Time and Work

Time Time taken to complete an assigned job

Individual time Time needed by single person to complete a job

Work It is the amount of work done actually

In general, there are two methods for approaching time and work problems. For example; either of

Method 1: Fraction technique

or

Method 2: Efficiency technique

Discussion:

✔ If a man can do a piece of work in 5 days and total work is 30 units then his efficiency will be 6 unit work in one day.

✔ If we take total work as 1 unit then he will finish 1/5th of the work in one day

✔ If A works three times faster than B then A takes 1/3rd the time taken by B

✔ Efficiency = Total Work/Time **(Efficiency Technique)**

Work from Days:

If A can do a piece of work in n days, then A's 1 day's work = 1/n **(Fraction Technique)**

Days from Work:

If A's 1 day's work = 1/n, then A can finish the work in n days

✔ If A is thrice as good a workman as B, then:

- Ration of work done by A and B = 3:1
- Ration of times taken by A and B to finish a work = 1:3

Ex 1.

If Roger can do a piece of work in 8 days and Antony can complete the same work in 5 days, in how many days will both of them together complete it ?

Ans.

Fraction Technique:

Roger's 1 day's work $= \frac{1}{8}$;

Antony's 1 day's work $= \frac{1}{5}$

(Roger + Antony)'s day's work $= \frac{1}{8} + \frac{1}{5} = \frac{13}{40}$

Both will complete the work in $\frac{40}{13} = 3\frac{1}{13}$ days.

Efficiency Technique:

Let Total Work be x, then

Roger's Efficiency = Total Work/ Time $= \frac{x}{8}$

Antony's Efficiency $= \frac{x}{5}$

Together Efficiency $= \frac{x}{8} + \frac{x}{5} = \frac{13x}{40}$

Ex 2.

A and B together can complete a piece of work in 15 days and B alone in 20 days. In how many days can A alone complete the work?

Ans.

(A+B)'s 1 day's work $= \dfrac{1}{15}$

B's 1 day's work $\dfrac{1}{20}$

$\therefore$ A's 1 day's work $= \left(\dfrac{1}{15} - \dfrac{1}{20}\right) = \dfrac{1}{60}$

Hence, A alone can complete the work in 60 days.

Ex 3.

A can do a piece of work in 10 days, and B can do the same work in 20 days. With the help of C, they finished the work in 4 days. C can do the work in how many days, working alone?

Ans.

C alone will take $\dfrac{1}{4} - \dfrac{1}{10} - \dfrac{1}{20} = \dfrac{2}{20} = \dfrac{1}{10}$

$\Rightarrow$ 10 days are required to complete the work.

Ex 4.

Ram is twice as efficient as Sunita and can finish a piece of work in 25 days less than Sunita. Sunita can finish this work in how many days?

Ans.

Work Formula: Efficiency of Ramesh: Efficiency of Sunita = 2: 1.

Ram will take 1/2 of time as compared to Sunita.

Say, Sunita takes $2x$ days and Ram takes x days.

$\therefore 2x - x = 25 \Rightarrow x = 25$

$\therefore$ Sunita takes $25 \times 2 = 50$ days to do the work.

Ex 5.

X can do a piece of work in 20 days. He worked at it for 5 days and then Y finished it in 15 days. In how many days can X and Y together finish the work?

Ans.

X's five day work $= \dfrac{5}{20} = \dfrac{1}{4}$

Remaining work $= 1 - \dfrac{1}{4} = \dfrac{3}{4}$

This work was done by Y in 15 days. Y does 3/4th of the work in 15 days, he will finish the work in $15 \times 4/3 = 20$ days.

X & Y together would take $\dfrac{1}{20} + \dfrac{1}{20} = \dfrac{2}{20} = \dfrac{1}{10}$

i.e. 10 days to complete the work.

Ex 6.

A is 30% more efficient than B. How much time will they, working together, take to complete a job which A alone could have done in 23 days?

Ans.

Ratio of times taken by A and B = 100 : 130 = 10 : 13

Suppose B takes x days to do the work.

Then, $10 : 13 :: 23 : x$ implies $x = \dfrac{299}{10}$

A's 1 day's work $= \dfrac{1}{23}$

B's 1 day's work $= \dfrac{10}{299}$

(A + B)'s 1 day's work $= \left(\dfrac{1}{23} + \dfrac{10}{299} \right) = \dfrac{23}{299} = \dfrac{1}{13}$

Therefore, A and B together can complete the work in 13 days.

Ex 7.

Sakshi can do a piece of work in 20 days. Tanya is 25% more efficient than Sakshi. The number of days taken by Tanya to do the same piece of work is?

Ans.

Ratio of times taken by Sakshi and Tanya = 125 : 100 = 5 : 4

Suppose Tanya takes x days to do the work

$5:4 :: 20: x$ implies $x = 16$ days

Hence, Tanya takes 16 days to complete the work.

Ex 8.

A alone can do a piece of work in 6 days and B alone in 8 days. A and B undertook to do it for Rs. 3200. With the help of C, they completed the work in 3 days. How much is to be paid to C?

Ans.

C's 1 day's work $= \frac{1}{3} - \left(\frac{1}{6} + \frac{1}{8}\right) = \frac{1}{24}$

A's wages : B's wages : C's wages $= \frac{1}{6} : \frac{1}{8} : \frac{1}{24} = 4 : 3 : 1$

C's share (for 3 days) $= Rs. \left(3 \times \frac{1}{24} \times 3200\right) = Rs. 400$

Ex 9.

If 6 men and 8 boys can do a piece of work in 10 days while 26 men and 48 boys can do the same in 2 days, the time taken by 15 men and 20 boys in doing the same type of work will be?

Ans.

Let 1 man's 1 day's work $= x$ and 1 boy's 1 day's work $= y$

Then $6x + 8y = \dfrac{1}{10}$ and $26x + 48y = \dfrac{1}{2}$ implies $x = \dfrac{1}{100}, y = \dfrac{1}{200}$

(15 men +20 boys)'s 1 days's work $= \dfrac{15}{100} + \dfrac{20}{200} = \dfrac{1}{4}$

Therefore, 15 men and 20 boys can do the work in 4 days

Ex 10.

Mr. Ram has a sum of money, which is sufficient to pay Usha's wages for 30 days and Manika's wages for 60 days. If he employs them together, the money is sufficient to pay their wages for how many days?

Ans.

Usha's one day's wage bill is $\frac{1}{30}$ of the total money.

Manika's wage bill is $\frac{1}{60}$ of the total money.

That means together their wage bill is $\frac{1}{30} + \frac{1}{60} = \frac{3}{60} = \frac{1}{20}$ of the total money.

Thus, the money is sufficient for their 20 days' wages

Ex 11.

A takes 5 days more than B to do a certain job and 9 days more than C; A and B together can do the job in the same time as C. How many days A would take to do it?

Ans.

Suppose A takes x days to do the job alone. Then, B takes $(x - 5)$ days and C takes $(x - 9)$ days.

(A+B)'s 1 day's work = C's 1 day's work

$$\Rightarrow \frac{1}{x} + \left(\frac{1}{x - 5} \right) = \left(\frac{1}{x - 9} \right)$$

$$\Rightarrow (x - 3)(x - 15) = 0$$

$$\Rightarrow x = 15, \text{ Since } x \neq 3$$

Hence, A alone would take 15 days to do the job.

Ex 12.

Three friends, Anne, Bob and Chris work together to do a certain job. The time it takes them to do the work together is 6 hours less than Anne would have take alone, 1 hour less than Bob would have taken alone and half the time Chris would have taken working alone. How long did it take them to complete the job, working together?

Ans. Let the time taken by the three friends together to do the work be x hours. Then,

Time taken by Anne alone $= (x + 6)$ hrs

Time taken by Bob alone $= (x + 1)$ hrs

Time taken by Chris alone $= 2x$ hrs

$$\therefore \left(\frac{1}{x+6}\right) + \left(\frac{1}{x+1}\right) + \left(\frac{1}{2x}\right) = \left(\frac{1}{x}\right)$$

$$\Rightarrow x = \frac{2}{3}$$

Required time $= \frac{2}{3}$ hrs $= \left(\frac{2}{3} \times 60\right)$mins $= 40$ mins

Ex 13.

A does 20% less work than B. If A can complete a piece of work in $7\frac{1}{2}$ hours, then B can do it in?

Ans.

Ration of times taken by A and B = 100 : 80 = 5:4

Suppose B takes x hours to do the work.

$5:4 :: \frac{15}{2} : x \Rightarrow x = \left(\frac{4\times15}{2\times5}\right) \Rightarrow x = 6$ hours.

Ex 14.

A can do a work in 15 days and B in 20 days. If they work on it together for 4 days, then the fraction of the work that is left is ?

Ans.

A's 1 day's work $= \dfrac{1}{15}$

B's 1 day's work $= \dfrac{1}{20}$

(A+B)'s 1 day's work $= \dfrac{1}{15} + \dfrac{1}{20} = \dfrac{7}{60}$

(A+B)'s 4 day's work $= \dfrac{7}{60} \times 4 = \dfrac{7}{15}$

Remaining work $= 1 - \dfrac{7}{15} = \dfrac{8}{15}$

Ex 15.

A, B and C can do a piece of work in 20, 30 and 60 days respectively. In how many days can A do the work if he is assisted by B and C on every third day?

Ans.

A's 2 day's work $= (\frac{1}{20} \times 2) = \frac{1}{10}$

$(A + B + C)$'s 1 day's work $= (\frac{1}{20} + \frac{1}{30} + \frac{1}{60}) = \frac{1}{10}$

Work done in 3 days $= (\frac{1}{10} + \frac{1}{10}) = \frac{1}{5}$

Whole work will be done in $(3 \times 5) = 15$ days

Thank You