BANK NAUKRI

# TIME AND WORK

# CONCEPT BUILDER MANUAL

# Time and Work

## 1. Work

Work is the quantity of energy transferred from one system to another but for question based on this topic, Work is defined as the amount of job assigned or the amount of job actually done.

## 2. Analogy with Time-Speed-Distance

Problem on work are based on the application of concept of ratio of time and speed. Work is always considered as a whole or one. There exists an analogy between the time-speed-distance problems and work.

Work based problem are more or less related to time speed and distance.
Above mentioned definition of work throws light on three important points.
Work = 1 (It is always measured as a whole) = Distance
Rate at which work is done = speed
Number of days required to do the work = Time

*Example:*

If Ram and Raman can do a job in 10 days and 15 days independently, how many days would they take to complete the same job working simultaneously?

Solution:

If total work is W, Ram's rate of working = W/10 per day and that of Raman = W/15 per day. Thus when working simultaneously, rate of work done = W/10 + W/15 and thus time taken:
= W/(W/10+W/15) = (15 X 10) / (15+10)
=6 Days

*Alternatively:*

Above problem can be worked out assuming work to be just 1 unit and thus eliminating use of W.
Assume the total work to be the LCM of the days taken individually i.e. LCM of 10 & 15 i.e. 3o units of work.
Thus Ram's rate of working = 3 units per day and Raman's rate of working = 2 units per day.
When working simultaneously, 3+2=5 units of work is done every day and thus it would take 30/5=6 Days.

### 3. Important Formulae

#### a. *Work from Days:*
If A can do a piece of work in n days, then A's 1 day's work = 1/n

#### b. *Days from Work*
If A's 1 day's work =1/n, then A can finish the work in n days.

#### c. *Ratios*
1. If A is thrice as good a workman as B, then:

2. Ratio of work done by A and B =3:1.

3. Ratio of times taken by A and B to finish a work =1:3

4. If A is x times as good a workman as B, then he will take (1 /x)th of the time by B to do the same work.

5. A and B can do a piece of work in 'a' days and 'b' days respectively, then working together, they will take (xy / x+y) days to finish the work and in one day, they will finish (x+y / xy)th part of work.

## Sample Questions:

1. To complete a piece of work A and B take 8 days, B and C 12 days. A, B and C take 6 days. A and C will take?
   a. 7 days
   b. 7.5 days
   c. 8 days
   d. 8.5 days

   *Solution:*
   Given (A+B)'s one day's work = 1/8
   (B+C)'s one day's work = 1/12
   (A+B+C)'s 1 day's work = 1/6
   Work done by A, alone:
   = (A+B+C)'s 1 day's work - (B+C)'s one day's work
   = 1/6 – 1/12
   = 1/12
   Work done by C, alone:
   =(A+B+C)'s 1 day's work - (A+B)'s one day's work
   =1/6 – 1/8
   =1/24

(A+C)'s one day's work: = 1/12 + 1/24
 = 1/8
(A+C) will take 8 days to complete the work together.

2. Two pipes can fill the cistern in 10hr and 12 hr respectively, while the third empty it in 20hr. If all pipes are opened simultaneously, then the cistern will be filled in?
   a. 7.5 hr
   b. 8 hr
   c. 8.5 hr
   d. 10 hr

   *Solution:*

   Work done by all the tanks working together in 1 hour = 1 /10 + 1 /12 − 1 / 20 = 2/15
   Hence, tank will be filled in 1/52 = 7.5 hour

3. Two pipes can fill a tank in 20 and 24 minutes respectively and a waste pipe can empty 3 gallons per minute. All the three pipes working together can fill the tank in 15 minutes. The capacity of the tank in gallons is?
   a. 100
   b. 110
   c. 120
   d. 140

   *Solution:*
   Work done by the waste pipe in 1 minute = 1/15 − [1/20 + 1/24]
   = −1/40
   volume of 140 part = 3 gallons.
   Therefore, Volume of whole = (3×40) gallons = 120 gallons.

4. 39 persons can repair a road in 12 days, working 5 hours a day. In how many days will 30 persons, working 6 hours a day, complete the work?
   a. 10
   b. 13
   c. 14
   d. 15

   *Solution:*
   Let's calculate how much time it takes to repair the road if just 1 person were working on it.
   5 hours a day for 12 days makes it 60 hours per person.
   39 people working 60 hours each makes it 39 X 60 = 2340 hours in total.
   Now we have 30 people working 6 hours a day That means 30 X 6 = 180 hours are spent each day.
   We need a total of 2340 hours. With 180 hours every day, that's going to take 2340 / 180 = 13 days

5. Water flows into a reservoir which is 200 m long and 150 m wide, through a pipe of cross-section (0.3m x 0.2m) at 20 kmph. In what time will the water level be 8?
   a. 100 hrs
   b. 150 hrs
   c. 175 hrs
   d. 200 hrs

*Solution:*
Volume of water collected in the tank in 1 hour = 0.3 X 0.2 X 20 X 1000 =1200 m cubic
If after t hours, the water is at height of 8m, 1200t = 200 X 150×8
Therefore, t= 200 Hours.