Revision

a) **General 2 2005 Q24c**

Make L the subject of the equation $T = 2\pi L^2$. 2

b) **General 2 2017 Q28d**

Make y the subject of the equation $x = \sqrt{yp - 1}$. 2

c) **Standard 1 2019 Q34**

Given the formula $C = \dfrac{A(y+1)}{24}$, calculate the value of y when $C = 120$ and $A = 500$. 3

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Solution

a) $L = \pm\sqrt{\dfrac{T}{2\pi}}$

b) $y = \dfrac{x^2 + 1}{p}$

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Solution

a) $L = \pm\sqrt{\dfrac{T}{2\pi}}$

b) $y = \dfrac{x^2 + 1}{p}$

c) $y = 4.76$

Speed, Distance and Time

Standard

MS-A1 Formulae and Equations

updated: 2021-01-26

Learning Outcome

Topic:

Speed, Distance and Time

Syllabus:

- solve problems involving formulae, including calculating distance, speed and time (with change of units of measurement as required) or calculating stopping distances of vehicles using a suitable formula

Activities/Tasks:

- Cambridge Ex 3B Q1-20

Speed

Definition 1

Speed is a comparison between *distance travelled* and *time taken*.

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Formula

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Where:

- s - average speed
- d - distance travelled
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Important Note

This formula is **not** on the reference sheet.

Example 1

Find the average speed of a car which travels 110 km in 2 hours.

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Solution

$$
\begin{aligned}
s &= \frac{d}{t} \\
&= \frac{110 \text{ km}}{2 \text{ h}} \\
&= 55 \text{ km/h}
\end{aligned}
$$

Rearranging

The formula for speed can rewritten to make *distance* or time the subject.

$$s = \frac{d}{t} \qquad d = st \qquad t = \frac{d}{s}$$

Example 2

Jonah rides his motorcycle on a highway at an average speed of 90 km/h.

a) How far can Jonah travel in $1\frac{1}{2}$ hours?

b) How long will he take to travel 210 km? Answer in hours and minutes.

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$d = (90)\left(1\frac{1}{2}\right)$

SHIFT 1 ▶ 1 ▼ 2

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Solution

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$$d = st$$

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$$d = 135 \text{ km}$$

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$$t = \frac{d}{s}$$

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2 hours and 20 minutes.

Stopping distance

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Important Note
You **are not** expected to memorise any formulae.

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The distance a vehicle will travel in order to come to a complete stop.

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Important Note
You **are not** expected to memorise any formulae.
You **are** expected to be able to substitute into a given formula.

Example 3

Claire is driving on a motorway at a speed of 110 kilometres per hour and has to brake suddenly. She has a reaction time of 2 seconds and a braking distance of 59.2 metres. What is Claire's stopping distance?

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Solution

$$\begin{aligned} 110 \text{ km/h} &= 110\,000 \text{ m/hr} \\ &= \frac{110\,000}{60 \times 60} \text{ m/s} \end{aligned}$$

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Solution

$$\begin{aligned} 110 \text{ km/h} &= 110\,000 \text{ m/hr} \\ &= \frac{110\,000}{60 \times 60} \text{ m/s} \\ &= 30.555... \text{ m/s} \end{aligned}$$

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Solution

Let d be Claire's stopping distance.

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\begin{aligned}
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&= \frac{110\,000}{60 \times 60} \text{ m/s} \\
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Let d be Claire's stopping distance.

$$d = \underbrace{\text{reaction time distance}}_{d=st} + \text{braking distance}$$

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$$\begin{aligned} d &= \underbrace{\text{reaction time distance}}_{d=st} + \text{braking distance} \\ &= st + \text{braking distance} \\ &= (30.555...)(2) + (59.2) \end{aligned}$$

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Claire's stopping distance is 120.3 metres.

Example 4

Max was driving 60 km/h and has a reaction time of 0.8 s. Calculate the stopping distance correct to the nearest metre given the formula $d = \frac{5vt}{18} + \frac{v^2}{170}$ where d is the stopping distance (m), v is the speed (m/s) and t is reaction time (s).

Example 4

Max was driving 60 km/h and has a reaction time of 0.8 s. Calculate the stopping distance correct to the nearest metre given the formula $d = \frac{5vt}{18} + \frac{v^2}{170}$ where d is the stopping distance (m), v is the speed (m/s) and t is reaction time (s).

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Solution

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$$d = \frac{5(60)(0.8)}{18} + \frac{60^2}{170}$$

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Solution

$$d = \frac{5vt}{18} + \frac{v^2}{170}$$
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$$d = 34.509...$$

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$$d \approx 35 \text{ m}$$

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$$d = 34.509...$$
$$d \approx 35 \text{ m}$$

Max's stopping distance is 35 metres.

Today's work

- Cambridge Ex 3B Q1-20