AILET

The Guide to The Concept of Time And Work

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Time and work deals with the relation between time and work in mathematical terms.

For example, if I write 500 words a day, then how many days would it take for me to write 1500 words or how many words will I write in 4 days?

Rule 1

If someone can complete a task in X units of time, then the work done by that person in one unit of time is 1/X.

Continuing the above example, if I can write an essay of 5000 words in 10 days, then the work done by me each day would be 5000/10 = 500 words.

Rule 2-

Similarly, if someone does 1/X work in one unit of time, then the units of time required to complete a task would be X.

Thus, if I write 500 words a day, I need 5 days to write a 2500 word newspaper article.

It is important to note that work is always taken as a whole or as a one.

Illustration 1

If A and B are doing a work together and A takes 6 hours to complete the work and B takes 10 hours to complete the work, then how many hours will it take for them to complete the work together?

Apply Rule 1 to calculate the work done by them together in one hour.

Work done by A in an hour = 1/6 work

Work done by B in an hour = 1/10 work

(Work done by A in an hour + Work done by B in an hour = Work done by A and B in an hour)

Work done by A and B in an hour = 1/10 +1/6 = 6+10/60 = 16/60 = 4/15 work

Then apply Rule 2 to take out the total time required to complete the work.

Work done by A and B in an hour = 4/15 work

(Here 1/X = 4/15, thus, X = 15/4)

Total time required to complete the work = 15/4 = 3.75 hours or 3 hours 45 minutes

Illustration 2

If A is twice as good as B and both of them complete a work in 15 days then how many days would it take

1. i) For A to complete the work alone and ii) For B to complete the work alone?

First take out the ratio in which A and B complete the work.

As A is twice as fast as B then the ratio of the work done by them in one unit of time is 2:1.

Thus, A:B = 2:1.

Now we know that they both completed the work in 15 days.

Thus, the work done by them in one day = 1/15 work.

Now we know the ratio in which they do their work as well as the work done by them in one day.

Thus, work done by A in one day = 2/3 X 1/15 = 2/45 work and work done by B in one day = 1/3 X 1/15 = 1/45.

Applying Rule 2:

Total time needed by A = 45/2 = 22.5 days and total time needed by B is 45 days.

Illustration 3

Negative work

A alone can build a wall in 12 days. B alone can build it in 36 days. C can break the same wall in 18 days. How much time will it take to build the wall?

Wall build in a day = Wall build by A + Wall build by B – Wall demolished by C

Wall build in a day = 1/12 +1/36 – 1/18 = 3+1-2/36 = 2/36 = 1/18

Thus, number of days required to build the wall = 18 days

Using percentages to solve the same question

Wall to be build = 100%

Percentage of wall build by A in a day = 100%/12 = 8.33%

Percentage of wall build by B in a day = 100%/36 = 2.77%

Percentage of wall demolished by C in a day = 100%/18 = 5.55%

Wall build in a day = 8.33% + 2.77% – 5.55% = 5.55%

Number of days required to build the wall = 100/5.55% = 18 days

Illustration 4

A factory needed to complete a work in 60 days. It employed 30 workmen. However, after 30 days only 25% of the work was completed. How many more workmen are needed to complete the work on time?

30 workmen – 30 days – ¼ work

30 workmen – 1 day – 1/(4X30) work

1 workman – 1 day – 1/(4X30X30) work

Days left – 30 days

1 workman – 30 days – 30/(4X30X30) work

1 workman – 30 days – 1/120 work

Work left = ¾ work

Work done by 1 workman in 30 days = 1/120 work

Keeping the days constant, work done by 120 workmen in 45 days – 1 work

Work done by 120X3/4 workmen in 45 days – 3/4work

3/4th work will be completed in 45 days by 90 workmen.

Thus, the factory needs to employ 60 more workmen to complete the work on time.

Faster way to solve this problem

30 workmen – 30 days – ¼ work

Work left = ¾ work

Days remaining = 30 days

To complete 1/4th work in 30 days – 30 workmen

To complete 3/4th work in 30 days – 30 X 3 = 90 workmen

Workmen already employed – 30

Thus, the factory needs to employ 60 more workmen to complete the work on time.

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