a) General 2 2005 Q24c

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

b) General 2 2017 Q28d

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

c) Standard 1 2019 Q34

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

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2

2

3

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c) Standard 1 2019 Q34

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

3

Solution

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

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

c) y = 4.76

Speed, Distance and Time

Standard

MS-A1 Formulae and Equations updated: 2021-01-26

Learning Outcome

Activities/Tasks:

Topic:

Speed, Distance and Time

Syllabus: · solve problems involving formulae, including calculating distance, speed and

· Cambridge Ex 3B Q1-20

distances of vehicles using a suitable formula

time (with change of units of measurement as required) or calculating stopping



Definition 1

Speed is a comparison between distance travelled and time taken.

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$$s = \frac{1}{2}$$

Where:

 $s\,$ - average speed

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Where:

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- d distance travelled

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Speed is a comparison between distance travelled and time taken.

In most real world situations, an objects speed is not constant. Therefore we often use the **average speed**.

Formula

$$s = \frac{1}{2}$$

Where:

 $s\,$ - average speed

 $d\,$ - distance travelled

t - time taken

Important Note

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

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

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Solution





110 km



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

Solution

110 km

=55 km/h

Rearranging

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

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

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



Example 2

a)
$$d = st$$

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

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

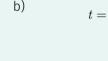
Solution

Example 2

a)
$$d = st$$

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

 $d=135~\mathrm{km}$



$$\overline{s}$$

Solution

Example 2

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

 $d=135~\mathrm{km}$

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











Solution a)
$$d=st$$
 b) $t=rac{d}{s}$

t = 2.33... h

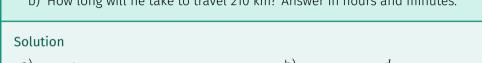
SHIFT <a>□ 1 <a>□ 2

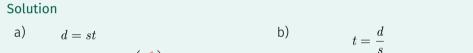
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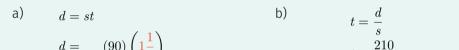


$$d = \begin{pmatrix} 90 \end{pmatrix} \begin{pmatrix} 1 \\ 2 \end{pmatrix}$$

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

$$t = \frac{210}{90}$$

$$t = 2.33... \text{ h}$$





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

a) How far can Jonah travel in
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Solution



Example 2

d = 135 km

Solution
a)
$$d = st$$
 b) $t = \frac{d}{s}$
 $d = (90) \left(1\frac{1}{2}\right)$ $t = \frac{210}{s}$

 $t = 2^{\circ}20'0''$

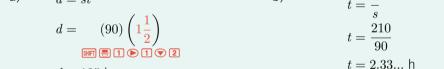
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a)
$$d=st$$
 b) $t=\frac{d}{s}$ $d=(90)\left(1\frac{1}{2}\right)$ $t=\frac{210}{90}$

 $t = 2^{\circ}20'0''$

2 hours and 20 minutes.

Definition 2 Stopping distance

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.

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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

 $110 \; \mathrm{km/h} = 110\,000 \; \mathrm{m/hr}$

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?

Solution

Example 3

$$110 \text{ km/h} = 110000 \text{ m/hr}$$

$$-\frac{110000}{\text{m/s}} \text{ m/s}$$

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?

Solution

Example 3

$$110 \text{ km/h} = 110000 \text{ m/hr}$$

= $\frac{110000}{60 \times 60} \text{ m/s}$

= 30.555... m/s

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?

Solution

Example 3

Let d be Claire's stopping distance.

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110 km/h = 110 000 m/hr
=
$$\frac{110 000}{60 \times 60}$$
 m/s

$$d = re$$

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

$$= st +$$
braking distance

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Let
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 be Claire's stopping distance.

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

$$= \frac{30.555}{60 \times 60}$$
 m/s $= st + \text{braking distance}$ $= 30.555...$ m/s $= (30.555...)(2) + (59.2)$

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

$$= st +$$

$$= (30.555...)(2) + (59.2)$$
$$= 120.311$$

$$= (30.333...)(2) + (39.2)$$

= 120.311...

$$= (30.555...)(2) + (59.2)$$

$$= st + \text{braking distance}$$

= $(30.555...)(2) + (59.2)$

$$d = st$$

$$= st + \text{braking distance}$$

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Solution

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Let d be Claire's stopping distance.
110 \text{ km/h} = 110000 \text{ m/hr}
                                            d = \text{reaction time distance} + \text{braking distance}
                110\,000
                                                             d = st
```

$$= \frac{110\,000}{60 \times 60} \text{ m/s}$$
$$= 30.555... \text{ m/s}$$

$$= (30.555...)(2) + (59.2)$$
$$= 120.311...$$

= st + braking distance

$$d = 120.3 \text{ m (1 d.p.)}$$

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?

Solution

Example 3

Let d be Claire's stopping distance. $110 \text{ km/h} = 110\,000 \text{ m/h}$ $d = \underbrace{\text{reaction time distance}}_{d=st} + \text{braking distance}$

 $= \frac{110\,000}{60\times60} \text{ m/s}$ = 30.555... m/s

 $d = 120.3 \; {\rm m} \; {\rm (1 \; d.p.)}$

= st + braking distance

= (30.555...)(2) + (59.2)

= 120.311...

Claire's stopping distance is 120.3 metres.

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 $d=\frac{5vt}{18}+\frac{v^2}{170}$ is the stopping distance (m), v is the speed (m/s) and t is reaction time (s).

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Solution

$$d = \frac{5vt}{18} + \frac{v^2}{170}$$
$$d = \frac{5(60)(0.8)}{100} + \frac{60^2}{100}$$

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 $d=\frac{5vt}{18}+\frac{v^2}{170}$ is the stopping distance (m), v is the speed (m/s) and t is reaction time (s).

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

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

$$d = 34.509...$$

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 $d=\frac{5vt}{18}+\frac{v^2}{170}$ is the stopping distance (m), v is the speed (m/s) and t is reaction time (s).

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

$$d=\frac{5(60)(0.8)}{100}+\frac{60^2}{1000}$$

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

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 $d=rac{5vt}{18}+rac{v^2}{170}$ is the stopping distance (m), v is the speed (m/s) and t is reaction time (s).

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

 $d = \frac{5(60)(0.8)}{}$

$$d = \frac{18}{18} + \frac{170}{170}$$

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

$$d = 34.509...$$

 $d \approx 35 \text{ m}$

Max's stopping distance is 35 metres.

Today's work

• Cambridge Ex 3B Q1-20