Time and Work

Understanding of Time and Work

- Time and Work problems involve finding how much time is needed to complete a task based on the number of workers or their efficiency.
- More workers can finish the same work in less time, and fewer workers need more time, so they are related by inverse proportion.
- Work done is often considered as a single unit (like 1 work or 1 task).

Important Points

- Work and time are inversely proportional: More workers, less time; fewer workers, more time.
- **Formula:** Work = Number of workers × Time × Efficiency
- **If the amount of work remains constant:** Number of workers × Time = Constant
- **For different efficiencies:** Efficiency × Time = Constant
- Always keep units consistent when solving problems.

Examples with Solutions

Example: Basic Time and Work Problem

➢ **8 workers can build a wall in 15 days. How many days will 12 workers take to build the same wall?**

Solution: 8 × 15 = 12 × x

120 = 12x

x = 10 days

Example: Finding Number of Workers

➢ **15 men can complete a work in 24 days. How many men are required to complete it in 10 days?**

Solution: 15 × 24 = x × 10

360 = 10x

x = 36 men

Example: Work Sharing Between Workers

- **A can complete a work in 12 days, B can complete the same work in 18 days. How long will they take to complete it together?**

Solution: A's 1 day work = $\frac{1}{12}$, B's 1 day work = $\frac{1}{18}$

Combined 1 day work = $\frac{1}{12} + \frac{1}{18} = \frac{3+2}{36} = \frac{5}{36}$

Time to complete work = $\frac{36}{5}$ = 7.2 days

Example: Different Efficiency

- **A is twice as efficient as B. If A alone can complete a work in 12 days, how many days will B alone take?**

Solution: A's efficiency = 2B's efficiency

If A takes 12 days, B will take 2 × 12 = 24 days

Example: Worker Leaving the Work

- **10 men can finish a work in 20 days. After 5 days, 2 men leave. How many more days will the remaining men take?**

Solution: Work done in 5 days = $\frac{5}{20} = \frac{1}{4}$ of work

Remaining work = $1 - \frac{1}{4} = \frac{3}{4}$

Now, 8 men are left

Time = $\frac{Original\ time \times Remaining\ work \times Original\ number\ of\ men}{New\ number\ of\ men}$

$= \frac{20 \times \frac{3}{4} \times 10}{8}$

$= \frac{15 \times 10}{8}$

$= \frac{150}{8}$ = 18.75 days

Summary Points

- Time and workers are inversely proportional.
- More workers finish the work faster.
- **Formula:** Workers × Time = Constant.
- If efficiencies differ, adjust time according to efficiency.
- Always check if workers join or leave during the work.