

Stopping Distances

GCSE Physics · Written to the shared content for AQA, Edexcel and OCR

Name _____ Class _____ Date _____

1. Worked example

State what is meant by thinking distance and braking distance, and give two factors that affect each. (4 marks)

Step 1 · Thinking distance

The distance travelled during the driver's reaction time. Affected by speed, tiredness, alcohol or drugs, and distractions such

Step 2 · Braking distance

The distance travelled under the braking force. Affected by speed, wet or icy roads, worn brakes or tyres, and the mass of the vehicle.

Answer: Thinking: reaction time factors + speed; braking: road, brakes, tyres + speed

Check: Speed affects both.

2. Now try one with the steps

A driver's reaction time is 0.70 s and the car is travelling at 20 m/s. The braking distance is 29 m. Calculate the stopping distance. (3 marks)

Step 1 · Thinking distance

Step 2 · Add braking distance

Answer:

3. Practice

Show your working. The marks tell you how much is expected.

1. State what is meant by the stopping distance of a vehicle. [1]

2. Define thinking distance. [1]

3. Give two factors that increase a driver's reaction time. [2]

4. Give two factors that increase braking distance. [2]
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5. State a typical range for human reaction time. [1]
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6. A car travels at 20 m/s and the driver's reaction time is 0.70 s. Calculate the thinking distance. [2]
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7. The braking distance for the car in question 6 is 29 m. Calculate the stopping distance. [1]
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8. Explain why braking distance is longer on a wet road. [2]
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9. Explain why the brakes get hot when a car stops. [2]
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10. A car's speed doubles. Describe how its thinking distance and braking distance change. [2]
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11. A ruler is caught after falling 0.20 m from rest. Calculate the reaction time to 2 significant figures. $g = 9.8 \text{ m/s}^2$. [3]
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12. A car at 25 m/s brakes with a deceleration of 7.0 m/s^2 . Calculate the braking distance to 2 significant figures. [3]
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13. Estimate the braking force on a 1200 kg car decelerating at 7.0 m/s^2 . [2]
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14. Explain why very large decelerations are dangerous for the people in a vehicle.

[2]

4. Before you hand it in

"Alcohol increases braking distance."

Alcohol, tiredness and phones increase reaction time, so they increase thinking distance.

"Doubling speed doubles the stopping distance."

Thinking distance doubles but braking distance quadruples, so stopping distance more than doubles.

Using the speed in mph in $s = v t$ with time in seconds

Convert to m/s first ($\text{mph} \times 0.45 \approx \text{m/s}$).

"Wet roads increase thinking distance."

Road conditions affect braking distance; driver condition affects thinking distance; speed affects both.