

Quantitative Aptitude

Time and Work: Work and Efficiency Concepts

Concept	Formula / Explanation	Example / Note
Work	Work = Time × Efficiency	If A does 5 units/day for 6 days, Work = 5 × 6 = 30 units
Efficiency	Efficiency = Work / Time	If work is 60 units and A takes 10 days, Efficiency = 6 units/day
Time	Time = Work / Efficiency	If work = 48 units, efficiency = 6 units/day, Time = 8 days
Total Work	Total Work = LCM of individual times	If A takes 6 days, B takes 8 days, Total Work = LCM(6,8) = 24 units
Combined Efficiency	A's Eff + B's Eff = Total Eff	If A = 4 units/day, B = 6 units/day, together = 10 units/day
Efficiency Ratio (based on time)	Efficiency \propto 1/Time $\Rightarrow E_1 : E_2 = T_2 : T_1$	If A takes 5 days, B takes 10 days $\Rightarrow E_1 : E_2 = 10:5 = 2:1$
Work Ratio (based on efficiency)	Work done \propto Efficiency × Time	Use to split wages/amounts based on contribution
Men, Days, Work	$M_1 \times D_1 = M_2 \times D_2$ (when work is same)	Used when number of men and days change
One day's work	1 day's work = 1 / total days	If A finishes in 10 days, 1 day work = 1/10
Total work from 1 day's work	Total Work = 1 day's work × Total Days	Reverse of above
A is 'x%' more efficient than B	Let B's eff = 100, then A = 100+x \Rightarrow Ratio = A:B = (100+x):100	If A is 25% more efficient \Rightarrow Ratio = 125:100 = 5:4
A is 'x%' less efficient than B	A = 100-x \Rightarrow Ratio = A:B = (100-x):100	If A is 20% less \Rightarrow Ratio = 80:100 = 4:5
Alternate Work Days	Use unit method or LCM, consider number of days each person works	Alternate day working is solved step-wise
Pipe & Cistern as Negative Work	Leakage = negative efficiency	If pipe fills 10 units/day and leak empties 2, net = 8 units/day
Work Sharing Based on Efficiency	Share \propto Efficiency × Time worked	For unequal working durations
Inversely Proportional Time	Time \propto 1 / Efficiency	Time taken is inversely proportional to speed or efficiency

Time and Work – Concepts, Formulas & Shortcuts

Concept / Topic	Details / Explanation	Formula / Key Point
1. Basic Work Formula	Work is directly proportional to time and efficiency.	Work = Time × Efficiency
2. Unit Work Method	Total work is considered as 1 unit (or LCM of days if needed).	Use unitary method: If A completes in 10 days, A's 1 day work = 1/10
3. Time Taken to Complete Work	If A can do a piece of work in 'x' days.	Work done/day = 1/x \Rightarrow Total Time = 1 ÷ Work done/day

4. Combined Work	If A can do a work in x days and B in y days.	$(A + B)$'s 1 day work = $1/x + 1/y$ Time = $xy / (x + y)$
5. Efficiency and Time Relation	More efficiency means less time.	Efficiency $\propto 1 /$ Time
6. Ratio of Work and Time	Compare work done by different people.	$\text{Time}_1 / \text{Time}_2 = \text{Efficiency}_2 / \text{Efficiency}_1$
7. Work Done in 'n' Days	If A's 1 day work is $1/x$, work done in n days = n/x	Total Work Done = Days \times Efficiency
8. Remaining Work	Total work - work done = Remaining work	Can use unit work method or LCM
9. A leaves the work after n days	Handle work in parts: work done with A + rest by others	Break the problem into phases
10. Men, Women, and Children	Use efficiency ratio (e.g., M:W:C = 4:3:2)	Convert all to a single unit for comparison
11. LCM Method	Take LCM of individual days to assume total work	Makes calculation easier
13. Work and Wages	Wages \propto Work Done (not time)	Total Wages \times (Person's Work / Total Work)
14. Unequal Working Days (Wages)	If people work different days, calculate work individually	Assign wages in ratio of work done
15. Alternate Working Days	A & B work alternately (e.g., A-B-A...)	Count days and multiply by individual 1 day work
16. Negative Work (Leaking Pipes / Spoilers)	If B undoes A's work, subtract	Net work = A's work - B's work
17. Work Completion %	To find part of work completed or left	Work done = (No. of days \times 1 day work)

Work and Wages Specific Concepts

Case	Explanation	Formula / Example
Equal Wages	All do equal work	Divide equally
Unequal Efficiency	More efficient person gets more wage	Wages \propto Work Done
Different Time Periods	Different days of work	Wages \propto (Days \times Efficiency)
Ratio-Based Wages	If A:B:C work ratio = 2:3:5	Divide total wages in 2:3:5
Wages with Partial Work	If total work = 60 units A: 20 units, B: 40 units	A's Wage = $(20/60) \times$ Total Wage

Time and Work – (Man-Day Based)

S.No.	Concept	Explanation / Formula	Example / Note
1.	Work and Time Relationship	More men \rightarrow less time; More time \rightarrow more work	Work \propto Men \times Days
2.	Basic Formula	Work = Men \times Days \times Hours (if hourly rate given)	If 5 men do a work in 4 days, total work = $5 \times 4 = 20$ man-days
3.	Combined Work Rate	A's 1-day work + B's 1-day work = $(A + B)$'s 1-day work	If A = $1/10$, B = $1/15$, together = $1/10 + 1/15 = 1/6$
4.	Total Work in Units	If A completes in x days, then total work = x units	Used to avoid fractions
5.	Work Efficiency Ratio	If A : B = efficiency ratio, then Time ratio = 1 : efficiency	If A is twice as efficient as B \rightarrow Time ratio = 1 : 2
6.	More Men, Less Time	$M_1 \times D_1 = M_2 \times D_2$ (if work constant)	Men \times Days = Constant
7.	A and B together, but A leaves after some days	Use A + B's rate \times days + B's rate \times remaining days	Useful for replacement problems
8.	Inversely Proportional Rule	Work is constant \rightarrow Men and Days are inversely proportional	$M_1 : M_2 = D_2 : D_1$
9.	Negative Work (Leakage, Destruction)	Net work = Work done - Work undone	Pipes filling and leakage
10.	LCM Method	Assume total work as LCM of days taken by individuals	Simplifies fraction-based calculations
11.	One finishes a fraction, rest completes	Find part done, remaining part and respective time	Very common in SSC exams

Time and Work – (Alternate Days Working Concept)

Type of Question	Example Scenario	How to Approach
1. A starts, B next, alternate till completion	A can do a work in 6 days, B in 12 days. They work alternately starting with A. In how many days will the work be completed?	Find A's and B's 1-day work. Add both for 2-day cycle. Repeat till total work is done. If work left after full cycles, assign last day accordingly.
2. Total work given, who works on last day?	Work is 20 units. A does 4 units/day, B does 2. A starts alternately. Who works on last day?	Find how much work is done in each 2-day cycle (A+B), divide total work, check remaining. Remaining work tells who works last.
3. B starts instead of A	B starts first, works alternate days with A. Who finishes last?	Same logic as above, but reverse the sequence. Start cycle with B.
4. Work completed in N days, how many days did A and B work?	A and B work on alternate days starting with A. Total work done in 7 days. How many days did each work?	Count A's and B's days in sequence: A works on odd days, B on even. Split 7 days accordingly: A = 4 days, B = 3 days.
5. Unequal Efficiency / Units Given	A does 5 units/day, B does 3 units/day. A starts, they work alternately. Total work = 35 units. Find days needed.	2-day work = A+B = 8 units. Divide 35 by 8. After full cycles, assign leftover work to A or B as per day.

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