



Time and Work

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1. Introduction:

Time and Work problems are most frequently asked problems in quantitative aptitude. To solve these problems very quickly, you should understand the concept of Time and Work and some shortcut methods.

2. Basic Concepts:

In solving the problems based on time and work, we need to calculate the following parameters.

- (A) **Time** :- Time taken to complete an assigned job.
- (B) **Individual time** :- Time needed by single person to complete a job.
- (C) **Work**:- It is the amount of work done actually.

- If a man can do a piece of work in 5 days, then he will finish $\frac{1}{5}$ th of the work in one day.
- If a man can finish $\frac{1}{5}$ th of the work in one day then he will take 5 days to complete the work.
- If a man $\frac{5}{6}$ th of work in one hour then he will take $\frac{6}{5}$ hours to complete the full work.
- If A works three times faster than B then A takes $\frac{1}{3}$ rd the time taken by B.

3. Rules and Tricks:

Rule 1: Universal Rule

This rule can be used in almost every problems.

- If M_1 persons can do W_1 work in D_1 days and M_2 persons can do W_2 works in D_2 days then we can say

$$M_1 D_1 W_2 = M_2 D_2 W_1$$

- If the persons work T_1 and T_2 hours per day respectively then the equation gets modified to

$$M_1 D_1 T_1 W_2 = M_2 D_2 T_2 W_1$$

- If the persons has efficiency of E_1 and E_2 respectively then,

$$M_1 D_1 T_1 E_1 W_2 = M_2 D_2 T_2 E_2 W_1$$

Example:

- 5 men can prepare 10 cycles in 6 days working 6 hours a day. Then in how many days can 12 men prepare 16 cycles working 8 hours a day?

Sol:

Here $M_1 = 5$, $W_1 = 10$, $D_1 = 6$, $T_1 = 6$ and

$M_2 = 12$, $W_2 = 16$, $T_2 = 8$

So from the above rule

$$M_1 D_1 T_1 W_2 = M_2 D_2 T_2 W_1$$

$$5 \times 6 \times 6 \times 16 = 12 \times D_2 \times 8 \times 10$$

$$D_2 = 3 \text{ Days.}$$

So they will complete the work in 3 days.

Rule 2:

If A can do a piece of work in n days, then
The work done by A in one day = $1/n$

Example:

If A can repair 50 cycles in 5 days then A can
repair $50/5 = 10$ cycles in one day.

Rule 3:

If A can do a piece of work in X days and B can do the same work in Y days, then both of them working together will do the same work in

$$\frac{XY}{X + y} \text{ days.}$$

Example:

If A can do a piece of work in 10 days and B can do the same work in 15 days then how long will they take if they both work together?

Solution 1:

A can finish the work in $D_1 = 10$ days.

B can finish the work in $D_2 = 15$ days.

$$\begin{aligned}\text{A and B working together} &= \frac{D_1 * D_2}{D_1 + D_2} \\ &= 10 * 15 / 10 + 15 \\ &= 150 / 25 = 6 \text{ days.}\end{aligned}$$

Solution 2: (UNITARY METHOD)

Let the total work be assumed as $\text{LCM}(10,15) = 30$ Units

Now to complete 30 units A takes 10 days

To complete 30 units B takes 15 days

Units done in 1 day by A = 3

Units done in 1 day by B = 2

Units done in 1 day by A & B = 5

To complete 30 units they will take $30/5 = 6$ days

Rule 4:

If A is twice as good a workman as B, then A will take half of the time taken by B to complete a piece of work.

Example:

A is twice as good a workman as B. Together, they finish the work in 14 days. In how many days can it be done by each separately?

Solution 1:

Let's assume that A alone can finish the work in x days.

It is given that A is twice as good a workman as B so B alone can finish the work in 2x days

$$= x * 2x / x + 2x = 2x^2/3x = 14.$$

So x = 21 days.

So A can finish the work in 21 days and B can finish the work in 42 days.

Solution 2:

If A and B working together can finish a work in X days and A is K times efficient than B, then the time taken by

(i) A, working alone, to complete the work is

$$\left[\frac{K + 1}{K} \right] X \text{ days.}$$

Here, $X = 14$, $K = 2$

Hence , $= (3/2)14$
 $= 21 \text{ days.}$



(ii) **B, working** alone, to complete the work is
 $(K+1)X$ days.

Hence,

$$= 3 * 14 = 42 \text{ days.}$$

Rule 5:

If A can finish a work in X days and B is K times efficient than A, then the time taken by both A and B working together to complete the work is

$$\frac{X}{1 + K} \text{ days.}$$

Example:

If A can finish a work in 20 days and B is 3 times efficient than A, means $B=20/3$ then the time taken by both A and B working together to complete the work is

$$1/20 + 1/20/3 = 4/20 = 1/5$$

Solution: $= 20 / (1+3) = 5 \text{ days.}$

Rule 6:

If A, B and C, while working alone, can complete a work in X, Y and Z days respectively, then they will together complete the work in

$$\frac{XYZ}{XY + YZ + ZX} \text{ days.}$$

Example:

A, B and C can complete a piece of work in 5, 10 and 15 days respectively. Working together, they will complete the same work in:

Solution 1:

$$\begin{aligned}\text{By using the formula} &= \frac{5 * 10 * 15}{(5*10)+(10*15)+(5*15)} \\ &= 2 \frac{8}{11} \text{ days.}\end{aligned}$$

Solution 2: ((UNITARY METHOD)

Let the total work be assumed as $\text{LCM}(5,10,15) = 30$ Units

Now to complete 30 units A takes 5 days

To complete 30 units B takes 10 days

To complete 30 units C takes 15 days

Units done in 1 day by A = 6

Units done in 1 day by B = 3

Units done in 1 day by C = 2

Units done in 1 day by A+B+C = 11

To complete 30 units they will take $30/11 = 2 \frac{8}{11}$ days

Rule 7:

Two persons A and B, working together, can complete a piece of work in X days. If A, working alone, can complete the work in Y days, then B, working alone, will complete the work in

$$\frac{XY}{Y - X} \text{ days.}$$

Example:

Jack and Jill together can do a piece of work in 10 days. Jack alone can do it in 15 days. In how many days can Jill alone do it?

Solution 1:

By using formula,

$$= \frac{10 * 15}{15 - 10}$$

$$= 30 \text{ days.}$$

Solution 2: (UNITARY METHOD)

Let the total work be assumed as $\text{LCM}(10,15) = 30$ Units

Now to complete 30 units Jack and Jill takes 10 days

To complete 30 units Jack takes 15 days

Units done in 1 day by Jack + Jill = 3

Units done in 1 day by Jack = 2

Units done in 1 day by Jill = 1

To complete 30 units they will take $30/1 = 30$ days

Rule 8:

If A and B, working together, can finish a piece of work in X days, B and C in Y days, C and A in Z days, then

(a) A, B and C working together, will finish the job in $\frac{2XYZ}{XY + YZ + ZX}$ days.

(b) A alone will finish the job in $\frac{2XYZ}{XY + YZ - ZX}$ days.

(c) B alone will finish the job in

$$\frac{2XYZ}{YZ + ZX - XY} \text{ days.}$$

(d) C alone will finish the job in

$$\frac{2XYZ}{ZX + XY - YZ} \text{ days.}$$

Note: This type can be solved under unitary method also.

Rule 9:

If the number of men are changed in the ratio of $m:n$, then the time taken to complete the work will change in the ratio $n:m$.

Rule 10:

If A is K times more efficient than B and is therefore able to finish a work in X days less than B, then

B, working alone, can finish the work in

$$\frac{KX}{K - 1} \text{ days.}$$

Example:

A is thrice as good as workman as B and takes 10 days less to do a piece of work than B takes. Find the time in which B alone can complete the work.

Solution 1:

Here, $k = 3$ and $X = 10$.


Therefore, Time taken by B, working alone, to complete the work
 $= (3 * 10) / (3-1) = 15$ days.

Solution 2:

Efficiency ratio = A : B

3 : 1

Time ratio = 1 : 3 (Inverse of efficiency)



Diff = 2 parts

2 parts = 10 days

A = 1 part = 5 days

B = 3 parts = 15 days.



Practice Questions

1. 45 men complete a piece of work in 30 days working 12 hours a day. In how many days will 60 men complete the work if working 10 hours a day?

- a) 27 days
- b) 30 days
- c) 24 days
- d) 22 days

Ans: A



2. A contractor undertakes to build a wall in 50 days. He employs 50 people for the same. However after 25 days he finds that only 40% of the work is complete. How many more men need to be employed to complete the work in time?

- a) 25
- b) 30
- c) 35
- d) 20

Ans: A

3. 45 men can complete a work in 16 days. Six days after they started working, 30 more men joined them. How many days will they now take to complete the remaining work?

- a) 4
- b) 5
- c) 6
- d) 7

Ans: C

4. A does alone a work in 4 days. B does alone a work in 8 days. In how many days the work will be completed if A & B together?

- a) 4 days
- b) 8 days
- c) 32 days
- d) $8/3$ days

Ans: D

5. Fatima and Zahira can do a piece of work in 12 days and 15 days respectively. If they work for alternate day and Fatima starts the work first, then in how many days the work will be completed?

- a) $12 \frac{1}{5}$ days
- b) $13 \frac{1}{4}$ days
- c) $13 \frac{1}{5}$ days
- d) 15 days

Ans: B

6. A can finish a work in 24 days, B in 9 days and C in 12 days. B & C start the work but are forced to leave after 3 days. The remaining work done by A in:

- a) 10
- b) 12.5
- c) 20
- d) 7

Ans: A

7. A alone can complete a work in 16 days and B alone can complete the same in 12 days.

Starting with A, they work on alternate days.

The total work will be completed in how many days?

- a) 12 days
- b) $12 \frac{1}{2}$ days
- c) $13 \frac{3}{4}$ days
- d) 13 days

Ans: C

8. Manoj and Harvinder can complete a piece of work in 16 days, which Harvinder can complete in 32 days. If Manoj & Harvinder work on alternate days, starting with Harvinder, in how much time would the work be completed?

- a) 16 days
- b) 17 days
- c) 32 days
- d) None of these

Ans: C

- 9 If A can complete a work in 12 days, B in 15 days and C can do the same work in 20 days.
- 1 Working simultaneously they will finish the work in how many days 5.
 - 2 A started the work and left after 2 day the remaining work by B in how many days? $50/4$
 - 3 A started the work and B joins after 3 days the remaining work will be completed in how many days 5
 - 4 They started the work together & C left after 2 days, the remaining work will be done in how many days. 4
 - 5 They started the work together and B left 2 days before the completion of work after how many days B left $11/3$.
 - 6 Working alternatively (A, B, C, A, B, C.....) they will finish the work in how many days. 15

10 Q A contractor adopts a work to complete it in 100 days. He employed 100 workers. But after 50 days it was found that only $\frac{1}{3}^{\text{rd}}$ of the work has completed. How many more worker he should employ to complete the work in time.

- Ans 100

11Q A can complete a work in 10 days. B can complete it in 12 days. If they work on alternate days they can complete the work in how many days if-

- A starts the work Ans 10 days 20 hrs
- B starts the work. Ans 11 days

12 Q If 1man or 2 women or 3 boys can do a work in 21 days. Then 1 man and 2 women and 3 boys can complete the work in how many days? 7

*Thank
you*

