**Concept of Time and Work**

**1. Man – Days - Work - Hour Formula:**  
More men can do more work (M is directly proportional to W).  
More men can do more work in less days (M is inversely proportional to D).

More men can do more work in less hours (M is inversely proportional to H).

**MDH/W=Constant**

Where,   
M = Number of men  
D = Number of days  
H = Number of hours per day  
W = Amount of work

\*If M1 men can do W1 work in D1 days working H1 hours per day and M2 men can do W2 work in D2 days working H2 hours per day, then  
M1D1H1 / W1=M2D2H2 / W2

Or, **M1D1H1W2=M2D2H2W1**

This is **Universal Formula** in Time and Work and is known **as Chain Rule**.

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

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

**4.Ratio**  
If A is thrice as good a workman as B, then:

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

**5.**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.

**6.**A and B can do a piece of work in ′a′ days and ’b′ days respectively, then working together:

* They will complete the work in ab/(a+b) days
* In one day, they will finish ((a+b)/ab)th part of work.

**7.**If A and B can together complete a job in x days.   
If A alone does the work and takes ’a’ days more than A and B working together.  
If B alone does the work and takes ’b’ days more than A and B working together.  
Then, x=√(ab) days

**SOLVED EXAMPLES**

**1.Adam is thrice as good a workman as Brain and together they finish the piece of work in 15 days. In how many days will Adam alone finish the work?**  
**Solution:**  
Adam’s 1 day’s work: Brain’s 1 day’s work = 3 : 1  
(Adam + Brain)’s 1 day’s work = 1/15  
Now, divided 1/15 in the ratio 3 : 1  
Therefore, Adam’s 1 day’s work = 1/15 × 3/4 = 1/20  
Therefore, Adam alone can finish the work in 20 days.  
  
**2.** **Archie, Benjamin, Christopher can finish a piece of work in 10 days, 12 days and 15 days respectively. If all the three work at it together, they are paid $ 600 for the whole work. How should the money be divided among them?  
Solution:**   
Archie’s 1 day’s work = 1/10                         
Benjamin’s 1 day’s work = 1/12  
Christopher’s 1 day’s work = 1/15  
Therefore, ratio of shares of Archie, Benjamin, Christopher = Ratio of their 1 day’s work.  
 = 1/10 : 1/12 : 1/15  = 6 : 5 : 4  
Sum of ratio terms = 6 + 5 + 4 = 15  
Therefore,

Archie’s share = $ 6/15 × 600 = 6 × 40 = $ 240  
Benjamin’s share = $ 5/15 × 600 = 5 × 40 = $ 200  
Christopher’s share = $ 4/15 × 600 = 4 × 40 = $ 160

**3. A tank can fill by the taps in 8 hours and can be emptied by the other taps in 10 hours. How long will it take to fill the tank if both the taps are opened together?**  
**Solution:**  
Time taken by the 1st tap to fill the tank = 8 hours  
In 1 hour, the tap fills 1/8 of the tank.  
Time taken by the other tap to empty the tank = 10hrs  
In 1 hour, the other tap empty -1/10 of the tank (since, empty is taken as negative)  
Therefore, in 1 hour work done by tap A and tap B

= 1/8 – 1/10  
= (5 – 4)/ 40  
= 1/40  
Therefore, both the taps when opened together will fill the tank in 40 hours.  
  
**4. A tank can be filled by one tap in 4 hour and empty by an outlet pipe in 6 hours. How long will it take to fill the tank if both the tap and pipe are opened together?**  
**Solution:**  
Time taken by tap to fill the tank = 4 hours  
In 1 hour, the tap fill 1/4 th part of tank.  
Time taken by pipe to empty the tank = 6 hours  
In 1 hour, the pipe empties 1/6 th part of the tank.  
Thus, in one hour (1/4 – 1/6) th = (3 – 2)/12) th  
= 1/12 th part of the tank is filled.  
Therefore, the tank will be filled in 12 hours.