

8300

GCSE MATHEMATICS

Foundation and Higher tier – Questions by Topic

Ratio, Proportion and Rates of Change

Calculating with speed

v1.0

Name _____

Materials

For this paper you must have:

- Mathematical instruments

Information

- The marks for questions are shown in brackets

Advice

- In all calculations, show clearly how you work out your answer

For questions 1 to 6 you must **NOT** use a calculator.



Q1.

- (a) Eve drove 180 miles from Cardiff to Leeds.
She drove the first 125 miles at 50 mph then the remaining distance at 60 mph.
Find the total time that Eve was driving.

(4)

- (b) If Eve drove the whole distance at 50 mph, how would this affect her journey time?

(1)

(Total 5 marks)

Q2.

The distance between 2 towns is 48 km

8 km = 5 miles

- (a) Work out the distance between the 2 towns in miles.

(3)

- (b) A car travels at an average speed of 20 miles per hour between the 2 towns.
What length of time does the car take to travel between the 2 towns?

(2)

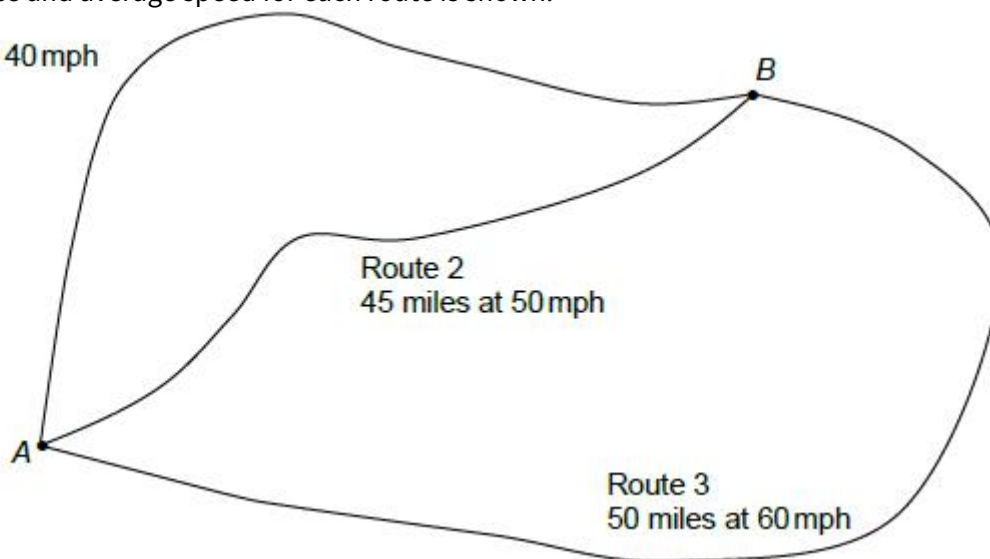
(Total 5 marks)

Q3.

The diagram shows three routes, 1, 2 and 3, between two towns, A and B.

The distance and average speed for each route is shown.

Route 1
30 miles at 40 mph



Not drawn accurately

- (a) Which of the three routes takes the longest time?

You **must** show your working.

(4)

- (b) Samantha and Daniel take the same time to travel from A to B.

Samantha travels along route 1 at 10 mph **faster** than the average speed.

Daniel travels along route 2, but not at the average speed for this route.

Does Daniel travel faster or slower than the average speed for route 2 and by how much?

Faster

☐

Slower

☐

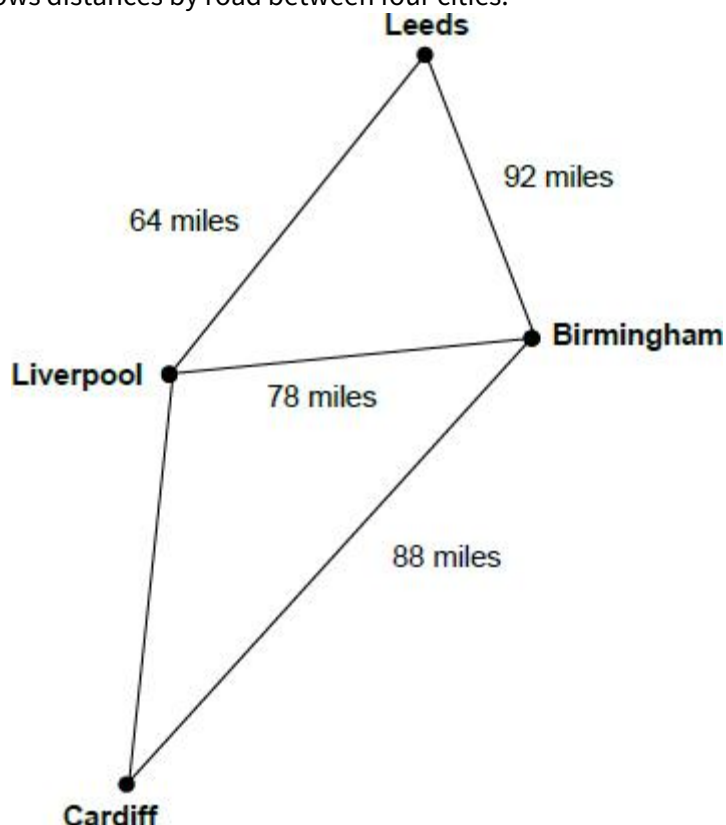
You **must** show your working.

(3)

(Total 7 marks)

Q4.

The diagram shows distances by road between four cities.



- (a) Sam drives from Cardiff to Leeds via Birmingham.
Tim drives from Cardiff to Leeds via Liverpool.
Tim drives 18 more miles than Sam.
Work out the distance by road from Cardiff to Liverpool. (3)
- (b) Eve drove the 180 miles from Cardiff to Leeds.
She drove the first 125 miles at 50mph then the remaining distance at 60mph.
Find the total time that Eve was driving. (4)
- (c) If Eve drove the whole distance at 50mph, how would this affect her journey time? (1)
- (Total 8 mark)**

Q5.

A journey has two stages.

	Distance (km)	Average speed (km/h)	Time (h)
Stage 1	30	a	$\frac{30}{a}$
Stage 2	30	b	$\frac{30}{b}$

Show that the average speed for the **whole** journey, in km/h, is

$$\frac{2ab}{a+b}$$

(Total 3 marks)

Question 6 is **higher** tier only.

Q6.

Paul travels from Rye to Eston at an average speed of 90 km/h
He travels for T hours.
Mary makes the same journey at an average speed of 70 km/h
She travels for 1 hour longer than Paul.
Work out the value of T

(Total 4 marks)

For the rest of the questions, you may use a calculator.



Q7.

- (a) Three electric cars are tested by driving them around a track until the battery runs out.
The table shows some information about their performance.

Car	Total time travelled (hours)	Average speed (km/h)	Total distance travelled (km)
A	4	35	
B		40	180
C	3		150

Complete the table.

(3)

- (b) Two cars are driven around a 10 kilometre track.
Both cars leave from the start line at the same time.
Car X travels at exactly 40 km/h
Car Y travels at exactly 30 km/h
How many minutes will it be before they pass the start line together again?

(2)

(Total 5 marks)

Q8.

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?

(Total 5 marks)

Q9.

The table shows information about journeys A and B.
Complete the table.

	Distance travelled	Time taken	Average speed
A	14 miles		56 mph
B		1 hour 20 minutes	39 mph

(Total 2 marks)

Q10.

A car travels 3.5 miles in 5 minutes.
Work out the average speed in miles per hour.

(Total 3 marks)

Q11.

A car journey is in two stages.
Stage 1 The car travels 110 miles in 2 hours.
Stage 2 The car travels 44 miles at the same average speed as Stage 1
Work out the time for Stage 2
Give your answer in minutes.

(Total 3 marks)

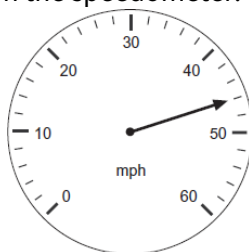
Q12.

Beth drives 200 miles in 4 hours.
She drives the first 18 miles at an average speed of 36 mph
Work out her average speed for the rest of the journey.

(Total 3 marks)

Q13.

(a) Write down the speed shown on the speedometer.



(1)

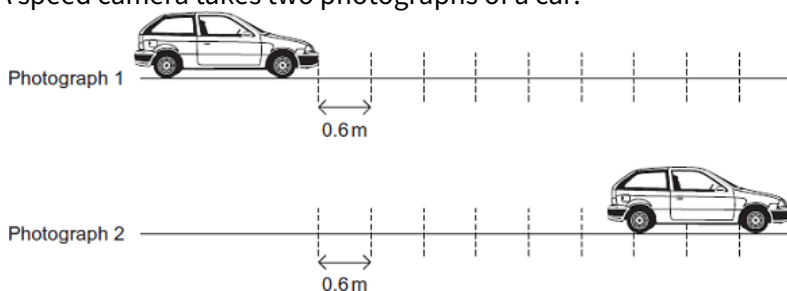
(b) A car travels for 1 hour 30 minutes at an average speed of 28 mph.
How many miles does the car travel?

(3)

(Total 4 marks)

Q14.

(a) A speed camera takes two photographs of a car.



Photograph 2 was taken 0.5 seconds after Photograph 1.
Marks on the road are 0.6 metres apart.
Calculate the average speed of the car in m/s.

(3)

(b) You are given that

1 kilometre = 1000 metres

and

1 hour = 3600 seconds

A lorry is travelling at 13.6 m/s.

The speed limit is 50 km/h.

Show that the lorry is travelling below the speed limit.

(3)

(Total 6 marks)

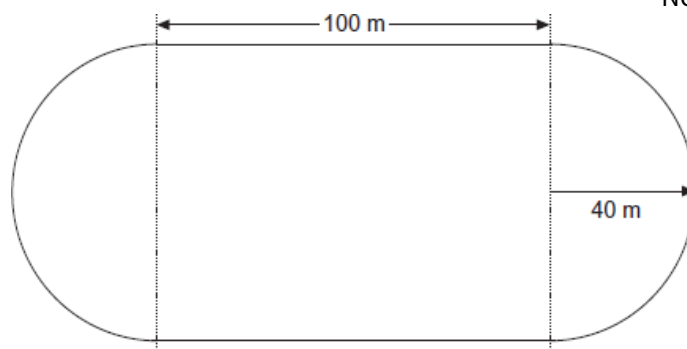
Q15.

Ellie drives 169 miles from Sheffield to London.
 She drives at an average speed of 65 miles per hour.
 She leaves Sheffield at 6:30 am.
 Does she arrive in London before 9:00 am?
 You **must** show your working.

(Total 4 marks)**Q16.**

A cycle track has two identical semi-circular ends and two straight sides as shown.

Not drawn accurately



A cyclist completes one lap.
 Her average speed is 18 m / s
 Her target time to complete one lap is 30 seconds.
 Does she beat her target?
 You **must** show your working.

(Total 4 marks)**Q17.**

The direct route between two airports A and B is 450 km
 An aircraft leaves A at 09.15
 It arrives at B at 10.55

- (a) Work out the average speed of the aircraft.
 Assume the aircraft travelled the direct route.

(3)

- (b) In fact the aircraft did **not** travel the direct route.
 How does this affect the average speed?
 Tick a box.

☐

Faster

☐

Slower

☐

The same

Give a reason for your answer.

(2)**(Total 5 marks)****Q18.**

The speed of the International Space Station is 27 576 kilometres per hour.

- (a) The station travels 42 600 kilometres in one orbit.
 Work out the number of **full** orbits the station does in one day.

(3)

- (b) Convert 27 576 kilometres per hour into metres per second.

(3)**(Total 6 marks)**

Q19.

The direct route between two airports *A* and *B* is 690 km

An aircraft leaves *A* at 06.30

It arrives at *B* at 08.00

- (a) Work out the average speed of the aircraft.
Assume the aircraft travelled the direct route.

(3)

- (b) In fact the aircraft went an alternate route.

It still arrived at 08:00.

What does this mean about its average speed compared to your answer to part (a)?

Tick a box.

☐

Faster

☐

Slower

☐

The same

Give a reason for your answer.

(2)

(Total 5 marks)

Q20.

The direct route between two airports *A* and *B* is 450 km.

An aircraft leaves *A* at 09.30

It arrives at *B* at 11.00

- (a) Work out the average speed of the aircraft.
Assume the aircraft travelled the direct route.

(3)

- (b) In fact the aircraft did **not** travel the direct route.

How does this affect the average speed?

Tick a box.

☐

Faster

☐

Slower

☐

The same

Give a reason for your answer.

(2)

(Total 5 marks)

Q21.

Charlie is driving 293 miles home.

He

- leaves at 9.00 am
- travels the first 176 miles at an average speed of 48 mph
- drives the rest of the way at an average speed of 65 mph

Will he be home by 2.30 pm?

You **must** show your working.

(Total 4 marks)

Q22.

Tasha drove 198 miles.

Her average speed for the first 3 hours was 45 miles per hour.

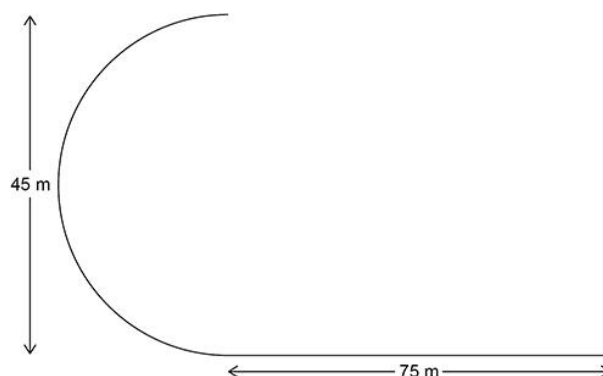
Her average speed for the rest of the journey was 31.5 miles per hour.

Work out her average speed for the whole journey.

(Total 4 marks)

Q23.

Part of a running track is the arc of a semicircle joined to a straight line.
The semicircle has diameter 45 metres.
The straight line has length 75 metres.



Not drawn accurately

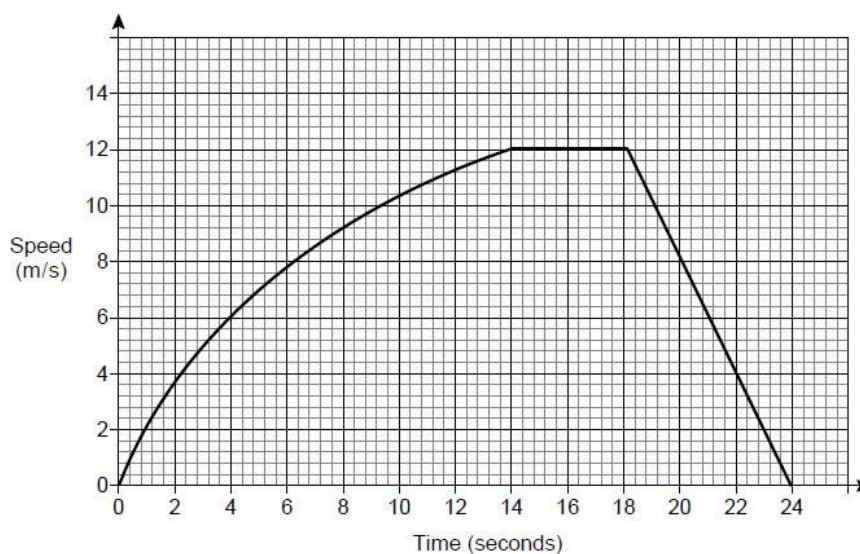
Abby runs once along this part of the track in 18 seconds.
Work out her average speed.
Give your answer to 2 significant figures.

(Total 4 marks)

Questions 24 to 26 are **higher** tier only.

Q24.

The speed-time graph for a car's journey is shown.



- (a) Estimate the acceleration at 6 seconds.
You **must** show your working.

(3)

- (b) Estimate the average speed of the car for the journey.
You **must** show your working.

(4)

- (c) Evaluate your answer to part (b).
Tick a box.

☐

underestimate

☐

exact

☐

overestimate

Comment

(1)

(Total 8 marks)

Q25.

A car and a lorry complete the same 240 mile journey without stopping.

The average speed of the car is x mph.

The average speed of the lorry is 12 mph slower than the car.

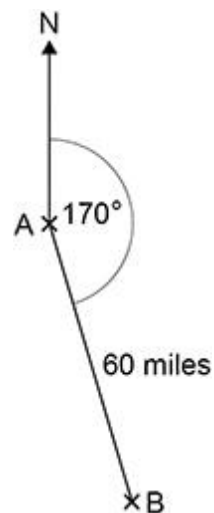
The lorry takes 1 hour longer than the car.

Use an algebraic method to work out the average speed of the car.

(Total 6 marks)

Q26.

B is 60 miles from A on a bearing of 170°



Not drawn
accurately

A ship sails from A on a bearing of 247°

It travels at a constant speed of 23 mph for $1\frac{1}{2}$ hours.

Is the ship now closer to B than it was when it left A?

You **must** show your working.

(Total 5 marks)