# R20/21 Compound Measure/Speed

OCR

9 Abdul drives 105 miles at an average speed of 70 miles per hour.
He then drives 100 miles at an average speed of 40 miles per hour.

Calculate his average speed for the whole journey.
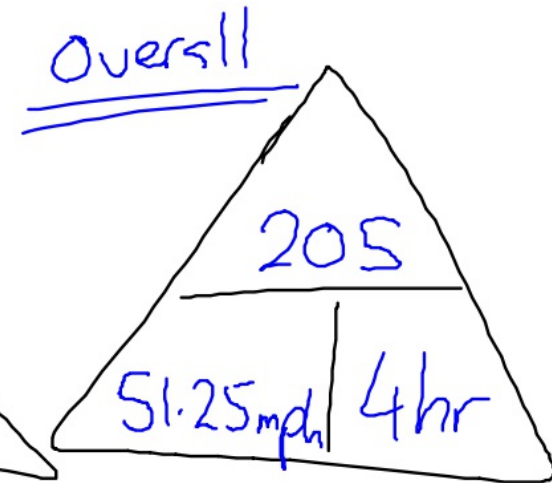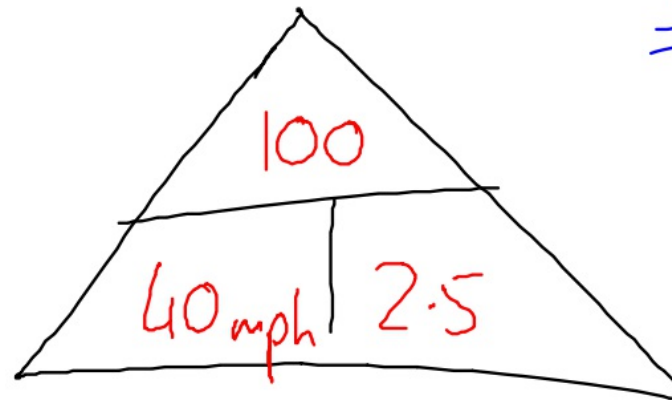
.... mph **[5]**

9 Abdul drives 105 miles at an average speed of 70 miles per hour.
He then drives 100 miles at an average speed of 40 miles per hour.

Calculate his average speed for the whole journey.

1st

105
70mph | 1.5hr

100
40mph | 2.5

Overall

205
51.25mph | 4hr

Distance
Speed | Time
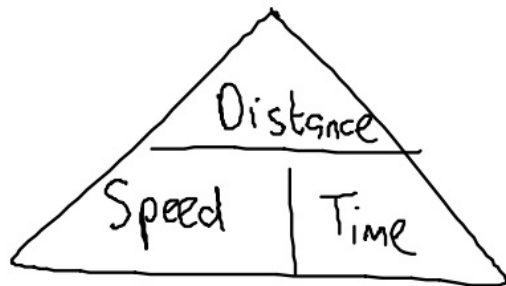
51.25

.... mph **[5]**

12 (a) A ship travels at a constant speed.
The ship travels 60 miles in 2 hours 30 minutes.

How far does it travel in 6 hours?

(a) ....miles [3]

12 (a) A ship travels at a constant speed.
The ship travels 60 miles in 2 hours 30 minutes.

How far does it travel in 6 hours?

$\div 5$ (60 miles = 2 hours 30 mins) $\div 5$

12 miles = 30 min

$\times 12$ ( ) $\times 12$

144 miles = 6 hrs

(a) ....144.............miles **[3]**

12 Trish and Marc both cycled the same distance.
Trish completed the distance in 2 hours.
Her average speed was 16 miles per hour.
Marc completed the distance in 4 hours.

Find Marc's average speed for the journey.

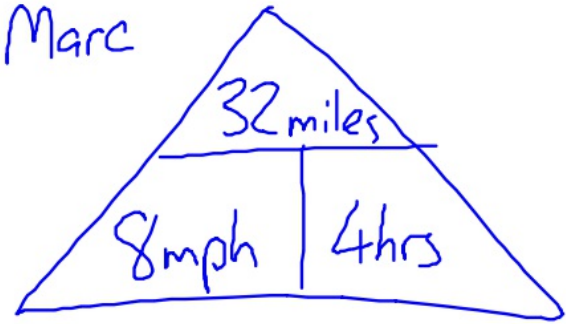... mph **[2]**

12 Trish and Marc both cycled the same distance.
Trish completed the distance in 2 hours.
Her average speed was 16 miles per hour.
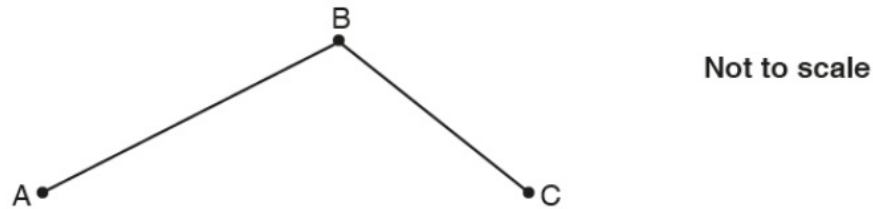Marc completed the distance in 4 hours.

Find Marc's average speed for the journey.

D

S | T

Trish

32 miles

16m/h | 2

Marc

32 miles

8mph | 4hrs

8

.... mph **[2]**

14 Halina cycled from A to B at an average speed of 26 km per hour.
She then cycled from B to C at an average speed of 20 km per hour.

B

Not to scale

A

C

She left A at 10.00 am, did not stop at B and arrived at C at 3.00 pm.

(a) It took Halina x hours to cycle from A to B.

   (i) Explain why the distance from A to B, in kilometres, is 26x.

     ....

     .... **[1]**

   (ii) Write down an expression, in terms of x, for the **time** taken to cycle from B to C.

                          (a)(ii) .... hours **[2]**

   (iii) Hence show that the **distance** from B to C, in kilometres, is 100 − 20x.

     .... **[1]**

(b) The **total distance** cycled by Halina from A to C is 118 km.

Find the distance from A to B.

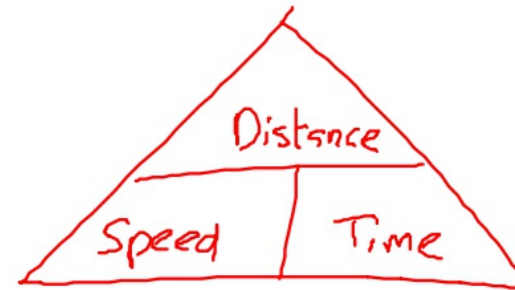(b) .... km **[4]**

14 Halina cycled from A to B at an average speed of 26 km per hour.
She then cycled from B to C at an average speed of 20 km per hour.

B

26 kmph
x

20 kmph

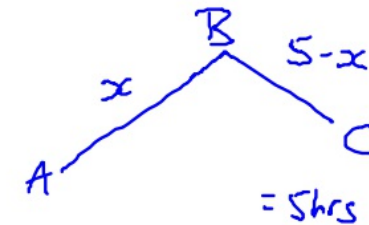**Not to scale**

A •

• C
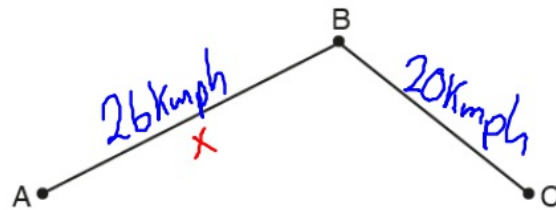
Distance

Speed | Time

She left A at 10.00 am, did not stop at B and arrived at C at 3.00 pm. 5 hrs

B   5-x
x
   C
A
= 5 hrs

(a) It took Halina x hours to cycle from A to B.

(i) Explain why the distance from A to B, in kilometres, is 26x.

Speed × Time
26 × x = 26x ✓ .... [1]

(ii) Write down an expression, in terms of x, for the **time** taken to cycle from B to C.

5 - x

(a)(ii) .... hours **[2]**

(iii) Hence show that the **distance** from B to C, in kilometres, is 100 − 20x

Speed × time   20(5 − x) = 100 − 20x
20 × 5 − x

.... **[1]**

(b) The **total distance** cycled by Halina from A to C is 118 km.

Find the distance from A to B.

B

100 - 20x

26x

A

C

$x = 3$

$26x$
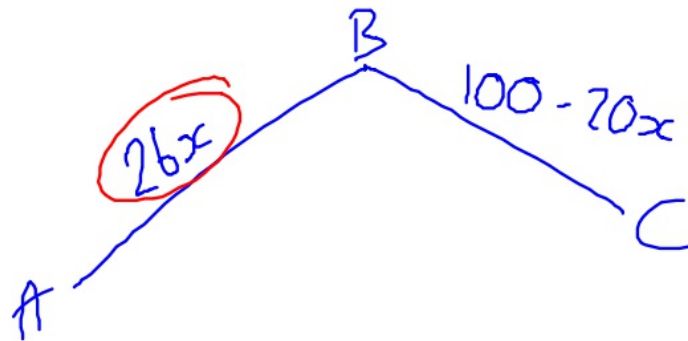
$26x + 100 - 20x$

$6x + 100 = 118km$

$6x = 18$

$x = 3$

26
× 3
‾‾‾
78

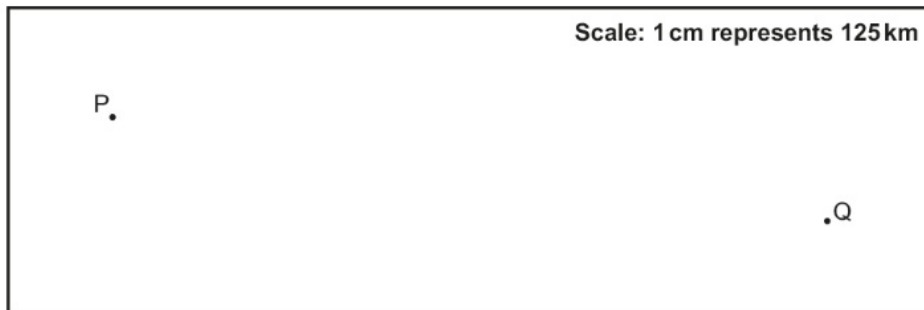**(b)** .... 78 .... km **[4]**

19 The scale diagram below shows two cities, P and Q.

A plane departs from P at 0947 and arrives at Q at 1207.

R16
R20
(a) Work out the average speed, in kilometres per hour, of the plane.

Scale: 1 cm represents 125 km

P.

.Q

(a) ....km/h **[5]**

(b) Give one reason why your answer may be inaccurate.

....

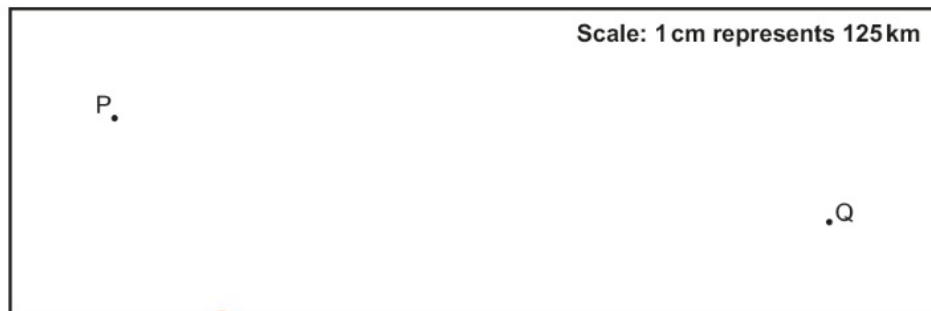... **[1]**

19 The scale diagram below shows two cities, P and Q.

A plane departs from P at 0947 and arrives at Q at 1207.

Measure = 11.6cm

R16
R20

(a) Work out the average speed, in kilometres per hour, of the plane.

$11.6cm \times 125$

$= 1450 km$ ✓

20min

$\frac{1}{3}$ hr

0.$\dot{3}$

Scale: 1 cm represents 125 km

P.

.Q

$\frac{D}{S \mid T}$

1450

$S = \dfrac{1450}{2.\dot{3}}$

13min

2hrs

7min

$S = 621.4 km/h$ ✓

09 47

12 07

10

2hrs 20min
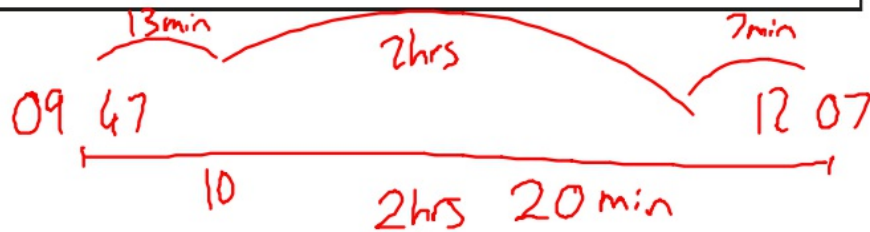
(a) 610.7 — 632.2 km/h ....km/h **[5]**

(b) Give one reason why your answer may be inaccurate.

Measured incorrectly / Maybe aeroplane has not flown straight ...... **[1]**

20 A bee flies from its hive to a flower at a constant speed of 7.5 metres per second for 10 seconds.
The bee then takes 15 seconds to fly back to the hive.

R21

Assume the bee always flies in a straight line.

(a) Ignoring the time spent at the flower, work out the **overall** average speed of the bee in its flight from the hive to the flower and back.

(a)   .... metres per second **[4]**

(b) If the bee is not assumed to fly in a straight line, how might your answer be affected?

....

.... **[1]**

20 A bee flies from its hive to a flower at a constant speed of 7.5 metres per second for 10 seconds.
The bee then takes 15 seconds to fly back to the hive.

R21 Assume the bee always flies in a straight line.

(a) Ignoring the time spent at the flower, work out the **overall** average speed of the bee in its flight from the hive to the flower and back.

Ist part

7.5m for 10sec

75m travelled

2nd part

75m an 15sec

overall

$\div 2$ 150m = 25sec $\Big)$ $\div 25$
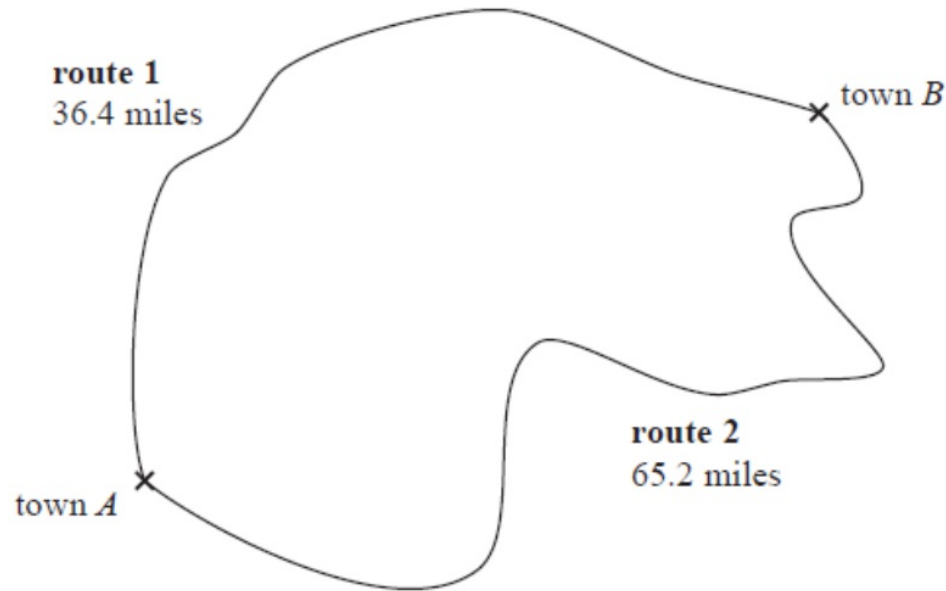
6m = 1sec

(a) .... 6 .... metres per second **[4]**

(b) If the bee is not assumed to fly in a straight line, how might your answer be affected?

Overall speed will be greater as they have travelled further in the same time. **[1]**

Edexcel

2   Eric and Geraldine both drove from town *A* to town *B*.

route 1
36.4 miles

town *B*

route 2
65.2 miles

town *A*

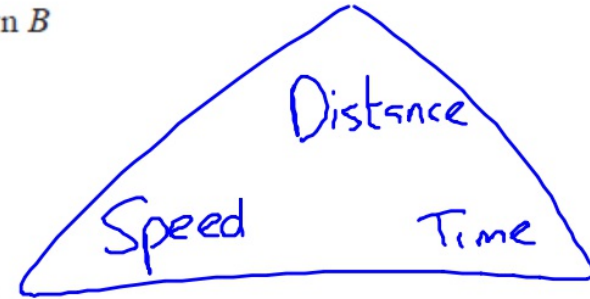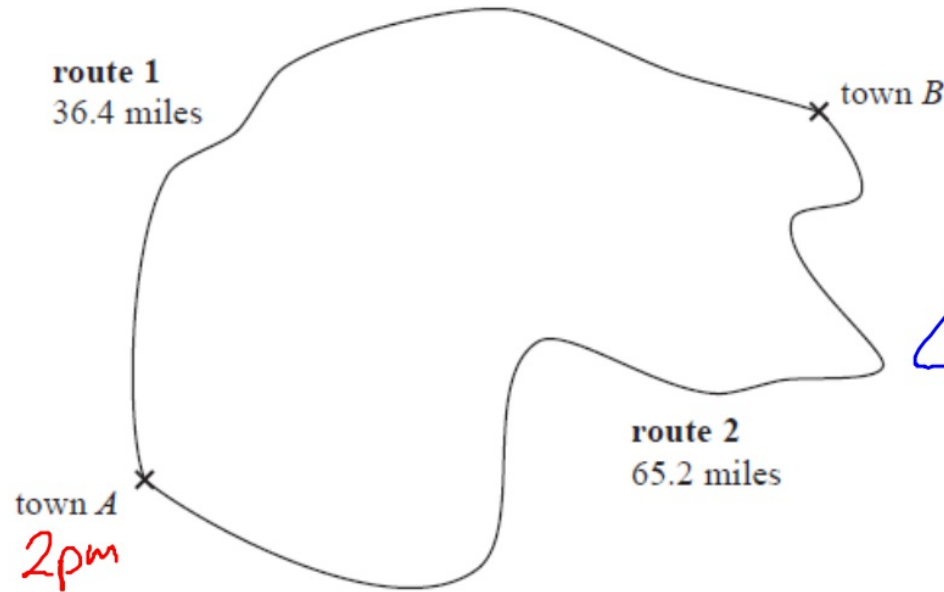Both Eric and Geraldine left town *A* at 2 pm.

Eric drove on route 1
He got to town *B* at 2 48 pm.

Geraldine drove on route 2
She got to town *B* at 3 25 pm.

Who drove at the greater average speed?
You must show all your working.

(Total for Question 2 is 3 marks)

2   Eric and Geraldine both drove from town A to town B.

route 1
36.4 miles

town B

Distance

Speed   Time

route 2
65.2 miles

town A
2pm

Both Eric and Geraldine left town A at 2 pm.

Eric drove on route 1
He got to town B at 2 48 pm.

Geraldine drove on route 2
She got to town B at 3 25 pm.

Who drove at the greater average speed?
You must show all your working.

Eric

Speed $\dfrac{36.4 \text{ miles}}{48 \text{ min}}$

Speed = 0.7583 mp/min

Geraldine

Speed = $\dfrac{65.2}{85 \text{ min}}$

= 0.7670 mp/min

Geraldine has gone faster.

(Total for Question 2 is 3 marks)

9 Emily drives 186 miles in 3 hours.

(a) What is her average speed?

.... mph

(2)

Sarah drives at an average speed of 58 mph for 4 hours.

(b) How many miles does Sarah drive?

.... miles

(2)

9 Emily drives 186 miles in 3 hours.

(a) What is her average speed?

per hour

N20
N21

$\div 3$ $\begin{cases} 186\,miles = 3\,hrs \\ 62\,miles = 1\,hr \end{cases} \div 3$

62 .... mph

(2)

Sarah drives at an average speed of (58 mph) for 4 hours.

(b) How many miles does Sarah drive?

N20
N21

$$x4 \left(\begin{array}{l} 58 \text{ miles} = 1 \text{ hr} \\ 232 \text{ miles} = 4 \text{ hrs} \end{array} \right) x4$$

_____232_____ miles

(2)

14 Ayshab walked x miles at 4 mph.
She then walked $2x$ miles at 3 mph.

(a) Find Ayshab's average speed for the whole journey.
   Give your answer as a mixed number.

R20

.... mph

(4)

The second part of the journey took 25 minutes longer than the first part of the journey.

(b) Find the value of x.

A16

$x =$ ....

(4)

(Total for Question 14 is 8 marks)

4 miles

14 Ayshab walked x miles at 4 mph.
  She then walked $2x$ miles at 3 mph.

8 miles

(a) Find Ayshab's average speed for the whole journey.
  Give your answer as a mixed number.

Assign distances

overall speed — $\frac{1 hr}{}$

R20

1st part

4 miles = 1hr

$\frac{12}{11} \times 3 = \frac{36}{11} = 3\frac{3}{11}$

2nd part

3 miles = 1hr
1 mile = 20 min
8 miles = 160 min
8 miles = 2hrs 40min

12 miles = 3hrs 40min

$\frac{12}{11}$ miles = 20 min $\Big\}$ ÷11

= 1hr $\Big\}$ ×3

$3\frac{3}{11}$ mph

(4)

The second part of the journey took 25 minutes longer than the first part of the journey.

(b) Find the value of x.

A16

1st

2nd

$25 \text{ min} = \dfrac{25}{60} \text{ hr}$

$\dfrac{2x}{3} - \dfrac{x}{4} = \dfrac{25}{60}$

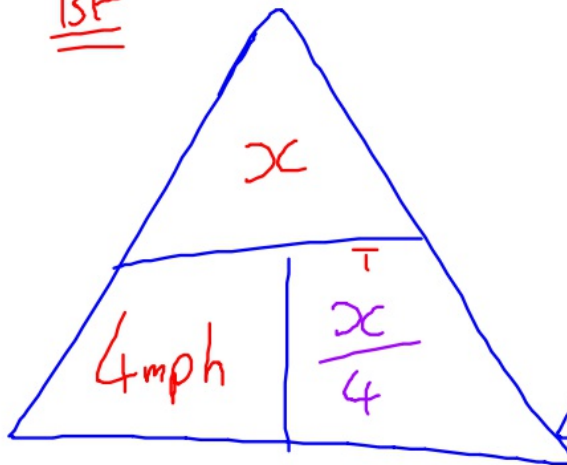$\dfrac{8x - 3x}{12} = \dfrac{25}{60}$

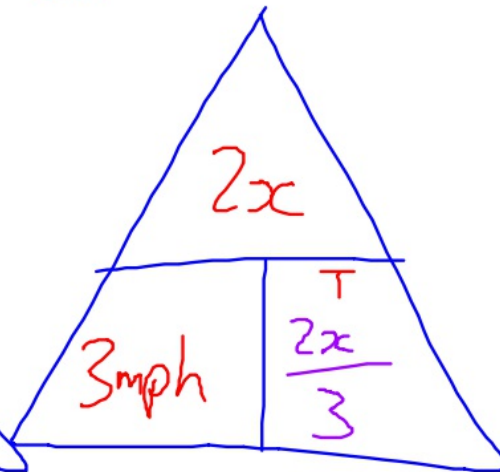$\dfrac{5x}{12} = \dfrac{25}{60}$

$60(5x) = 12(25)$

$300x = 300$

$x = 1$

$x = \underline{\hspace{1cm} 1 \hspace{1cm}}$ ✓

(4)

(Total for Question 14 is 8 marks)

17 A train travelled along a track in 110 minutes, correct to the nearest 5 minutes.

Jake finds out that the track is 270 km long.
He assumes that the track has been measured correct to the nearest 10 km.

(a) Could the average speed of the train have been greater than 160 km/h?
    You must show how you get your answer.

(4)

Jake's assumption was wrong.
The track was measured correct to the nearest 5 km.

(b) Explain how this could affect your decision in part (a).

....

....

....
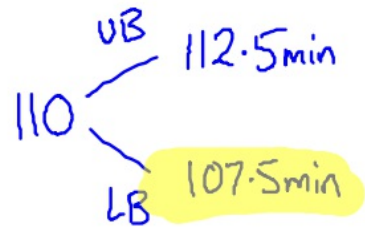
(1)

17 A train travelled along a track in 110 minutes, correct to the nearest 5 minutes.

Jake finds out that the track is 270 km long.
He assumes that the track has been measured correct to the nearest 10 km.

(a) Could the average speed of the train have been greater than 160 km/h?
   You must show how you get your answer.

UB 112·5min

110

LB 107·5min

UB 275

270 Km

LB 265

$$Speed = \frac{275}{107·5}$$

$$= 2·558 \, km/min$$

160 km = 60 min ÷60
2·6 km = 1 min ÷60

2·6 km/min

No, the average speed could not have been greater.

Jake's assumption was wrong.
The track was measured correct to the nearest 5 km.

(b) Explain how this could affect your decision in part (a).

270 272·5 km

267·5 km

$$\frac{272·5}{107·5} = 2·53... \quad speed \; would \; drop$$

(1)

9 James and Peter cycled along the same 50 km route.

James took $2\frac{1}{2}$ hours to cycle the 50 km.

Peter started to cycle 5 minutes after James started to cycle.
Peter caught up with James when they had both cycled 15 km.

James and Peter both cycled at constant speeds.

Work out Peter's speed.

.... km/h

(Total for Question 9 is 5 marks)

9 James and Peter cycled along the same 50 km route.

James took $2\frac{1}{2}$ hours to cycle the 50 km.

Created by W Neill

Peter started to cycle (5 minutes) after James started to cycle.
Peter caught up with James when they had both cycled (15 km)

James and Peter both cycled at constant speeds.

Work out Peter's speed.

speed/hr or 60min

Peter   5 min quicker

James $2\frac{1}{2}$ hrs = 50 km
÷5 ⟨ $\frac{1}{2}$ hr = 10 km ⟩ ÷5

÷2 ⟨ 40 min = 15 km ⟩ ÷2
20 min = 7.5 km
×3 ⟨ 60 min = 22.5 km ⟩ ×3

×4 ⟨ 1hr = 20 km ⟩ ÷4
15 min = 5 km
×3 ⟨ 45 min = 15 km ⟩ ×3

22.5 .... km/h

(Total for Question 9 is 5 marks)

16 The petrol consumption of a car, in litres per 100 kilometres, is given by the formula

$$\text{Petrol consumption} = \frac{100 \times \text{Number of litres of petrol used}}{\text{Number of kilometres travelled}}$$

Nathan's car travelled 148 kilometres, correct to 3 significant figures.
The car used 11.8 litres of petrol, correct to 3 significant figures.

Nathan says,

"My car used less than 8 litres of petrol per 100 kilometres."

Could Nathan be wrong?
You must show how you get your answer.

(Total for Question 16 is 3 marks)

16 The petrol consumption of a car, in litres per 100 kilometres, is given by the formula

$$\text{Petrol consumption} = \frac{100 \times \text{Number of litres of petrol used}}{\text{Number of kilometres travelled}}$$

Nathan's car travelled 148 kilometres, correct to 3 significant figures.
The car used 11.8 litres of petrol, correct to 3 significant figures.

Nathan says,

"My car used less than 8 litres of petrol per 100 kilometres."

Could Nathan be wrong? → show it is more than 8

You must show how you get your answer.

(biggest ans possible)

→ biggest / smallest

148 Km → 148.5 Km
148 Km → 147.5 Km

11.8 L → 11.85 L
11.8 L → 11.75 L

$$= \frac{100 \times 11.85}{147.5}$$

Yes Nathan is wrong $= 8.033 > 8$ L/km

(Total for Question 16 is 3 marks)

AQA

22 (b)   Average speed = $\dfrac{\text{distance}}{\text{time}}$

If the distance is halved and the time is doubled, what happens to the average speed?

Circle your answer.

[1 mark]

× 2   × 4   no change   ÷ 2   ÷ 4

(b) Average speed = $\dfrac{\text{distance}}{\text{time}}$

R20

If the distance is halved and the time is doubled, what happens to the average speed?

Circle your answer.

[1 mark]

× 2   × 4   no change   ÷ 2   ÷ 4

Speed $\dfrac{200}{20}$ $\dfrac{100}{40}$ = 2.5

= 10

÷4

21   The distance by road from Newport to London is 140 miles.

Tom travels by coach from Newport to London.
The coach leaves Newport at 1.30 pm

21 (a)   He assumes the coach will travel at an average speed of 50 mph

R20/21   Use his assumption to work out the arrival time in London.

[3 marks]

_____

_____

_____

21 The distance by road from Newport to London is 140 miles.

Tom travels by coach from Newport to London.
The coach leaves Newport at 1.30 pm

21 (b) In fact, the coach has a lower average speed.

How does this affect the arrival time?

[1 mark]

_____

_____

21   The distance by road from Newport to London is 140 miles.

Tom travels by coach from Newport to London.
The coach leaves Newport at 1.30 pm

(a)   He assumes the coach will travel at an average speed of 50 mph

R20/21   Use his assumption to work out the arrival time in London.

[3 marks]

$\div 5$ $\Big($ 50 miles = 1 hr / 60 min $\Big)$ $\div 5$

10 miles =

×14 $\Big($ 140 miles = 168 min $\Big)$ ×14

↳ 2hrs 48min
120min

leaves at 1·30 + 2hrs 48min

3·30 + 48min = 4.18pm ✓

21   The distance by road from Newport to London is 140 miles.

Tom travels by coach from Newport to London.
The coach leaves Newport at 1.30 pm

(b)   In fact, the coach has a lower average speed.

How does this affect the arrival time?

[1 mark]

Will take longer to make the journey
arrival time, will be later.

27 (a) Rearrange $v = u + at$ to make t the subject of the formula.

[2 marks]

A9a/b

_____

_____

_____

_____

Answer _____

27 (b) Complete this table with consistent metric units.

[2 marks]

R20

A29

Distance	Time	Speed	Acceleration
m	s		

27 (a) Rearrange $v = u + at$ to make t the subject of the formula.

A9a/b

[2 marks]

$$t =$$

$$v = \textcircled{u} + at$$

$$v - u = \textcircled{a}t$$

$$\frac{v - u}{a} = t \checkmark$$

Answer $\qquad$ $t = \dfrac{v - u}{a} \checkmark$

(b) Complete this table with consistent metric units.

[2 marks]

R20
A29

Distance	Time	Speed	Acceleration
m	s	m/s	m/s^2

metres   seconds

13

R20
R21

A car travels 3.5 miles in 5 minutes.

Work out the average speed in miles per hour.

[3 marks]

Answer _____ mph

13

A car travels 3.5 miles in 5 minutes.

R20
R21

Work out the average speed in miles per hour.

[3 marks]

$\times 12 \left(\begin{array}{l} 3.5 \text{ miles} = 5 \text{ min} \\ 42 \text{ miles} = 60 \text{min}/1\text{hr} \end{array} \right) \times 12$

Answer _____ 42 _____ mph

17 Liam drives his car.

He drives the first 9 miles in 9 minutes.

He then drives at an average speed of 70 miles per hour for 1 hour 36 minutes.

He finds this information about his car.

Average speed	Miles travelled per gallon
65 miles per hour or less	50
More than 65 miles per hour	40

Use the information to show that his car uses less than 3 gallons of petrol for the drive.

[5 marks]

17 Liam drives his car.

He drives the first 9 miles in 9 minutes.

He then drives at an average <mark>speed</mark> of 70 miles per hour for 1 hour 36 minutes.

per hr

He finds this information about his car.

Average speed	Miles travelled per gallon
65 miles per hour or less	50
More than 65 miles per hour	40

Use the information to show that his car uses less than 3 gallons of petrol for the drive.

R21
R26

D
S T

112 miles
70 × 1·6hrs

36min = decimal
60min = 1hr
6min = 0·1
36min = 0·6

1st part   Speed = 9miles = 9min

60miles = 60min

60mph

÷50 { 50miles = 1 gallon } ÷50

1mile =

x9 { 9miles = 0·18g } x9

÷40 { 40miles = 1 gallon } ÷40
1mile =
x112 { 112miles = 2·8gallons } x112

1hr 36min
1·6hrs

Total journey = 2·8g + 0·18g = 2·98g

[5 marks]

2·98 < 3 ✓

21

Priya and Joe travel the same 16.8 km route.

R21
Priya starts at 9.00 am and walks at a constant speed of 6 km/h

Joe starts at 9.30 am and runs at a constant speed.

Joe overtakes Priya at 10.20 am

At what time does Joe finish the route?

[5 marks]

Answer _____

21 Priya and Joe travel the same 16.8 km route.

Priya starts at 9.00 am and walks at a constant speed of 6 km/h

Joe starts at 9.30 am and runs at a constant speed.

Joe overtakes Priya at 10.20 am

At what time does Joe finish the route? **[5 marks]**

Joe

9.30 $\longrightarrow$ 8km
10.20

Where is Priya at 10.20?

9.00   6km = 1hr

10.00   = 6km

20min = $\frac{1}{3}$ of 6km

      = 2km

10.20 = 8km

50min = 8km

×2.1

1hr 45min

105min = 16.8km   ×2.1

9.30 + 1hr 45min

11.15 am ✓

Answer   **11.15 am** ✓