

OLYMPIAD · EVERYDAY MATHEMATICS · OLYMPIAD PREPARATION · SHORT NOTES

Chapter 14: Time and Work

Topic-wise short notes with solved examples

One day's work as a fraction, working together, working in turns, sharing wages, and tanks filled or emptied by pipes.

1 One day's work

- Take the whole job as **1**. If a person finishes it in n days, then in **one day** that person does $\frac{1}{n}$ of the job.
- If a person does $\frac{1}{n}$ of the job in a day, the whole job takes n days.
- When people work **together**, add their one-day work. If A takes a days and B takes b days, together they take $\frac{ab}{a+b}$ days.

Example 1.1 A can do a piece of work in 10 days and B can do it in 15 days. In how many days will they finish it together?

SOLUTION

$$\text{One day: } \frac{1}{10} + \frac{1}{15} = \frac{3+2}{30} = \frac{1}{6}.$$

6 days

Example 1.2 A and B together can do a job in 12 days. A alone can do it in 20 days. How long will B take alone?

SOLUTION

$$\text{B's one day} = \frac{1}{12} - \frac{1}{20} = \frac{5-3}{60} = \frac{1}{30}.$$

30 days

2 Working in turns and sharing wages

- If someone works for some days and then leaves, subtract what has been done from 1 and give the rest to the others.
- Wages** are shared in the ratio of the **work done** by each person.

Example 2.1 A can do a job in 12 days. A works for 4 days and then leaves. B finishes the rest in 8 days. How long would B take to do the whole job?

SOLUTION

A did $\frac{4}{12} = \frac{1}{3}$ of the job. The rest is $\frac{2}{3}$.

B does $\frac{2}{3}$ in 8 days, so the whole job takes $8 \times \frac{3}{2}$.

12 days

Example 2.2 A can finish a job in 6 days and B in 12 days. They are paid Rs 900 in all for working together. How much does each get?

SOLUTION

A does $\frac{1}{6}$ and B does $\frac{1}{12}$ per day. The ratio is 2 : 1.

A gets Rs 600 and B gets Rs 300

3 Men, days and pipes

- If the amount of work stays the same, **men** $\times$ **days** is fixed. More men means fewer days.
- A pipe that fills a tank in a hours adds $\frac{1}{a}$ of the tank in an hour. A pipe that **empties** it takes away $\frac{1}{b}$ of the tank in an hour. Treat the outlet as negative work.

Example 3.1 12 men can build a wall in 10 days. How many days will 8 men take?

SOLUTION

Work = $12 \times 10 = 120$ man-days. Days = $\frac{120}{8}$.

15 days

Example 3.2 A pipe fills a tank in 6 hours and another pipe empties it in 12 hours. How long will the tank take to fill if both are open?

SOLUTION

Net in one hour = $\frac{1}{6} - \frac{1}{12} = \frac{1}{12}$.

12 hours

REMEMBER

Write the one-day work of each person as a fraction with a common denominator. Then every question becomes addition or subtraction of fractions.