Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
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11	
12	
TOTAL	

AQA

Free-Standing Mathematics Qualification
Higher Level
June 2015

Shape and Space 4985

Unit 5

Friday 15 May 2015 9.00 am to 10.15 am

For this paper you must have:
- a clean copy of the Data Sheet (enclosed)
- a calculator
- a pair of compasses
- a protractor
- a ruler.

Time allowed
- 1 hour 15 minutes

Instructions
- Use black ink or black ball-point pen. Pencil should only be used for drawing.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page.
- Do all rough work in this book. Cross through any work that you do not want to be marked.
- You may **not** refer to the copy of the Data Sheet that was available prior to this examination. A clean copy is enclosed for your use.

Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 50.
- You are expected to use a calculator where appropriate.

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

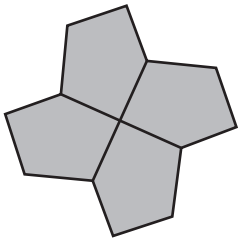
Section A

Answer **all** questions.

Answer each question in the space provided for that question.

Use **Paving tiles** *on page 2 of the Data Sheet.*

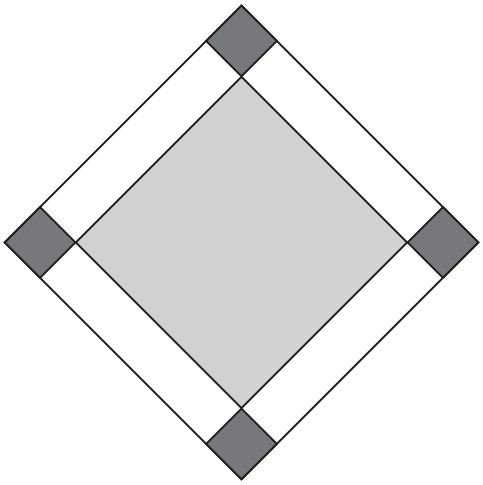
1 (a) The shape shown below is part of a pavement. What is the order of rotational symmetry of this shape?



[1 mark]

Answer .....

1 (b) On the shape below, draw any lines of symmetry.



[2 marks]

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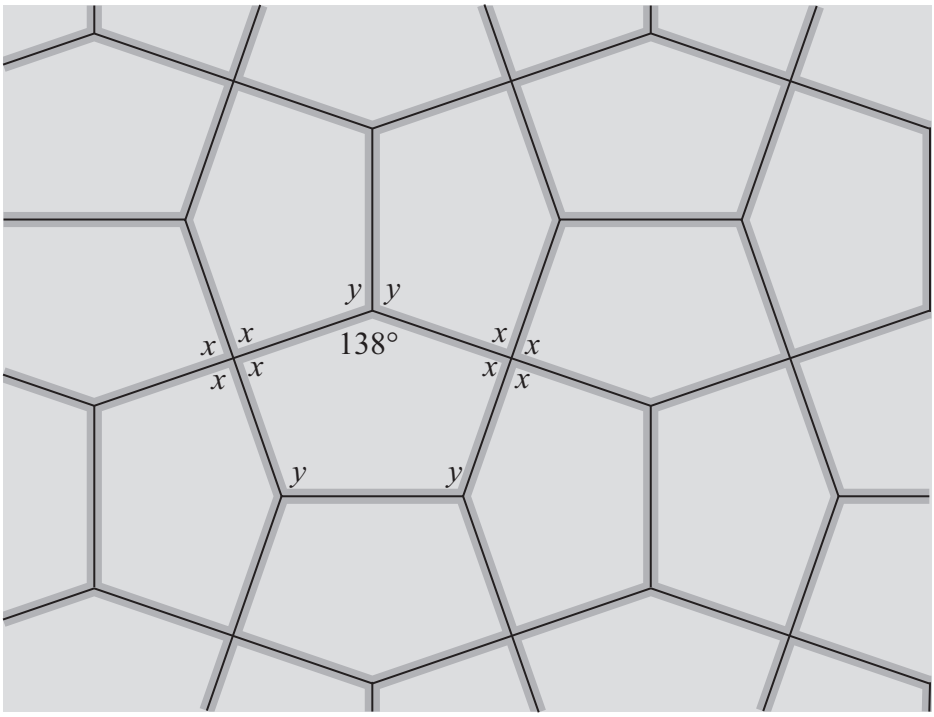
2



Not to scale

The pattern shown above is made of identical pentagons. Each pentagon has internal angles as shown.

All the angles marked x are equal to each other.

All the angles marked y are equal to each other.

2 (a) Write down the value of angle x.

[1 mark]

Answer .....

2 (b) Calculate the value of angle y. You must show your working.

[3 marks]

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Answer .....

4

3 A tile is in the shape of a triangle ABC, with $AB = 10$ cm, $BC = 12$ cm and $CA = 12$ cm.

3 (a) Using a **pencil, ruler and compasses only**, construct triangle ABC in the space below.

Show all construction arcs clearly.

[3 marks]

3 (b) What is the mathematical name of this type of triangle?

[1 mark]

Answer .....

4

Turn over for the next question

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

Section B

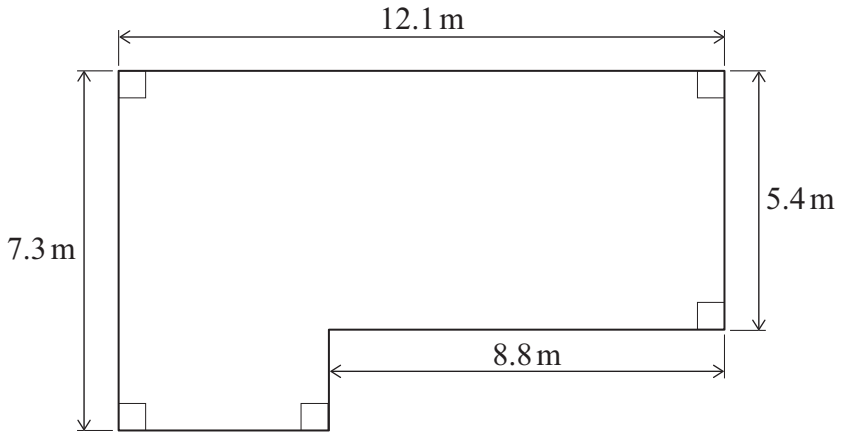
Answer **all** questions.

Answer each question in the space provided for that question.

Use **Recording studio** *on page 3 of the Data Sheet.*

4 Julia is setting up a recording studio. She needs to cover the floor of the control room with carpet, and to install central heating.

The diagram below is a floor plan of the control room in Julia's studio.



Not to scale

4 (a) Find the floor area of the control room.

[3 marks]

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Answer .....

4 (b) In order to install the central heating, Julia needs to know the volume of the control room.

The height of the control room is 2.9 metres.

Find the volume of the room. State the units of your answer.

[3 marks]

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Answer .....

6

5 The recording room in Julia's studio is in the shape of a cuboid.

The cuboid has length 8.8 metres, width 5.6 metres and height 3.4 metres.

One side of the room, of length 8.8 metres, is a window.

Julia needs to cover the other three walls and the ceiling of the recording room with sound insulating material.

Find the total area of sound insulating material needed.

[4 marks]

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Answer .....

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6 Julia buys a table to put in her studio.

The top of the table is in the shape of a circle.

The diameter of the table top is 110 cm.

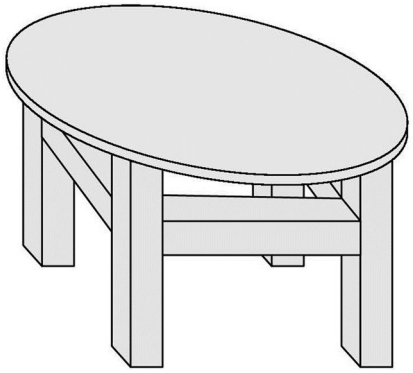
The table top is 2 cm thick.

The table top sits on a frame.
The frame has four legs. The legs are made of wood. Each leg has a cross-section 6 cm square.

The legs are connected by horizontal pieces of wood. The horizontal pieces of wood have a cross-section 6 cm square.
The horizontal pieces of wood are each 66 cm long.

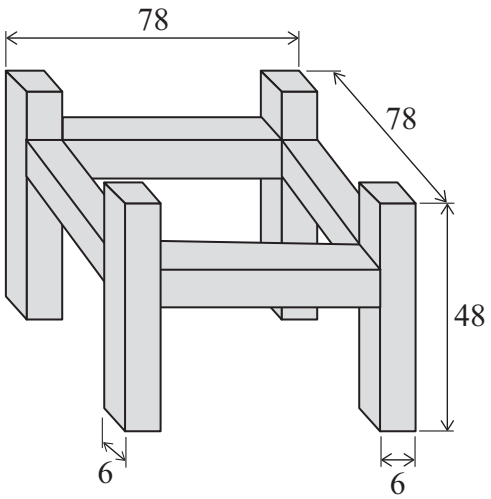
The outside corners of the tops of the legs are directly below the circumference of the circular table top.

The diagram below shows the table.



Not to scale

The diagram below shows the frame for the table, without the table top.



Not to scale

6 (a) In the space below, draw a plan (that is, a view from above) of the table, including the table top.

Use a scale of $1:10$. Show all hidden detail.

[4 marks]

Question 6 continues on the next page

6 (b) The diameter of the table top is 110 cm. This is accurate to the nearest centimetre.

Calculate an upper bound for the circumference of the table top.

[3 marks]

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Answer .....

7

Turn over for the next question

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ANSWER IN THE SPACES PROVIDED

Section C

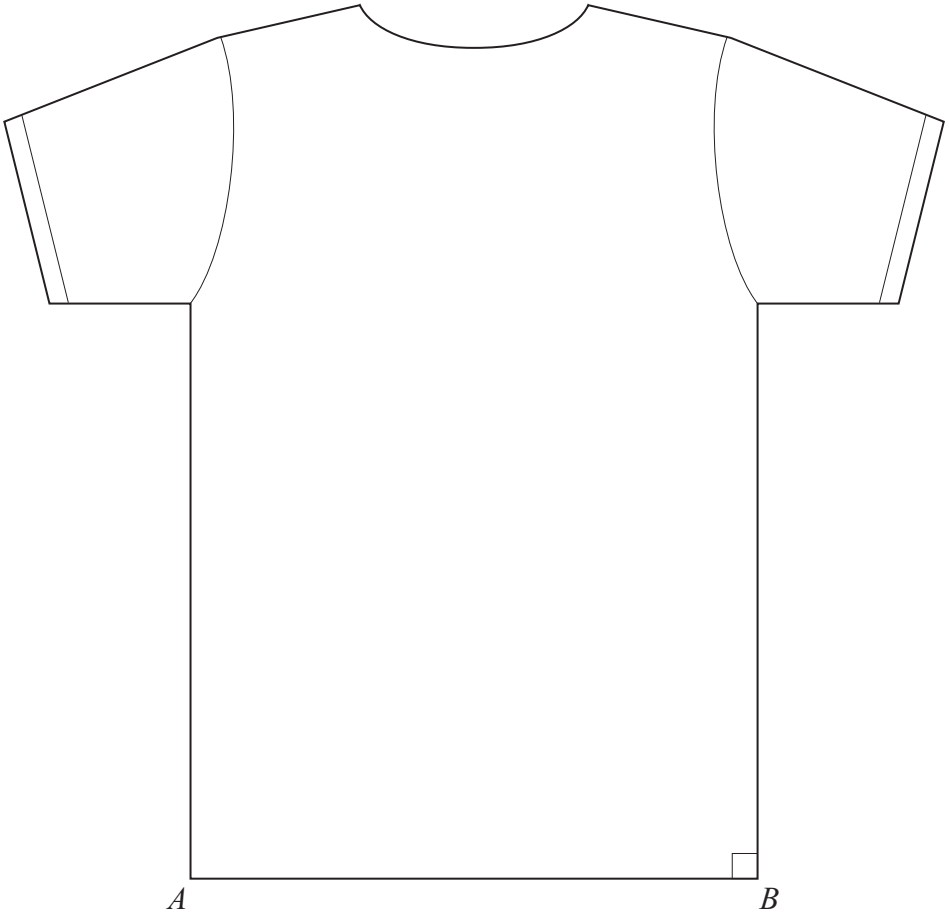
Answer **all** questions.

Answer each question in the space provided for that question.

Use **Cutting fabric** *on page 3 of the Data Sheet.*

7 The diagram below shows a t-shirt template drawn to a scale of $1:8$.

7 (a) On the diagram, measure the distance AB across the bottom edge of the t-shirt.



[1 mark]

Answer .....

7 (b) Find the width of the bottom edge of the actual t-shirt.

[2 marks]

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Answer .....

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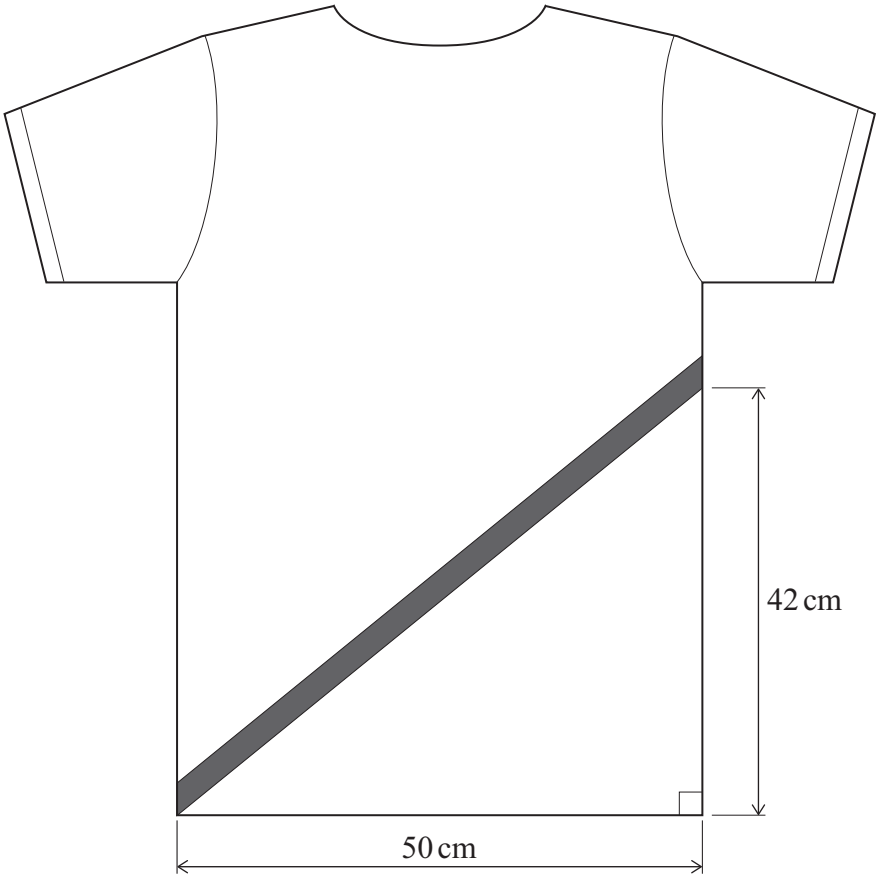
Turn over for the next question

8 The diagram shows the design for a t-shirt with a diagonal stripe.



Not to scale

Calculate the length of the lower edge of the stripe.

[3 marks]

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Answer .....

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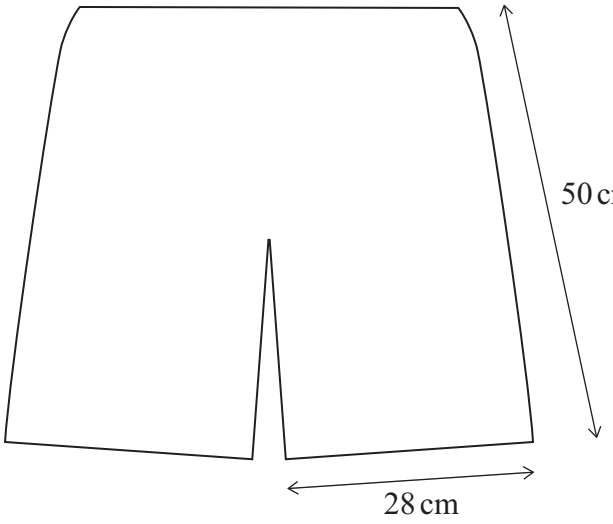
9 Beach shorts are made in two sizes, large and small.

The diagrams below show templates for these sizes.

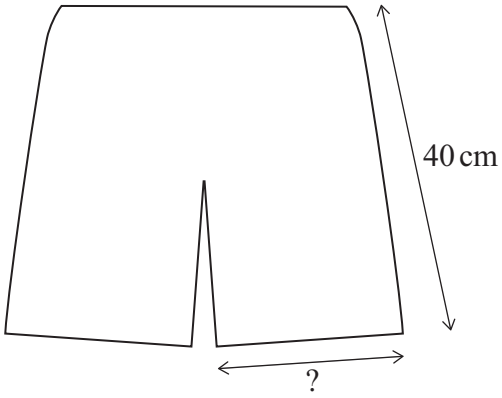
The templates are similar in shape.

Large



Not to scale

Small



Not to scale

The large size has an outside leg measurement of 50 cm, and a leg width of 28 cm.

The small size has an outside leg measurement of 40 cm.

Find the leg width of the small size.

[3 marks]

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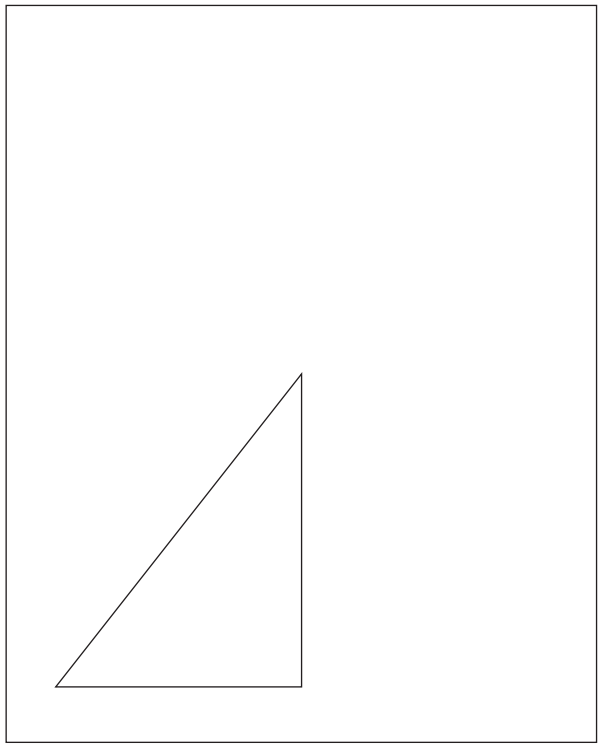
Answer .....

3

Turn over for the next question

10 The diagram shows part of a design of a t-shirt.



Complete the design so that it has rotational symmetry of order 2.

[3 marks]

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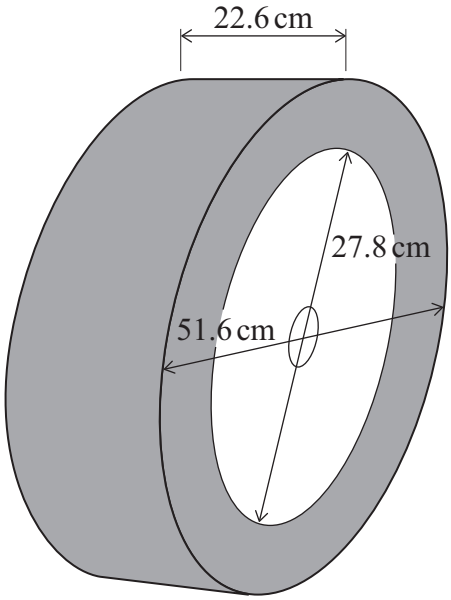
Section D

Answer **all** questions.

Answer each question in the space provided for that question.

Use **Racing cars** *on page 4 of the Data Sheet.*

11



The diagram shows a racing car wheel with a tyre around it.

The tyre has a width of 22.6 cm.
The wheel inside the tyre can be modelled as a cylinder of diameter 27.8 cm.
The tyre and wheel together can be modelled as a cylinder of diameter 51.6 cm.

Find the volume enclosed by the tyre, not including the volume of the wheel.

[4 marks]

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Answer .....

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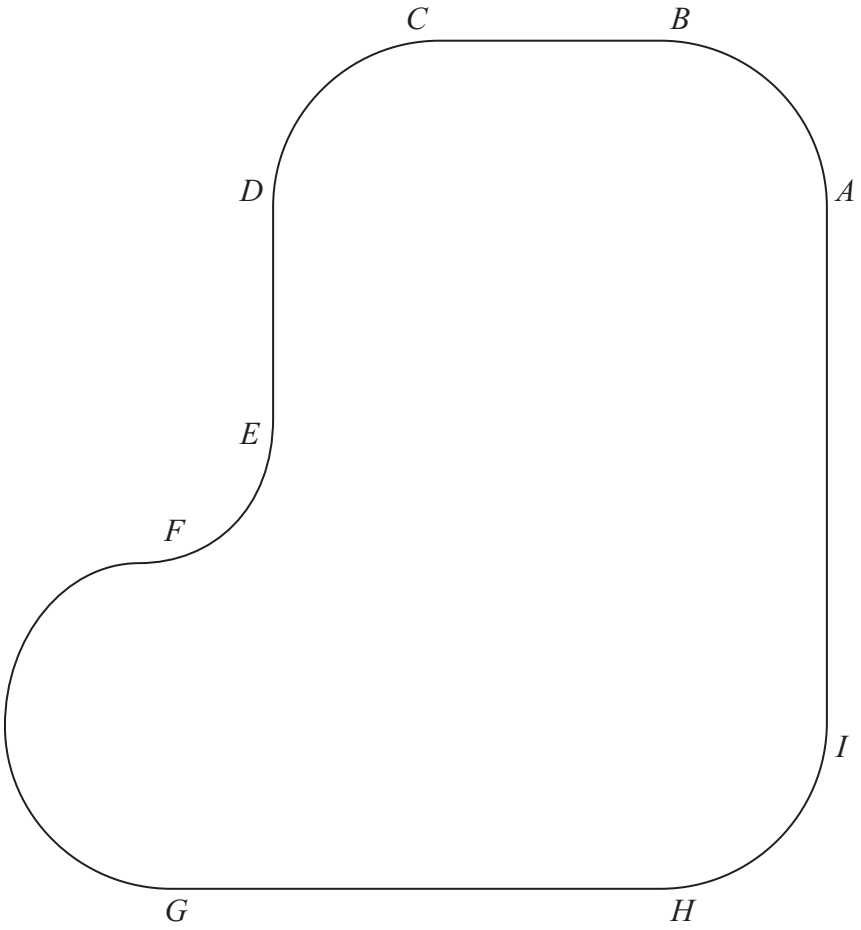
Turn over ▶

12 The diagram shows a path that a racing car could follow around a circuit.



Not to scale

BC, DE, GH and IA are straight lines with $BC = 0.65$ km, $DE = 0.9$ km, $GH = 1.25$ km and $IA = 1.8$ km.

AB, CD and HI are circular arcs. Each of them is a quarter of a circle of radius 0.4 km.
EF is a circular arc. It is a quarter of a circle of radius 0.2 km.
FG is a semi-circular arc of radius 0.55 km.

Gunther, a racing driver, drives his car once around the path shown, in 2 minutes 30 seconds.

Find Gunther's average speed in miles per hour.
Use the approximation 1.6 km $= 1$ mile.

[6 marks]

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Answer .....

6

END OF QUESTIONS

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