



Time And Work

- ★ Work means doing a job like constructing a wall, painting a building etc.
- ★ Work is always taken as one unit.
- ★ If a man can do a piece of work in 'n' days, then his one day's work is $\frac{1}{n}$.
- ★ If a man's one day's work is $\frac{1}{n}$, then he can complete the entire work in 'n' days.
- ★ If a man can do a piece of work in A days and another man can do the same work in B days, then they together can complete the work in $\frac{A \times B}{A + B}$ days.
- ★ Three persons A, B and C together can complete it in $\frac{A \times B \times C}{AB + BC + AC}$ days



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- ★ If A is 3 times as good workman as B, then he takes one third time taken by B for the same work.
- Ex:** A can complete a piece of work in 4 hours

Work is always taken as?

and B in 6 hours. In what time will they complete it if they work together?

Sol: A can complete in 4 hours and B in 6 hours if they work together they finish in $\frac{4 \times 6}{4 + 6} = \frac{24}{10} = 2.4$ days

★ If 'm' persons complete a work in 'n' days then the number of days required for one person to complete that work will be $m \times n$ days. For example, if 3 people complete a work in 4 days, then number of days required for 1 person to complete that work will be $3 \times 4 = 15$

Man Days: If 5 men can complete a work in 6 days, then the number of man days required to complete that work is $5 \times 6 = 30$.

Ex: 16 men together can complete a work in 3 days. In how many days 12 men finish that work?

Sol: 16 men complete in 3 days
∴ 12 men take $\frac{16}{12} \times 3 = 4$ days

short cut: The work which 16 men finish in 3 days, will be finished by 12 men in 'x' days
∴ $16 \times 3 = 12 \times x \Rightarrow x = 4$ days



Bank Exams

Quantitative Aptitude

- ★ If M_1 persons can do W_1 work in time D_1 and M_2 persons can do W_2 work in time D_2 , then the relation between these quantities is $M_1 D_1 W_2 = M_2 D_2 W_1$
- Ex:** If 10 persons can complete two-fifth of a work in 8 days, then how many persons are required to complete the remaining work in 12 days?

Sol: $M_1 D_1 W_2 = M_2 D_2 W_1$

$$10 \times 8 \times \frac{3}{5} = M_2 \times 12 \times \frac{2}{5}$$

$$M_2 = 10 \text{ days}$$

Pipes And Cisterns

The problems in pipes and cisterns require the application of the same basic concepts of those of Time and Work.

Negative work also will be there due to leakage or drain pipes in the questions.

Ex: A pipe fills a tank in 8 hours and a leak in the bottom empties it in 12 hours. In what time can the tank be filled when both function simultaneously?

Sol: Pipe's one hour's work = $\frac{1}{8}$ hours

$$\text{Leak's one hour's work} = \frac{1}{12} \text{ hours}$$

(∵ negative work)

Pipe and leak's one hour work

$$= \frac{1}{8} - \frac{1}{12} = \frac{1}{24}$$

Exercise

- Ganesh can complete a piece of work in 18 days while Ganesh and Mahath together can do the same work in 12 days. In how many days will Mahath alone can do that work?
1) 30 2) 16 3) 20
4) 36 5) None of these
- A tap can fill a tank in 25 minutes and another can empty it in 50 minutes. If both are opened simultaneously, in what time the tank is filled?
1) 25 min 2) 50 min 3) 44 min
4) 40 min 5) 24 min
- 26 men can do a piece of work in 12 days. In how many days can 39 men do that work?
1) 8 days 2) 12 days 3) 15 days
4) 20 days 5) None of these

- A can do a work in 20 days. He worked alone for 10 days and the remaining work was completed with the help of B in 2 days. In how many days will the total work be completed if they work together?
1) 15 days 2) 10 days 3) 4 days
4) 8 days 5) None of these
- A is 150% as good work man as B. if A can complete a work in 20 days, in what time both A and B together can complete that work?
1) 16 days 2) 9 days 3) 8 days
4) 6 days 5) 12 days
- A can fill a tank in 4 minutes and B can fill it in 6 minutes. If both are opened alternatively for one minute each starting with A, find in what time the tank is filled.
1) 5 minutes 2) $4 \frac{2}{5}$ minutes

- 3) $4 \frac{2}{3}$ minutes 4) 10 minutes
5) None of these
- A and B can complete a piece of work in 15 days and 12 days respectively. They started working together and received an amount of Rs. 5400. Find the share of B.
1) Rs. 2400 2) Rs. 1800 3) Rs. 1200
4) Rs. 3000 5) None of these
- A can do a piece of work in 24 days. A and B together can complete the same work in 14.4 days. In what time does B alone complete that work?
1) 32 days 2) 18 days 3) 36 days
4) 28 days 5) None of these
- Two pipes A and B can fill a tank in 30 minutes and 15 minutes respectively. A drain pipe C can empty a full tank in 10 minutes. In what time can the tank be filled when all the three are open simultaneously?

- 1) 20 minutes 2) 30 minutes 3) 24 minutes
4) 50 minutes 5) 28 minutes
- A and B can complete a piece of work in 24 days. B and C can complete it in 30 days and A and C in 40 days. In what time A, B and C together can complete that work?
1) 30 days 2) 28 days 3) 32 days
4) 20 days 5) None of these
- 25 men to complete a work in 20 days. But after 15 days only 60% work has been finished. In order to finish the work in the stipulated time, how many more men are required?
1) 30 2) 50 3) 25
4) 20 5) None of these

Answers

1-4 2-2 3-1 4-3 5-5 6-3 7-4 8-3 9-1
10-4 11-3.

Explanations

- $\frac{18 \times 12}{18 - 12} = 36$ days
- $\frac{20 \times 50}{50 - 25} = 50$ minutes
- $26 \times 12 = 39 \times ?$
 $? = 8$ days
- Work of A for 1 day = $\frac{1}{20}$
∴ Work of A for 10 days = $\frac{1}{20} \times 10 = \frac{1}{2}$
Remaining work = $1 - \frac{1}{2} = \frac{1}{2}$
 $\frac{1}{2}$ Work is done by A and B in 2 days
∴ Total work is done by A and B in $2 \times 2 = 4$ days
- A is 150% efficient than B
If A takes 100 days then B takes 150 days to complete that work.
But A can complete in 20 days
∴ B can complete in $\frac{20}{100} \times 150 = 30$ days

- A and B together can complete in $\frac{20 \times 30}{20 + 30} = 12$ days
- In the first minute A fills $\frac{1}{4}$ of the tank
in the second minute B fills $\frac{1}{6}$ of the tank
∴ In the first 2 minutes, $\frac{1}{4} + \frac{1}{6} = \frac{5}{12}$
of the tank is full
and in 4 minutes $2 \times \frac{5}{12} = \frac{5}{6}$ tank is full
Now the remaining $\frac{1}{6}$ tank A can fill in $4 \times \frac{1}{6} = \frac{2}{3}$ minutes
∴ Total time taken to fill the tank = $4 \frac{2}{3}$ minutes
- Ratio of their one day's work = $\frac{1}{15}, \frac{1}{12} = 4:5$
∴ B's share = $\frac{5}{9} \times 5400 = \text{Rs. } 3000$

- A and B together's one day's work = $\frac{1}{14.4}$
A's one day's work = $\frac{1}{24}$
B's one day's work = $\frac{1}{14.4} - \frac{1}{24} = \frac{1}{36}$
∴ B can complete the work in 36 days.
- Shortcut:**
When two persons together can complete a work in 'x' days and one of the persons can complete in 'y' days, then the other person can complete that work in $\frac{xy}{y-x}$ days
 $\Rightarrow \frac{14.4 \times 24}{24 - 14.4} = 36$ days
- A = 12 minutes (+), B = 15 minutes (+), C = 10 minutes (-)
All three together can fill the tank in $\frac{ABC}{AB + BC + AC}$ minutes
 $\Rightarrow \frac{(12) \times (15) \times (-10)}{(12) + (15) + (-10) + (-10) + (12) + (-10)}$

- $\Rightarrow \frac{-1800}{+180 - 150 - 120} = \frac{-1800}{-90} = 20$ minutes
- One day's work of A and B = $\frac{1}{24}$
One day's work of B and C = $\frac{1}{30}$
One day's work of A and C = $\frac{1}{40}$
2 days work of A, B and C = $\frac{1}{24} + \frac{1}{30} + \frac{1}{40} = \frac{1}{10}$
∴ One day's work of A, B and C = $\frac{1}{20}$
∴ A, B and C can complete that work in 20 days
- $\frac{M_1 D_1}{W_1} = \frac{M_2 D_2}{W_2}$
 $\therefore \frac{25 \times 15}{60} = \frac{M_2 \times 5}{40} \Rightarrow M_2 = 50$
∴ To complete the remaining work, (50 - 25) = 25 men are required