Work, Men, Effort

An activity or task involves Work to be performed. For example – producing a chair or table or typing a sheet of paper or to paint a room

We assume that it takes an effort of W to accomplish a task.

Example: Let C be the amount of work involved in producing 1 chair

Or let P be the amount of Work involved in painting a room.

Let T be the amount of work involved in producing 1 table

Complexity of one over the other

- Lets say that making a table is 50% more effort as compared to a chair.

- Then $T = C \times (100+50)/100$

- Or $T = 1.5\ C$

Rate or Efficiency

Bob takes 2 days to paint a room while Andy takes 3 days to paint 2 rooms

Who is more efficient ?

To do this we bring in the concept of Rate of doing work.

It is defined a Work/time.

Let P be the amount of effort needed to paint one room.

Bobs rate = P/2 = 0.5 P

Amount of effort needed to paint 2 rooms = 2P

Andy's rate = 2P/3 = 0.67P

Since 0.67P > 0.5P, Andy is more efficient than Bob

Alternately, Bob's rate is higher than that of Andy.

Examples

Laurel takes normally 6 days to paint an apartment and Hardy 8 days for the same. If they both work on it, in how many days will they complete the apartment ?

Let W be the work involved in painting the apartment. So Laurel takes 6 days to complete W amount of work and Hardy takes 8 days for the same.

If they work together, let d be the number of days that they take to complete the apartment.

Laurel takes 6 days for W amount of work.
In d days, the amount of work done by him = Wd/6

Hardy takes 8 days for W amount of work.
In d days, the amount of work done by him = Wd/8

Total work done by them = Wd/6 + Wd/8
But the total work done by them in d days = work involved in painting one apartment = W
So   Wd/6 + Wd/8 = W
or d/6 + d/8 = 1   or   14d/48 = 1
or d = 24/7 days = 3 3/7 days

Mini takes 4 hours to type a 100 page report. She started on a 80 page report and completed half of it. Mike work on the rest and completed it in 1.2 hours.

Who is more efficient ?

How much time would Mike take to complete a 100 page report on his own ?

Mini completes 100 pages in 4 hours.

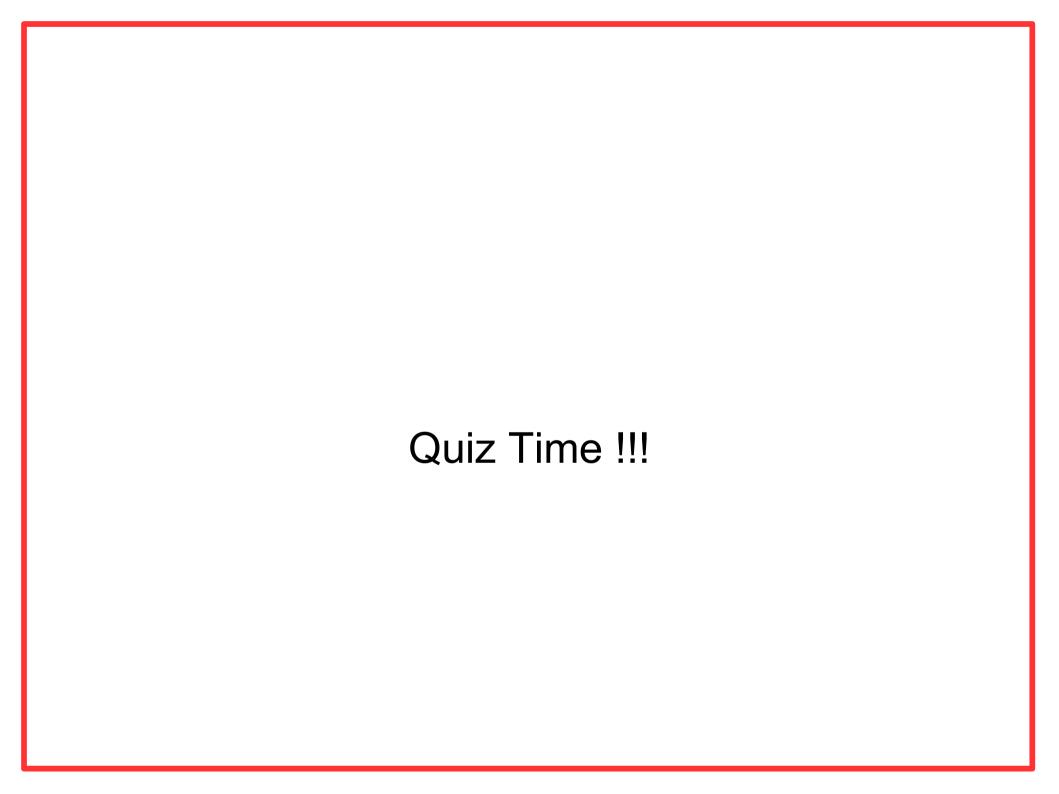She completed half of the 80 page report.

Implies she worked on 40 pages.

Time taken by Mini to complete 40 pages = 40 x 4/100 = 1.6 hours

Mike completed 40 pages in 1.2 hours

Since Mike takes less time for the same work (40 pages), he is more efficient than Mini.

To complete a 100 page report, Mike will take   100 x 1.2/40 = 3 hours

- **Pump1 has a water filling capacity of 10000 cubic meter per hour. Pump 2 has a capacity of 8000 cubic meter per hour. If the two are used to fill a swimming pool of capacity 10000, how much time would it take fill the same.**

- Let T be the time needed to fill the tank using both pumps.

- In this time Pump 1 will fill: 10000 T cu meter of water

- Pump 2 will fill : 8000 T cu meter of water

- Totally they fill : 10000T + 8000 T = 18000T cu meter of water

- This is nothing but the capacity of the tank

- 18000T = 10000

- Or T = 10000/18000 = 10/18 hrs =   10 x 60 /18 minutes = 600/18 = 100/3 minutes

-         = 33 1/3 minutes = 33 mins : 20 seconds

Quiz Time !!!

1. Pump1 has a water filling capacity of 10000 cubic meter per hour. Drain 1 has a capacity of emptying at the rate of 8000 cubic meter per hour. A swimming pool of capacity 15000 cu meter is currently full of stagnant water. It needs to be emptied and refilled with clean water. How much time would it take using the pump and the drain ?

2. Farmer Joe started harvesting operation on a patch of cultivated land. He could have completed it in 100 min. But after 50 mins he decided to take a break. His assistant Bill took over. Though Bill could have completed what was left to be harvested in 40 mins, he stopped after 20 minutes and handed over the operation to his trainee Chuck. Chuck worked for 30 minutes and the entire field was harvested.

Determine Joes rate of harvesting : Bill's rate : Chuck's rate.

(Hint : Let W be the amount of work involved in harvesting the entire field. Determine the fraction of work completed by each. Rate = work done / time taken)

3. Mario and Lucio work as painters in an auto garage. Mario worked on the exterior of a truck for 75 minutes which Lucio worked on the under carriage for 25 minutes. Painting the undercarriage is 25% more complex than the exterior. If Mario and Lucio are equally efficient, how would supervisor Pablo split $100 between Mario and Lucio as wages for the job done ?

(Hint: Let the rate of Mario and Lucio be W (work) per min. i.e Mario is able to complete W amount of work per minute)

1. Pump1 has a water filling capacity of 10000 cubic meter per hour. Drain 1 has a capacity of emptying at the rate of 8000 cubic meter per hour. A swimming pool of capacity 15000 cu meter is currently full of stagnant water. It needs to be emptied and refilled with clean water. How much time would it take using the pump and the drain ?

1) Let T_d --be the time to completely drain out the water. [hrs]

   T_p - be the time to completely fill the water.[hrs]

Now given in the ques..

$8000 * T_d = 15000$

so, $T_d = 15/8$ hrs

lly , $10000 * T_p = 15000$

$T_p = 1.5$ hrs

Total time taken to drain and fill = $T_p + T_d = 1.5 + 15/8 = 3.375$ hrs

1. Farmer Joe started harvesting operation on a patch of cultivated land. He could have completed it in 100 min. But after 50 mins he decided to take a break. His assistant Bill took over. Though Bill could have completed what was left to be harvested in 40 mins, he stopped after 20 minutes and handed over the operation to his trainee Chuck. Chuck worked for 30 minutes and the entire field was harvested.

>

> Let W be the amt of work in harvesting the whole land

> Then ,> Joe would take 100 min to complete W amt of work as given within 50 min joe would take 0.5W (in 50 min , Joe will complete 0.5W amount of work. That is the interpretation)

Joe's Rate = work/time = 0.5W/50min = W/100 work/minute)

> Bill would take 40 min to complete the remaining work [W-0.5W] = 0.5W

> As given 20 min --- 0.25 W

Bill's Rate = work/time = 0.25W/20min = W/80 work/minute)

chuck took 30 min to complete the remaining work = 0.25W

> Chuck's Rate = work/time = 0.25W/30min = W/120 work/minute)

Qn = Joes rate of harvesting : Bill's rate : Chuck's rate. = W/100 : W/80 : W/120 = 1/10 : 1/8 : 1/12 = 120/10 : 120/8 : 120/12 = 12 : 15 : 10

1. Mario and Lucio work as painters in an auto garage. Mario worked on the exterior of a truck for 75 minutes which Lucio worked on the under carriage for 25 minutes. Painting the undercarriage is 25% more complex than the exterior. If Mario and Lucio are equally efficient, how would supervisor Pablo split $100 between Mario and Lucio as wages for the job done ?

It is given that both are equally efficient.

Let their rate of doing work (painting) be W per minute

Mario worked for 75 mins. at the rate of W per minute

So the amount of work that he completed = M = ___W___ x ____75____ = 75W

Lucio worked for 25 mins at the rate of W per minute

So the amount of work that he completed = L = ___W____ x ____25____ = 25W

Lucio worked on the undercarriage which is 25% more complex than working on the exterior.

it means if X amount of work is done in the undercarriage, it is equivalent to   1.25 X work done on the exterior.

1. Say (L amount of work on the undercarriage) is equivalent to __1.25 x 25W___
   amount of work done on the exterior

$$= 5/4 \times 25W = 125W/4$$

So the work done is in the ratio   M : __125W/4__   = 75W : 125W/4 =   75 : 125/4   = 3 : 5/4   = 12 : 5

So $100 should be split as __12: 5

Mario should get =   100 x 12/17

Lucio should get = 100 x 5/17