

6. Common Mistakes, Mixed Practice & Challenge Set

Time, Speed & Distance — Study Notes (Part 6 of 6)

Common Mistakes to Avoid

These are statements that LOOK correct but usually trip students up. Read each carefully before checking the verdict.

1. "Average speed is always $(x+y)/2$ " — Wrong

This only works when TIME is equal at both speeds. When DISTANCE is equal instead, use $2xy/(x+y)$.
E.g. two equal-distance legs at 40 and 60 km/hr: correct average = $2(40)(60)/(100) = 48$ km/hr, not 50.

2. "Just plug into $2xy/(x+y)$ whenever speeds vary" — Wrong

That formula needs distance to be constant. If distances differ, always fall back on Average Speed = Total Distance / Total Time.

3. Ignoring direction in relative-speed problems — Wrong

If a question doesn't state whether two objects move in the same or opposite direction, the problem cannot be solved — direction changes whether you add or subtract speeds.

4. Assuming the length of a lamp post or pole matters — it does NOT

Only length matters if the object is a platform, bridge, or another train. A person or pole is treated as a point (negligible length).

5. Forgetting who your race-time answer refers to

When two runners are compared through a third (zigzag method), always double-check which distance corresponds to which runner before subtracting.

Mind Bender

The Mosquito Problem

Two trains, 200 km apart, move toward each other at 50 km/hr each. A mosquito starts at one train and flies back and forth between them at 75 km/hr until the trains collide. Find the total distance flown by the mosquito.

Trains meet after Time = Distance / Relative Speed = $200/(50+50) = 2$ hours.

The mosquito flies at 75 km/hr for the entire 2 hours, regardless of how many times it turns around.

Distance flown = Speed $\times$ Time = $75 \times 2 = 150$ km

Mixed Practice Questions (All Topics)

1. Ram cycles at a certain speed and takes 3 hours longer than Karthik to cover 180 km. Karthik's speed is 5 km/hr more than Ram's. Find Ram's speed.
2. A man reaches office 20 min late at 3 km/hr and reaches on time at 4 km/hr. Find the distance to his office.
3. The speed of a man in still water is 3 times the speed of the current. If downstream speed is twice the upstream speed, and his still-water speed is 6 km/hr, find the current's speed. (Same as Example 4 in Boats & Streams — try it without looking!)
4. If a train's speed decreases to $4/7$ of its usual speed, the journey takes 15 minutes longer. Find the usual time for the journey.

5. A gives B a head start such that they finish a race in a dead heat. If the ratio of A's to B's speed is 5:4, and B is given a start of 7 m, find the length of the race.
6. Two runners run around a circular track of circumference 300 m in opposite directions at speeds in the ratio 3:2. Find how many distinct points they meet at.
7. A car travels at 51 km/hr and takes 16 hours for a journey. A van covers the same distance. If the van's speed is 68 km/hr, how long does it take?
8. Two trains, X and Y, start simultaneously from stations A and B toward each other. After crossing, X takes 12 hours to reach B and Y takes 3 hours to reach A. If X's speed is 48 km/hr, find Y's speed.

✓ Answer Key

1. 15 km/hr
2. 4 km
3. 2 km/hr
4. 20 minutes
5. 35 m
6. 5 points (ratio 3:2 → sum 5, opposite direction)
7. 12 hours
8. 96 km/hr

Challenge Questions

These are tougher, multi-step problems for extra practice. Take your time — they combine ideas from more than one section.

1. Two towers, 200 m and 150 m tall, stand 250 m apart. Birds atop each tower fly down at the same speed and land together at a point on the ground between the towers to pick up a grain. A man then walks from the grain's position to the base of the first tower at 2 m/s, and from there to the second tower's base at 3 m/s. Find his average speed for that walk.
2. A tortoise completes one lap of a circular track in 8 minutes; a rabbit completes one lap in 5 minutes. If they start together from point A, after how many minutes will they first meet at point C, diametrically opposite A?
3. Mariya is boating upstream when the wind blows her hat off; it starts floating downstream. She continues upstream for 12 more minutes before noticing, then turns back and catches the hat exactly at her starting point. If the hat fell off 3 km from the start, find the speed of the river current.
4. Two trains start at the same time from stations X and Y toward each other. After crossing, they take 12 hours and 3 hours respectively to reach the other's starting station. If the first train's speed is 48 km/hr, find the second train's speed.

💡 Full worked solutions for the Challenge Questions aren't included here — attempt them using the formulas from Parts 1–5, then check your reasoning with a teacher or study partner.