Surname	
Other Names	
Candidate Signature	

AQA

Free-Standing Mathematics Qualification
Higher Level
June 2014

Shape and Space   4985

Unit 5

Friday 16 May 2014   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 **Flags** on page 2 of the Data Sheet.*

1 (a) From the flags shown on the Data Sheet, which nation's flag has rotational symmetry of order 2 but no lines of symmetry?

[1 mark]

Answer..

1 (b) On each of the flags below, draw **all** lines of symmetry.

[3 marks]

4
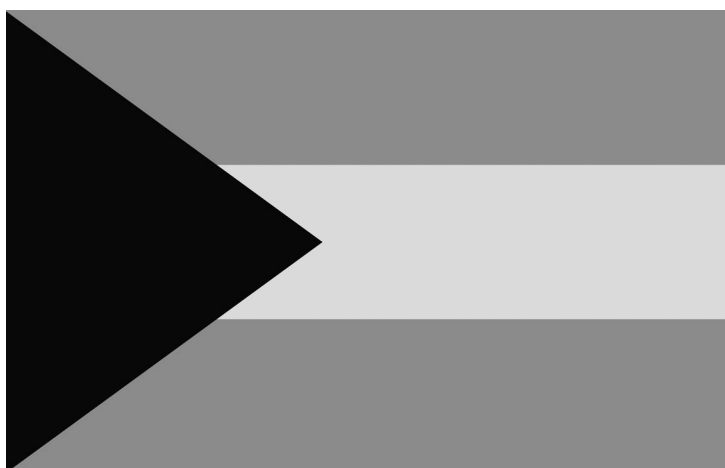
2 Half of the design for a flag is shown below.

Complete the design so that AB is a line of symmetry.

[3 marks]

Turn over for the next question

03

3   Another flag is shown below.

Not to scale
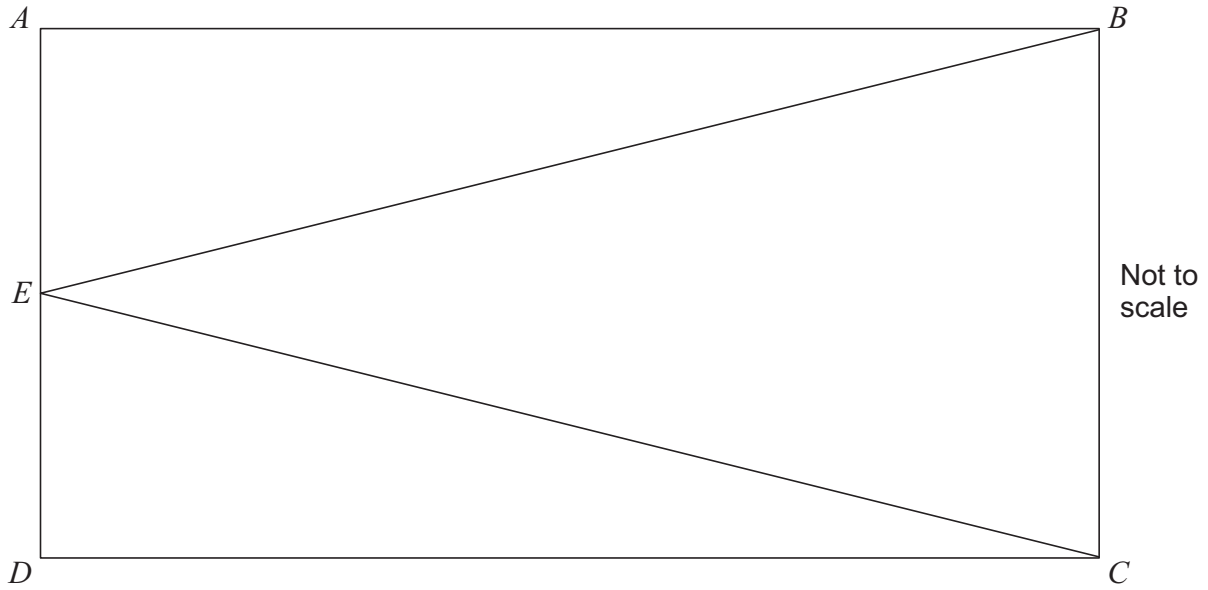
$ABCD$ is a rectangle.
$AE = ED = 60$ cm
$DC = 210$ cm

3 (a)   Find the area of triangle BCE.

[2 marks]

....

....

....

Answer...
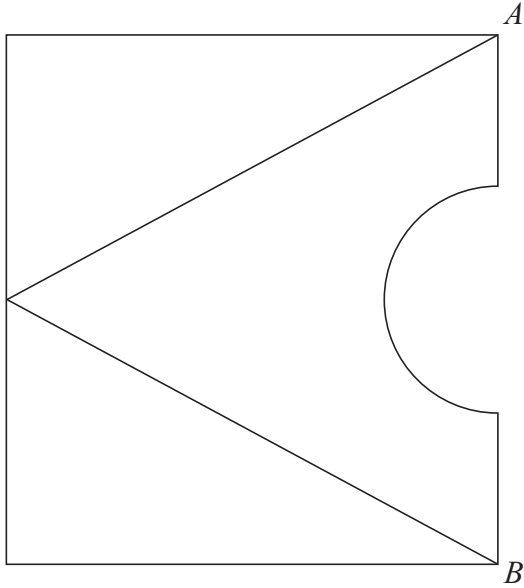
3 (b)   Find the length CE.

[3 marks]

....

....

....

....

....

Answer...

3 (c) $PQRS$ is a smaller flag which is similar in shape to $ABCD$.

Not to scale
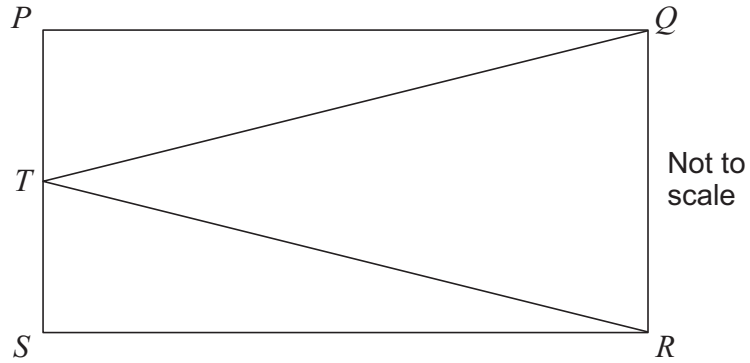
$TS = 20\,\text{cm}$

3 (c) (i)   Find the length SR.

[2 marks]

....

....

....

....

Answer...

3 (c) (ii)   Find the area of triangle QRT.

[2 marks]

....

....

....

....

Answer...

**Turn over for the next question**

9

Section B

Answer **all** questions.

Answer each question in the space provided for that question.

Use **Festival site** *on page 3 of the Data Sheet.*

4 The diagram below shows the outline of a spectator area for an outdoor stage at a music festival, in the shape of a quarter circle ABC of radius 60 metres.

It is drawn to a scale of $1{:}500$.

The stage is inside the quarter circle ABC, near point A.

Scale 1:500
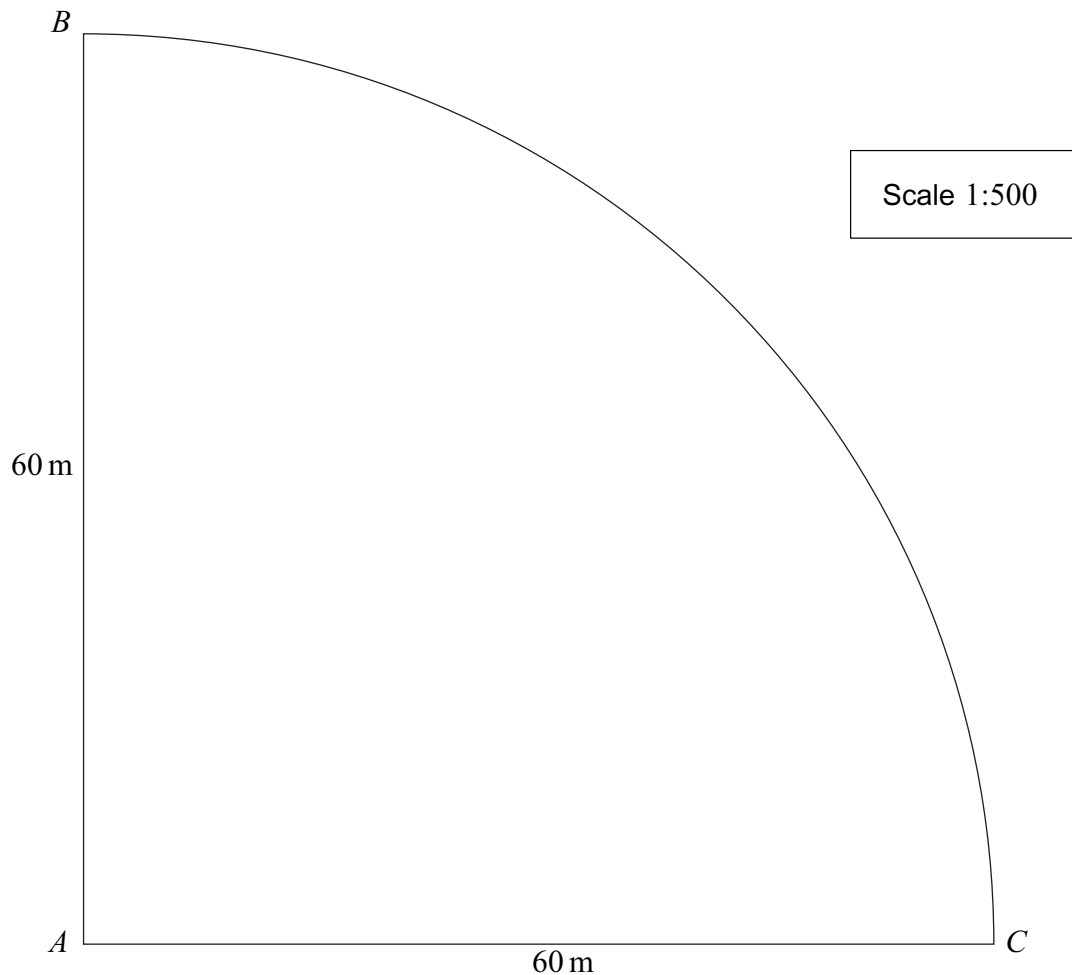
4 (a) **Using a pencil**, **a ruler and a pair of compasses only**, construct the bisector of angle BAC. Show **all** construction arcs clearly.

The bisector of angle BAC meets the **circular arc** BC at point D.
Mark the point D.

[2 marks]

4 (b) The festival organisers want to carry out a sound check at the point E where AD meets the **straight line** BC.

4 (b) (i) Draw the straight line BC. Mark the point E. Measure the distance AE on the diagram.

[1 mark]

Answer...

4 (b) (ii) Find the actual distance AE.

[1 mark]

....

....

....

....

Answer...

4 (c) The festival organisers want to put a fence around the quarter circle ABC.
Find the length of the fence.

[3 marks]

....

....

....

....

....

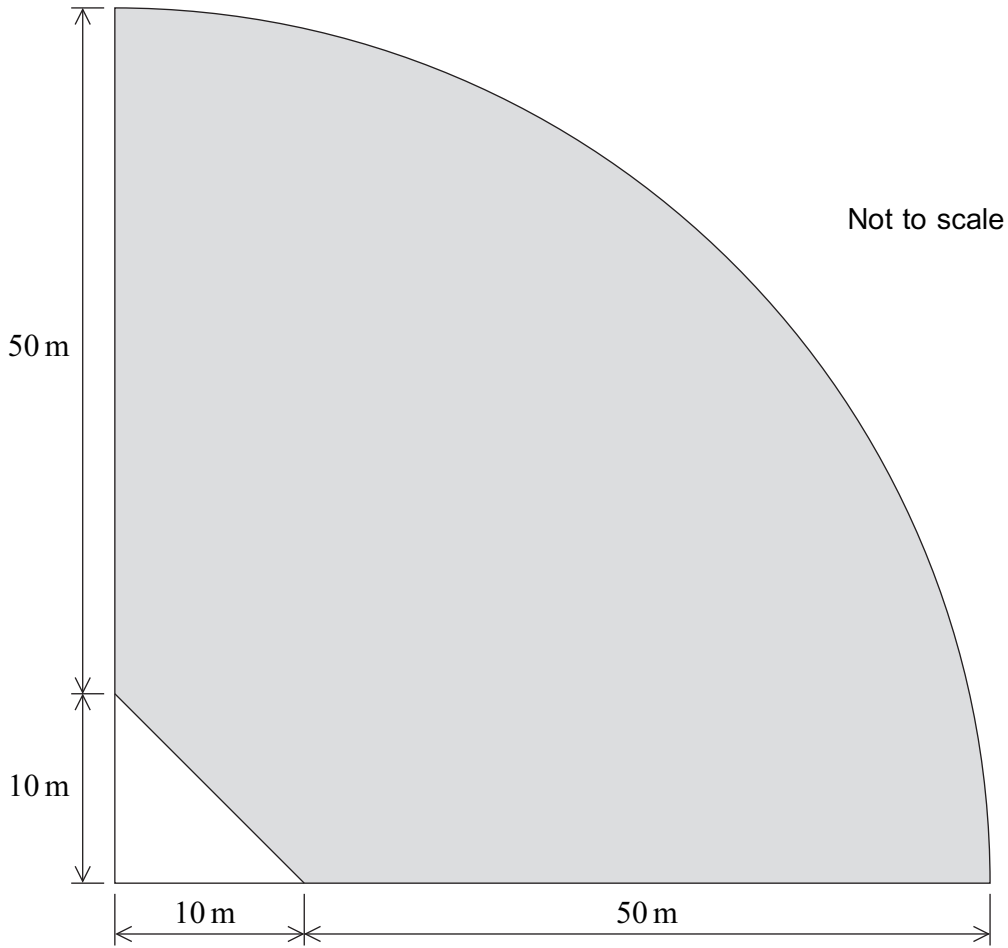Answer...

Turn over for the next question

7

Turn over ▶

5 The shaded area in the diagram below shows where the spectators can stand.

It is a quarter circle, of radius 60 metres, from which a right-angled triangle has been removed.

Not to scale

50 m

10 m

10 m

50 m

5 (a) Find the shaded area. Give your answer to three significant figures.

[4 marks]

....

....

....

....

Answer..

5 (b) Local safety regulations state that each spectator must have at least 3 square feet of space.

The festival organisers think that $10\,000$ spectators can stand in the area calculated in part **(a)**. Does this meet the local safety regulations?

You must show all your working.

You should use 1 square foot $= 0.0929\,\text{m}^2$.

[3 marks]

....

....

....

....

....
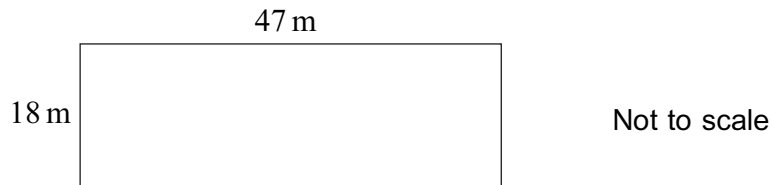
7

6

47 m

18 m

Not to scale

A rectangular camping field measures 47 metres by 18 metres.
These measurements are accurate to the nearest metre.
Find the lower bound for the area of the field.

[3 marks]

....

....

....

....

Answer...

3
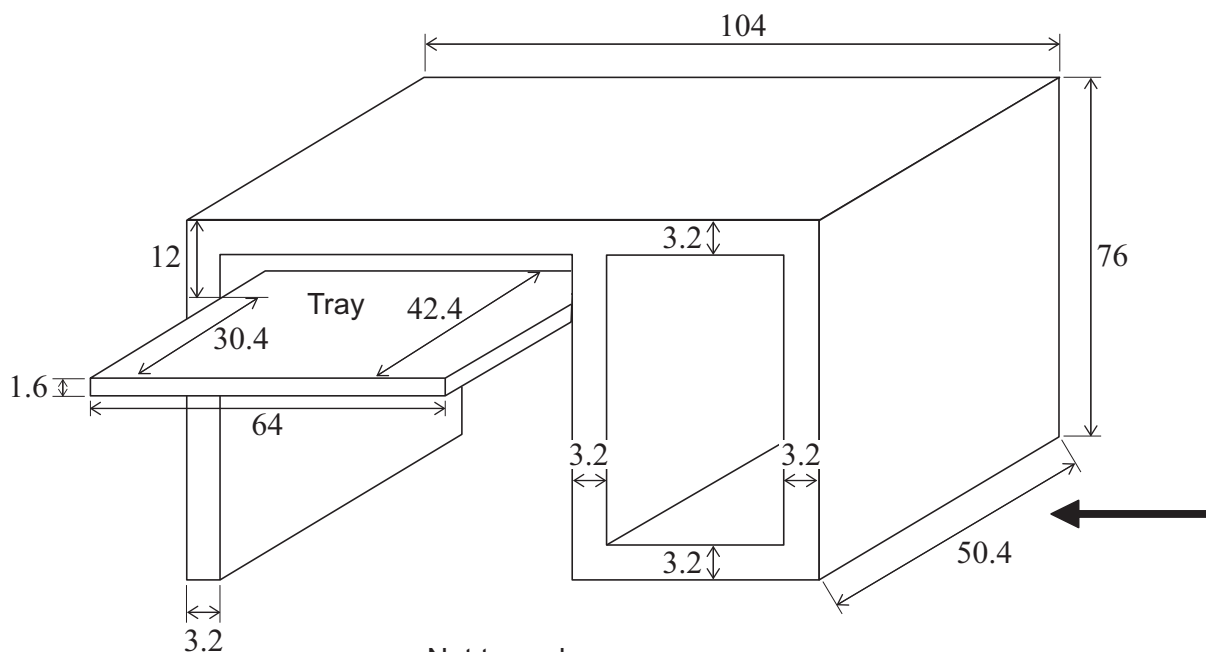
Turn over for the next question

Section C

Answer **all** questions.

Answer each question in the space provided for that question.

*Use **Workstations** on page 4 of the Data Sheet.*

7   The diagram below shows a workstation.
It measures 104 cm by 76 cm by 50.4 cm.
There is a tray which can be pushed in and out.
This tray measures 64 cm by 42.4 cm.
The top of the tray is 12 cm below the top of the workstation.
When fully extended, as shown in the diagram, the tray sticks out 30.4 cm from the front of the workstation.
The thickness of the tray is 1.6 cm.
The rest of the workstation is made of material of thickness 3.2 cm.
The section of the workstation on the right has a base, but the section below the tray does not.
The workstation does not have a back.

Not to scale
All measurements in centimetres

On the opposite page, draw a side elevation of this workstation, with the tray fully extended as shown, viewed from the direction shown by the arrow.

Make your drawing to a scale of $1:8$ and show all hidden detail.

[5 marks]

Turn over for the next question
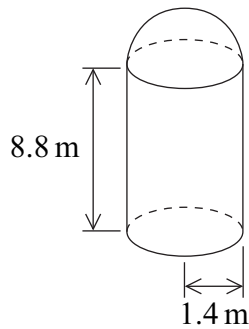
Turn over ▶

5

Section D

Answer **all** questions.

Answer each question in the space provided for that question.

*Use **Silos** on page 4 of the Data Sheet.*

8   A silo is in the form of a cylinder of radius $1.4\,\text{m}$ and height $8.8\,\text{m}$, topped by a hemisphere of radius $1.4\,\text{m}$.

$8.8\,\text{m}$

Not to scale

$1.4\,\text{m}$

The formula for the volume of a cylinder is

$$V = \pi r^2 h$$

The formula for the volume of a sphere is

$$V = \frac{4}{3}\pi r^3$$

Use these formulae to find the volume of the silo.
State the units of your answer.

[6 marks]

....

....

....

....

....

....

....

....

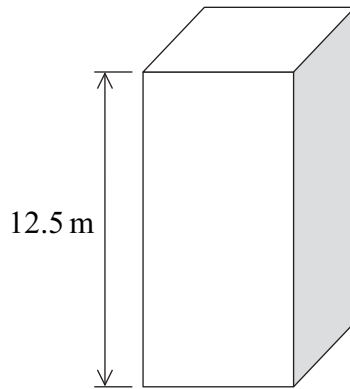Answer...

6

9 Another silo is in the form of a cuboid with a square top.

12.5 m

Not to scale

The height of the silo is $12.5\,m$ and the volume of the silo is $500\,m^3$.
Find the total area of the sides and the top of the silo.

[6 marks]

....

....

....

....

....

....

....

....

....

....

....

Answer...

END OF QUESTIONS

6

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED