together.

Thus the work completed in  $4 + 8 + 3 = 15$  days.

Ques. A takes 25 days and B takes 20 days to finish a job. They start together, but A after 5 days. In how many days can B alone complete the work?

Sol.: Time taken by A to complete the work = 25 days.

Time by B = 20 days.

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

Total work = 100 units.

$$\frac{100}{25} = 4 \text{ units.} \quad \text{--- A's efficiency.}$$

$$\frac{100}{20} = 5 \text{ units.} \quad \text{--- B's efficiency.}$$

Total work - work was completed by alone A in 10 days / efficiency of A and B

$$(100 - 40) / (4 + 9) = \frac{60}{9}$$

$$= \left( \frac{20}{3} \right) = \left( 6\frac{2}{3} \right)$$

Ques 6: A and B can together complete a piece of work in 4 days. If A alone can complete the same work in 12 days, in how many days can B alone complete the work?

Sol.:  $A+B = 4$

$$\begin{array}{r} 2 \overline{) 4,6} \\ 2 \overline{) 2,3} \\ 3 \overline{) 1,3} \end{array}$$

$\left. \begin{array}{l} \\ 1,1 \end{array} \right\} \text{LCM} = 12$

$A's \text{ efficiency} = \frac{1}{12} - \frac{1}{2} = \frac{1}{6}$

Time taken by B to complete the work  
 $= \left( \frac{12}{\frac{1}{6}} \right) = 12 \text{ days. Ans.}$

Ques.: A can complete a work in 8 days. After working for 5 days, B joins him and remaining work is completed in 1 day. In how many days would B alone complete the same work?

Sol.: Time =  $\frac{\text{Work}}{\text{Efficiency}}$

1 day work done by individual =  $\frac{\text{Work}}{\text{time}}$

$$1 \text{ day work of } A = \left(\frac{1}{8}\right)$$

$$2 \text{ days work of } A = \left(\frac{2}{8}\right) = \left(\frac{1}{4}\right)$$

$$\text{Remaining work} = \left(1 - \frac{1}{4}\right) = \left(\frac{3}{4}\right)$$

$$1 \text{ day work of } B = \left(\frac{1}{12}\right)$$

Remaining work is completed by A and B together:-

$$= 1 \text{ day work of } A \text{ and } B = \left(\frac{1}{8}\right) + \left(\frac{1}{12}\right) = \left(\frac{5}{24}\right)$$

$$\text{Time} = \frac{\text{Work}}{\text{Efficiency}}$$

$$\text{Time taken to complete } \left(\frac{3}{4}\right) \text{ work} = \left(\frac{\frac{3}{4}}{\frac{5}{24}}\right) = \frac{3}{4} \times \frac{24}{5} = \left(\frac{18}{5}\right) = 3.6 \text{ days}$$

Time taken in completing the work

$$= 2 + 3.6 \text{ days} = 5.6 \text{ days}$$

Ques- A can finish a job in 15 days and B can do the same job in 20 days. If they work on alternate days with A starting on 1<sup>st</sup> day, in how many days will the work be completed?

Sol. work done by A in 1 day =  $\frac{1}{15}$   
 " " by B in 1 day =  $\frac{1}{20}$

$$\frac{1}{15} + \frac{1}{20} = \left(\frac{7}{60}\right)$$

work done in 2 days is  $\left(\frac{7}{60}\right)$

$\therefore$  Remaining work =  $1 - \frac{5}{60} = \frac{1}{12}$

It takes A and B 17 days to complete the job working on alternate days, with A starting.

Ques- A contractor estimates that he will finish the work in 100 days by 50 men. But in 50 days only 40% work is completed.

(i) How many more days are required to finish the job?

(ii) How many more men are required to finish the job on time?

Sol. Remaining work =  $100 - 40\% = 60\%$ .

time =  $100 - 50 = 50$  days  
 work rate =  $\frac{40\%}{50 \times 50} = \frac{40}{2500} = \frac{1}{62.5}$

$x \times 50 \text{ days} \times \frac{40\%}{2500} = 60\%$

$x = \frac{60 \times 2500}{50 \times 40\%} = 75$

Additional men required =  $75 - 50 = 25$  men

Q9:  $(m_1 \times d_1 \times h_1) w_1 = (m_2 \times d_2 \times h_2) w_2$

$$(20 \times 6 \times 8) 112 = (25 \times 3 \times 5) w_2$$

$$\boxed{w_2 = 43.75 \text{ m}}$$

Q10: Total work =  $1 \times 12 = 12$  man-days.

No. of days =  $\frac{12}{21} = \left(\frac{4}{7}\right)$  days. Ans/

Q11: 6 days:- Total work done =  $6(4m + 3w)$

Daily work =  $sm + 7w$

Total work =  $4(sm + 7w)$

$$\Rightarrow 8(4m + 3w) = 4(5m + 7w)$$

$$24m + 24w = 20m + 28w$$

$$24m - 20m = 28 - 24w$$

$$4m = 4w$$

$$M = \frac{5}{2}w$$

$$M = \left(\frac{5}{2}\right)w$$

$$M + w = \left(\frac{5}{2}\right)w + w = \left(\frac{7}{2}\right)w$$

Total work =  $6(4M + 3w)$

$$6\left(4 \cdot \frac{5}{2}w + 3w\right) = 6\left(10w + 3w\right) = 6 \cdot 13w = 78w$$

They work at  $\frac{7}{2}w$  per day.

$$\text{Time} = \frac{\text{Total work}}{\text{Daily work}} = \frac{78w}{\frac{7}{2}w} = \left(\frac{156}{7}\right) = 22.29 \text{ days}$$

## Lesson-3

### Time & Work

$$\text{Work done} = \text{Time Work} \times \text{Rate of Work}$$

Ques. Vaibhav and Ankit can paint a wall in 10 and 40 min. respectively. If both together paint the wall, how much time will it take to complete the wall?

$$\text{Sol- } \frac{1}{10} + \frac{1}{40} = \left(\frac{1}{T}\right)$$

$$= \frac{(4+1)}{40} = \frac{1}{8} = \frac{1}{T}$$

$$\Rightarrow T = 8 \text{ min.} \quad \underline{\text{Ans.}}$$

Ques. Two pipes A and B can fill a tank in 20 and 30 min respectively. If both the pipes are used together. How long it will take to fill the tank?

$$\text{Sol.: } \left(\frac{1}{20} + \frac{1}{30}\right) = \left(\frac{1}{T}\right)$$

$$\left(\frac{3+2}{60}\right) = \frac{5}{60} = \frac{1}{12} = \left(\frac{1}{T}\right)$$

$$\boxed{T = 12 \text{ min}} \quad \underline{\text{Ans.}}$$

Ques:Formula:

$$m \times D \times H \times W = \text{constant}$$

 $m$  = No. of men $D$  = No. of Days $H$  = No. of hours. $W$  = work.

Ques. 24 men are required to complete the work in 20 days. How many additional men will be required to finish the work 4 days earlier?

Sol:

$$24 \times 20 = (24+x) \times 16$$

$$\boxed{x = 6}$$

Ans/.

Ques: A certain no. of men can build a wall in 14 days. If there were 6 more men, the work could have been completed 4 days earlier. How many men were initially there?

Sol:  $x \times 14^7 = (x+6) \times 10^4$

$$7x = 10x + 60 \Rightarrow 14x = 10x + 60$$

$$\boxed{x=15} \quad \text{Ans/}$$

$$\begin{array}{l} 7x = 10x + 60 \\ 3x = 60 \\ x = 20 \end{array}$$

Ans/

Que: 10 men take a time of 24 days to complete the paint 100 metre ground. How many days will be taken by 24 men to paint 80m ground?

Sol:  $\frac{240 \times 24}{100} = \frac{24 \times D}{80}$

$$\begin{array}{r} 240 \times 24 \\ 100 \\ \hline 80 \\ 24 \\ \hline 6 \end{array}$$

$$48 = 6D$$

$$\boxed{D = 8} \quad \text{Ans/}$$

Que. If 10 monkeys can eat 10 pieces of bread in 10 min., how much time will 100 monkeys take to eat 100 pieces of bread?

Sol:  $10 \times \frac{1}{6} \times 10 = \frac{100}{6} \times t$

$$\begin{array}{r} 10 \times 10 \\ 6 \\ \hline 100 \end{array}$$

$$\frac{10}{6} \times \frac{1}{10} = \frac{1}{6} \text{ Hrs} = \frac{1}{6} \times 60$$

$$= 10 \text{ min} \quad \text{Ans/}$$

Ques.

Inlet

outlet

Two pipes can fill a tank with water in 10 and 15 hours respectively. How much time it will take to fill a tank if both pipes are open together?

Sol:

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

$$\left( \frac{3+2}{30} \right) = \left( \frac{1}{T} \right)$$

$$\left( \frac{5}{30} \right) = \left( \frac{1}{T} \right)$$

6

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

$$5 \overline{)10, 15}$$

$$3 \overline{)2, 3}$$

$$3 \overline{)1, 3}$$

1, 1

Ans/  
.Ques.

A pipe can fill a tank with water in 12 hours. Another pipe empties the tank in 48 hours. How much time it will take to fill the tank if both pipes are open together?

Sol:

$$\left( \frac{1}{T} \right) = \frac{1}{12} - \frac{1}{48}$$

$$T = 16 \text{ Hours}$$

Ans/  
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