23GET276 - VQAR-II

UNIT I - QUANTITATIVE ABILITY III

Time and Work

Work = (Rate $\times$ Time)

Here,

- Rate refers to the rate of work done by a person
- Time refers to the time taken to complete a certain amount of work

If a worker completes a task in x days, their rate of work is 1/x.

Tips for Time and Work

1. If A can do a job in x days, then A's efficiency = 1/x

2. If A's efficiency is a and B's efficiency is b, then (A + B)'s efficiency = a + b

3. Ratio: If 'A' is 'x' times as good a workman as 'B', then

a) Ratio of work done by A and B in equal time = x : 1
b) Ratio of time taken by A and B to complete the work = 1 : x.

This means that 'A' takes $(1/x^{th})$ time as that of 'B' to finish the same amount of work.

For example, if A is twice good a workman as B, then it means that

a) A does twice as much work as done by B in equal time i.e. A:B = 2:1
b) A finishes his work in half the time as B.

4. Combined Work:

a) If 'A' and 'B' can finish the work in 'x' and 'y' days respectively, then
A's one day work = 1/x

B's one day work = 1/y

(A + B)'s one-day work = 1/x + 1/y = (x + y)/xy

Together, they finish the work in xy/(x+y) days.

b) If 'A', 'B' and 'C' can complete the work in x, y and z days respectively, then (A + B+ C) 's 1 day work = $1/x + 1/y + 1/z = (xy + yz + xz)/xyz$

Together, they complete the work in xyz/xy+ yz+ xz days.

c) If A can do work in 'x' days and if the same amount of work is done by A and B together in 'y' days, then A's one day work = $1/x$

(A + B)'s one-day work = $1/y$

B's one day work = $1/y – 1/x = x – y/xy$

So, 'B' alone will take xy/x-y days.

d) If A and B together perform some part of work in 'x' days, B and C together perform it in 'y' days and C and A together perform it in 'z' days, then

(A + B)'s one-day work = $1/x$

(B + C)'s one-day work = $1/y$

(C + A)'s one-day work = $1/z$

$1/x + 1/y + 1/z = 2(A + B + C)$'s 1 one day work

Now, we have at hand (A + B + C)'s one day work =

$$\frac{\left(\dfrac{1}{x} + \dfrac{1}{Y} + \dfrac{1}{Z}\right)}{2}$$

(A + B + C) will together complete the work in

$$\frac{2}{\left(\frac{1}{x} + \frac{1}{Y} + \frac{1}{Z}\right)} \text{ days}$$

3) Man -Work -Hour related problems:

Remember that,

$$\frac{M\ D\ H}{W} = \text{Constant}$$

where,
M: Number of men
D: Number of days
H: Number of hours
W: Amount of work done

If men are fixed, work is proportional to time.
If work is fixed, time is inversely proportional to men.

$$\frac{M1 \times T1}{W1} = \frac{M2 \times T2}{W2}$$

Solved Questions of Time and Work

1. Two men A and B working together can finish a job in 6 days. A Works twice as fast as B. How long would it take for each of them to finish the job individually?

a) A - 2 days, B - 4 days
b) A - 3 days, B - 6 days
c) A - 9 days, B - 18 days
d) A - 5 days, B - 10 days

Answer: c) A - 9 days, B - 18 days

Explanation: Let's consider a scenario where A and B are both working on a job. First, let's say it takes A "x" days to complete the job by themselves. Since B is slower than A and takes twice as long, B takes "2x" days to finish the same job on their own. Now, when A and B team up and work together, they can complete the job in just 6 days.

Therefore, Work done by A in 1 day + Work done by B in 1 day = 1/6 of the total job.
$(1/x) + (1/2x) = 1/6$
$(3/2x) = 1/6$
$1/x = 1/9$

Hence,
x = 9 days
Since, B works twice as slowly as A, time taken by B is
2 x 9 = 18

So, A would take 9 days and B would take 18 days to finish the job individually.

2. A man needs 8 hours to paint a room by himself, while his son can paint the same room in 12 hours on his own. How much time will it take for both of them to paint the room together?

a) 6 hours 30 minutes
b) 4 hours 48 minutes
c) 4 hours
d) 3 hours

Answer: b) 4 hours 48 minutes

Explanation: Let's assume that the work of painting the room is 1 unit.
The man can paint 1 unit in 8 hours and the son can paint 1 unit in 12 hours.

We consider,
Work done by man = 1/A
Work done by his son = 1/B
Work done by man and his son= 1/A + 1/B
= 1/8 + 1/12
= 5/24. So, it would take them 24/5 = 4.8 hours (4 hours 48 minutes) to paint the room together.

3. If A and B can finish a job together in 15 days, and B alone can do it in 20 days, how many days will it take for A to complete the job on their own?

a) 40 days
b) 30 days
c) 60 days
d) 70 days

Answer: c) 60 days

Explanation: No. of days taken by A and B to complete the work = 15 days
One day's work of (A + B) = 1/15

No. of days taken by B to complete the work = 20 days.
One day's work of B = 1/20

Then, A's one day's work = 1/15 − 1/20
= (4 − 3) / 60
= 1/60

Thus, A can complete the work in 60 days.

4. 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?

a) 12 days
b) 13 days
c) 14 days
d) 15 days

Answer: d) 15 days

Explanation: A's day's work = (1/20 x 2) = 1/10.

(A + B + C)'s 1 day's work = (1/20 + 1/30 + 1/60) = 6/60 = 1/10.

Work done in 3 days = (1/10 + 1/10) = 1/5.

Now, 1/5 work is done in 3 days.

Therefore, whole work will be done in (3 x 5) = 15 days.

5. A does 20% less work than B. In the event A can finish a bit of work in 15/2 hours, then B can do the same work in:

a) 5 hours
b) 11/2 hours
c) 6 hours
d) 13/2 hours

Answer: c) 6 hours

Explanation: Number of hours taken by A to finish the work = 7 1/2 hours = 15/2 hours.

Work done by A in one hour = 2/15.

Let the number of hours taken by B to finish the work = 1/x.

A can work 20% less than B which is 20/100 = 4/5 times of B's work.

Here, 4/5 : 1 = 2/15 : 1/x

4/5 = 2x/15

x= 15 x 4/5 x 2 = 6 hours.

Practice Questions on Time and Work

1. Paul is twice as efficient as Alice and takes 90 days less than Alice to complete the job. Find the time in which they can finish the job together.
a) 30 days
b) 40 days
c) 50 days
d) 60 days

Answer: d) 60 days

2. A can complete a task twice as fast as B. When they work together, they finish the job in 28 days. How many days will it take for A to complete the job alone?
a) 30 days
b) 34 days
c) 42 days
d) 48 days

Answer: c) 42 days

3. A is three times more efficient than B and can complete a task 24 days faster than B. When they work together, how long will it take them to finish the task?
a) 5 days
b) 9 days
c) 11 days
d) 14 days

Answer: b) 9 days

4. X and Y are working together to complete a task. If X works alone, it takes him 20 days to finish the job, and if Y works alone, it takes her 12 days. X begins working on the task by himself and after 4 days, Y joins him to help complete the work. How many days did it take for them to finish the entire task?
a) 8 days
b) 10 days
c) 12 days
d) 14 days

Answer: b) 10 days

5. A and B can complete a task together in 30 days. They collaborated for the first 20 days and then B had to leave. After that, A worked alone for another 20 days to finish the remaining work. How many days would it take for A to complete the entire job if they worked alone?
a) 60 days
b) 62 days
c) 66 days
d) 68 days

Answer: a) 60 days

6. Person A completes 4/5th of a job in 20 days. After that, A teams up with B, and together they finish the remaining 1/5th of the job in 3 days. How many days would it take for B to complete the entire job by themselves?
a) 37.5 days
b) 42.3 days
c) 48 days
d) 50 days

Answer: a) 37.5 days

7. A and B can complete a task together in 30 days. A works for 16 days, and then B completes the remaining work on their own in 44 days. How many days will it take for B to finish the entire task by themselves?
a) 60 days
b) 62 days
c) 66 days
d) 68 days

Answer: a) 60 days

8. A group of seven men can finish a job in 12 days. They began working on the job, but after 5 days, two of the men had to leave. How many more days will it take for the remaining men to finish the job?
a) 8 days
b) 8.2 days
c) 9 days
d) 9.8 days

Answer: d) 9.8 days

9. A group of ten women can complete a task in 7 days, while ten children can do it in 14 days. Now, how many days will it take for a team composed of 5 women and 10 children to finish the task?
a) 7 days
b) 8 days
c) 9 days
d) 10 days

Answer: a) 7 days

10. If 6 men and 8 boys can complete a task in 10 days and 26 men and 48 boys can finish the same task in 2 days, how long will it take for 15 men and 20 boys to complete a similar task?
a) 4 days
b) 6 days
c) 8 days
d) 10 days

Answer: a) 4 days