OCR
Oxford Cambridge and RSA
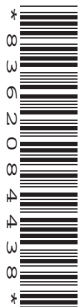
H

Friday 20 May 2022 – Morning

GCSE (9–1) Mathematics

J560/04 Paper 4 (Higher Tier)

Time allowed: 1 hour 30 minutes

You must have:
• the Formulae Sheet for Higher Tier (inside this document)

You can use:
• a scientific or graphical calculator
• geometrical instruments
• tracing paper

Please write clearly in black ink. **Do not write in the barcodes.**

Centre number ☐☐☐☐☐   Candidate number ☐☐☐☐

First name(s) _____

Last name _____

INSTRUCTIONS
• Use black ink. You can use an HB pencil, but only for graphs and diagrams.
• Write your answer to each question in the space provided. You can use extra paper if you need to, but you must clearly show your candidate number, the centre number and the question numbers.
• Answer **all** the questions.
• Where appropriate, your answer should be supported with working. Marks might be given for using a correct method, even if your answer is wrong.
• Use the π button on your calculator or take π to be 3.142 unless the question says something different.

INFORMATION
• The total mark for this paper is **100**.
• The marks for each question are shown in brackets **[ ]**.
• This document has **20** pages.

ADVICE
• Read each question carefully before you start your answer.

2

Answer **all** the questions.

1   **(a)**   Write $6\,050\,000$ in standard form.

(a)   .... **[1]**

(b)   Write 4.58×10^{-3} as an ordinary number.

(b)   .... **[1]**

2   Calculate.

$$\frac{270}{2.5^2} - \frac{4.6 + 17.2}{8.4 - 6.8}$$

.... **[2]**

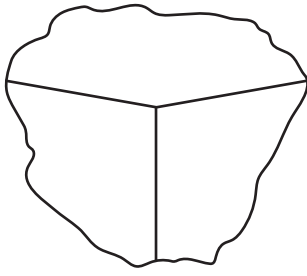3   In January 2018, an art collector bought an antique painting.
In January 2020, he sold it for £17 640.

Assume the value of the painting increased by 5% each year.

Calculate the art collector's profit.
You must show your working.

£ .... **[5]**
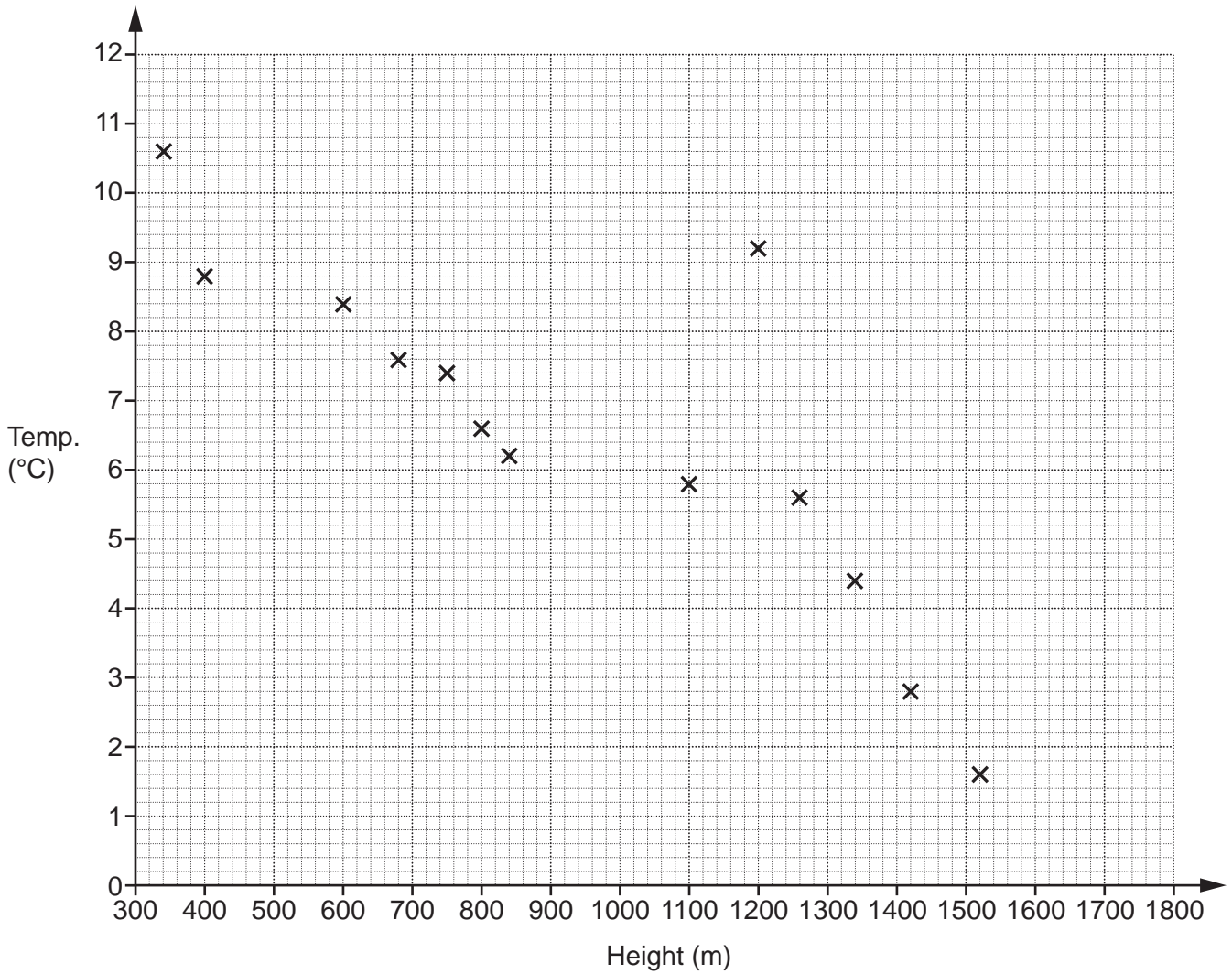
4 Three **regular** polygons meet at a point.

Not to scale

Two of the polygons are pentagons.

Find the number of sides of the third polygon.
You must show your working.

.... **[6]**

4

5 The scatter diagram shows the midday temperature at 13 different heights on a mountain.

(a) The table has the information for 2 more heights.

Plot these on the scatter diagram.

Height (m)	500	1580
Temperature (°C)	8.8	1.2

[2]

(b) Describe the type of correlation shown in the scatter diagram.

(b) .... **[1]**

5

(c) By drawing a line of best fit, estimate the temperature at 1000 m.

(c) .... °C **[2]**

(d) Circle the outlier on the scatter diagram. **[1]**

(e) Explain why using the scatter diagram to estimate the temperature at 1800 m may be unreliable.

....

.... **[1]**

(f) Find the percentage of the 15 temperatures which are below 6 °C.

(f) .... % **[3]**

Turn over

6 A machine can dig, on average, 2 cm of tunnel each minute.
It operates 24 hours each day.

(a) Work out how many days it should take to dig a tunnel of length 3.5 km.
Give your answer to the nearest day.

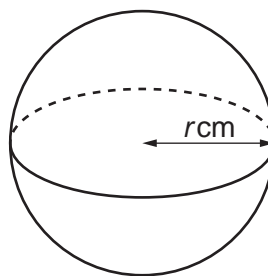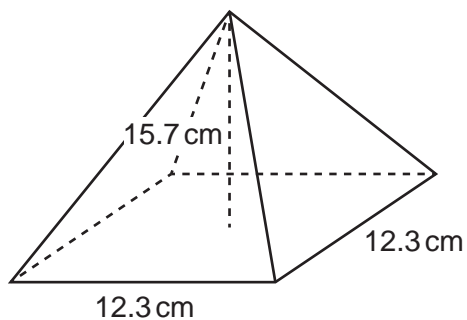(a) .... days **[4]**

(b) The machine actually digs an average of 2.5 cm of tunnel each minute for most of the time
and an average of 1.5 cm each minute for the rest of the time.

How would this affect your answer to part **(a)**?

....

.... **[1]**

7   The diagram shows a square-based pyramid and a sphere.

15.7 cm

12.3 cm

12.3 cm

r cm

The pyramid has base length 12.3 cm and perpendicular height 15.7 cm.
The sphere has radius r cm.

The pyramid and the sphere have the same volume.

Work out the radius of the sphere.
You must show your working.

[The volume of a pyramid is $\frac{1}{3} \times$ area of base $\times$ perpendicular height.

The volume V of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

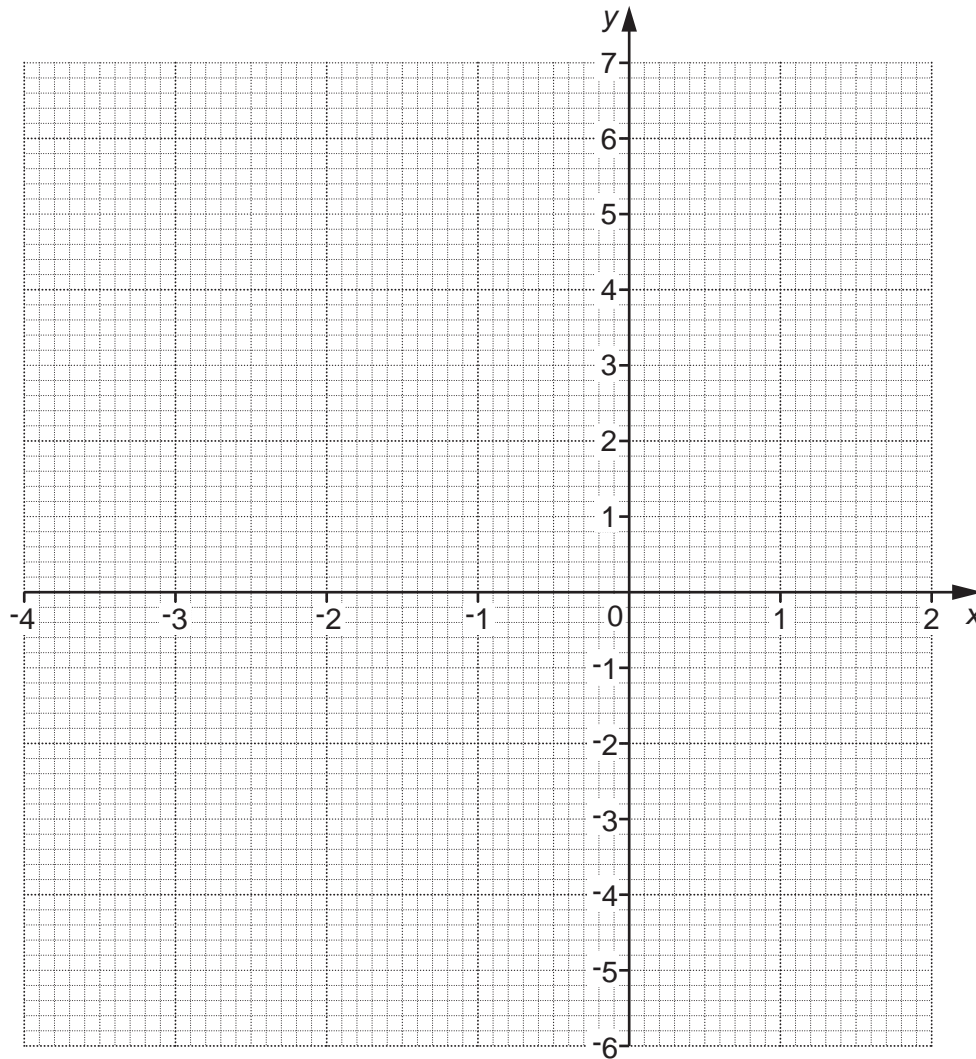.. cm **[5]**

Turn over

8

8 Here is a table of values for $y = x^2 + 2x - 2$.

x	-4	-3	-2	-1	0	1	2
y	6	1	-2	-3	-2	1	6

(a) Draw the graph of $y = x^2 + 2x - 2$ for $^-4 \leqslant x \leqslant 2$.

[3]

(b) Write down the equation of the line of symmetry of the graph.

(b) .... **[1]**

(c) Use the graph to solve the equation $x^2 + 2x - 2 = 0$.
Give your answers to **1** decimal place.

(c) $x =$ .... or $x =$ .... **[2]**

9 Points A, B and C lie on the circumference of a circle, centre O.
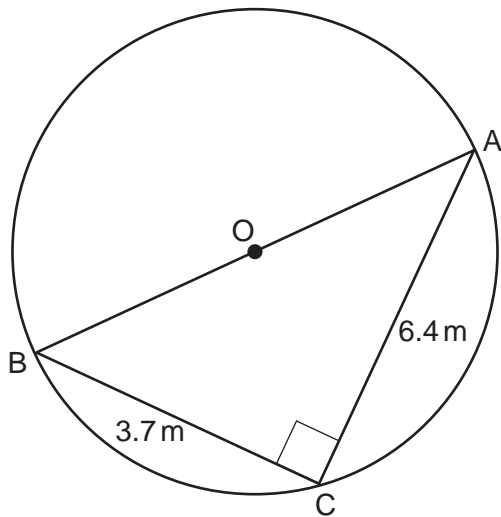
Not to scale

Angle ACB $= 90°$, AC $= 6.4$ m and BC $= 3.7$ m.

Work out the circumference of the circle.
You must show your working.

.... m **[5]**

10 A student is researching the difference in how much exercise adults and children do.
To collect their data, the student interviews the first 25 people found in the High Street at 11 am on one Monday morning.

(a) Make **three** different criticisms of the student's method of collecting data.

1 ....

....

....

2 ....

....

....

3 ....

....

....
[3]

(b) Here is the data collection table that the student used.

Hours exercised in a week (*h*)	Adult tally	Child tally
$0 \leqslant h \leqslant 2$		
$2 \leqslant h \leqslant 4$		
$4 \leqslant h \leqslant 8$		
$8 \leqslant h \leqslant 12$		
$12 \leqslant h \leqslant 20$		

Make **one** criticism of the student's table.

....

....

.... **[1]**
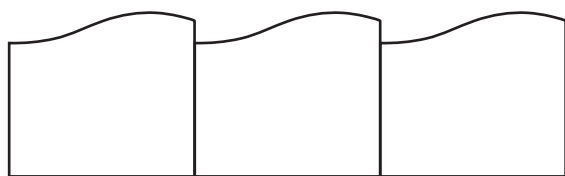
11 Jamie buys fence panels that fit tightly together.
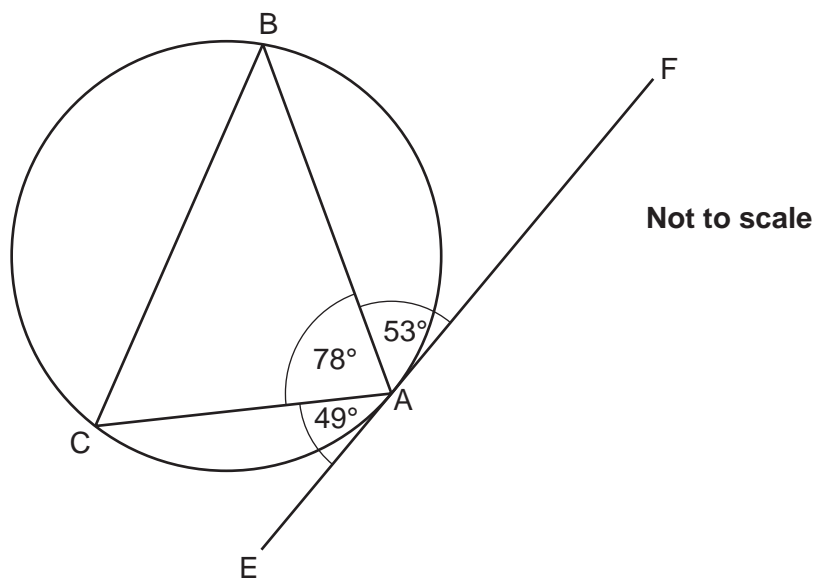
Not to scale

Each panel has a length of 1.8 m, correct to 1 decimal place.
Jamie measures the length of a garden as 42 m, correct to the nearest metre.

Work out the minimum number of panels Jamie should buy in order to be certain that there are enough panels for the length of the garden.
Show how you decide.

.... **[4]**

12 **(a)** Points A, B and C lie on the circumference of a circle.
EAF is a tangent to the circle.

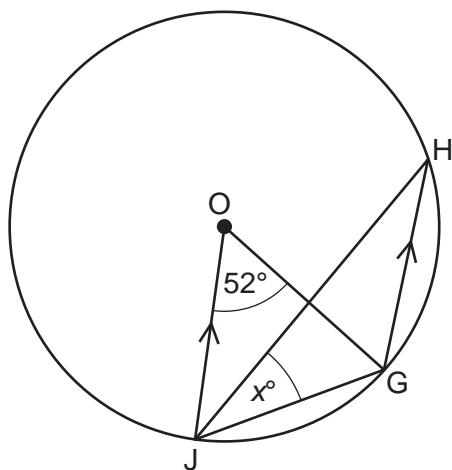**Not to scale**

Write down the value of angle BCA giving a reason for your answer.

Angle BCA = ………………° because ....

....

.... **[2]**

13

(b) Points G, H and J lie on the circumference of a circle, centre O.

Not to scale

Angle GOJ = 52° and angle GJH = $x°$.
Lines JO and GH are parallel.

Find the value of *x*.
You must show your working.

(b) *x* = ... **[5]**

Turn over

13 Here is a restaurant's menu.

Starter	**Main**	**Dessert**
Prawn Cocktail	Hunter's Chicken	Trifle
Duck Spring Rolls	Beef Curry	Ice Cream
Lamb Meatballs	Steak	Cheesecake
Leaf Salad (V)	Fish Pie	Chocolate Cake
Mushroom Soup (V)	Lasagne	Bakewell Tart
	Egg Salad (V)	Fruit Salad (V)
	Vegetable Hot Pot (V)	Cherry Pie (V)
	Macaroni Cheese (V)	

(V) denotes vegetarian

(a) A 3-course meal consists of one starter, one main and one dessert.

Work out how many different 3-course meals can be chosen from the menu.

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

(b) Find the fraction of the 3-course meals which are completely vegetarian (V).

(b) .... **[2]**

14 $(x+2)(3x+a)(bx+3) = 6x^3 + 11x^2 - 17x - 30$

Find the value of *a* and the value of *b*.

$a = $ ....

$b = $ .... **[2]**

15 Use algebra to prove that an odd number multiplied by a different odd number always gives an answer that is an odd number. **[4]**

16 Li bought a house at the start of 2016.
Li assumes the value of the house, £V, can be predicted using the formula

$$V = 185\,000 \times 1.035^n$$

where n is the number of years after the start of 2016.

(a) Explain how you know that the value of the house is predicted to increase each year.

....

.... **[1]**

(b) Write down the percentage increase per year that is used in the formula.

(b) .... % **[1]**

(c) Write down the value of the house at the start of 2016.

(c) £ .... **[1]**

(d) Calculate the predicted value of the house at the start of 2020, giving your answer correct to **4** significant figures.

(d) £ .... **[2]**

(e) (i) Compared with its value at the start of 2016, show that the formula predicts the house will have doubled in value at some point during 2036. **[3]**

(ii) Give **one** reason why this may not happen.

....

.... **[1]**
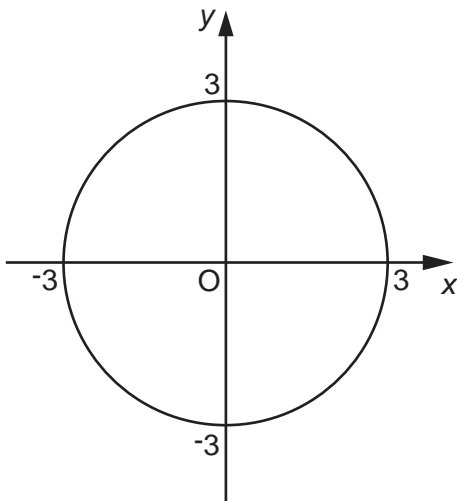
17 There are 15 sweets in a bag.
10 of the sweets are toffee and 5 are mint.
Reece takes two of the sweets at random.

Work out the probability that Reece takes one of each type of sweet.

.... **[4]**

18 The diagram shows a circle, centre the origin.

Write down the equation of the circle.

.... **[2]**

PMT

19 (a) Write as a single fraction in its simplest form.

$$\frac{4}{2n+3} - \frac{2n}{n^2+1}$$

(a) .... **[4]**

(b) Simplify.

$$\frac{x^2 - x - 12}{2x^2 - 3x - 20}$$

(b) .... **[5]**

TURN OVER FOR QUESTION 20

Turn over

20 Solve this inequality.

$$x^2 + 4x - 12 \leqslant 0$$

Give your answer using set notation.
You must show your working.

.... **[5]**

END OF QUESTION PAPER