OCR
Oxford Cambridge and RSA

H

Tuesday 20 June 2017 – Afternoon

GCSE METHODS IN MATHEMATICS

B392/02 Methods in Mathematics 2 (Higher Tier)

Candidates answer on the Question Paper.

OCR supplied materials:
None

Other materials required:
* Scientific or graphical calculator
* Geometrical instruments
* Tracing paper (optional)

Duration: 2 hours

Candidate forename		Candidate surname	

Centre number						Candidate number				

INSTRUCTIONS TO CANDIDATES

* Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
* Use black ink. HB pencil may be used for graphs and diagrams only.
* Answer **all** the questions.
* Read each question carefully. Make sure you know what you have to do before starting your answer.
* Your answers should be supported with appropriate working. Marks may be given for a correct method even if the answer is incorrect.
* Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
* Do **not** write in the barcodes.

INFORMATION FOR CANDIDATES

* The number of marks is given in brackets **[ ]** at the end of each question or part question.
* Quality of written communication will be assessed in questions marked with an asterisk (*****).
* The total number of marks for this paper is **90**.
* This document consists of **16** pages. Any blank pages are indicated.

You are permitted to use a calculator for this paper

OCR is an exempt Charity

Turn over

2
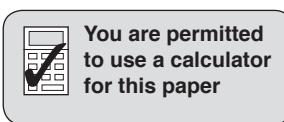
Formulae Sheet: Higher Tier

Area of trapezium $= \frac{1}{2}(a+b)h$
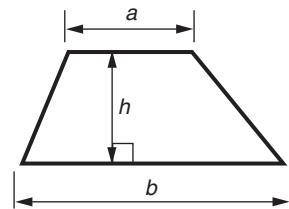
Volume of prism = (area of cross-section) × length
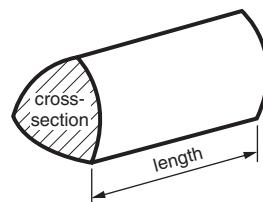
In any triangle *ABC*

Sine rule $\quad \dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$

Cosine rule $\quad a^2 = b^2 + c^2 - 2bc\cos A$

Area of triangle $= \frac{1}{2}ab\sin C$
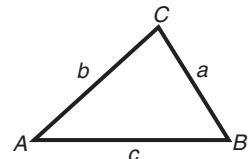
Volume of sphere $= \frac{4}{3}\pi r^3$

Surface area of sphere $= 4\pi r^2$
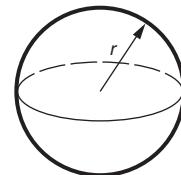
Volume of cone $= \frac{1}{3}\pi r^2 h$

Curved surface area of cone $= \pi r l$
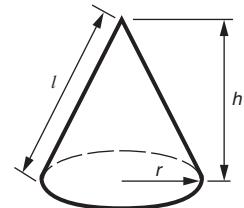
The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$,
where $a \neq 0$, are given by

$$x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$$

PLEASE DO NOT WRITE ON THIS PAGE

3

Answer **all** the questions.

1 **(a)** Use your calculator to work out the following.

    (i) 4.6^3

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

   **(ii)** $\dfrac{\sqrt[3]{67}}{3.2}$. Give your answer correct to three significant figures.

                                                  (ii) .... **[3]**

(b) **(i)** Change $\dfrac{5}{16}$ to a decimal.

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

    (ii) A calculator is used to convert a fraction to a decimal.
          Both the numerator and denominator are one digit whole numbers.
          The calculator displays 0.5555555556.

          What was the fraction?

                                                    (ii) .... **[3]**

Turn over

2 **(a)** The diagram below shows triangle PQR. Line QR is extended to point S.

Not to scale
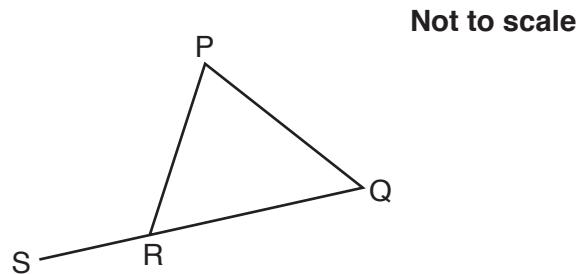
Fill in the missing angle in each of the second and third lines of the proof below.

Angle RPQ + Angle PQR + Angle PRQ = 180° (angles of triangle)

Angle RPQ + Angle PQR = 180° - Angle ....

Angle PRS = 180° - Angle .... (angles on straight line)

Angle PRS = Angle RPQ + Angle PQR

The exterior angle of a triangle is equal to the sum of the interior angles at the other two vertices.

[2]

(b) The diagram below shows regular pentagon ABCDE.
Line segment AE is extended to F.

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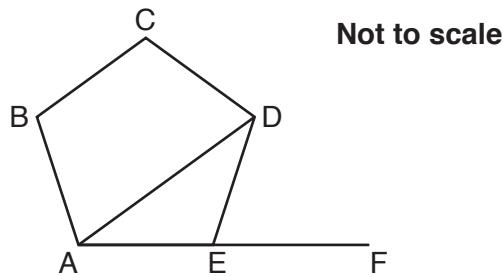
(i) Calculate exterior angle DEF.

(b) (i) ....° **[2]**

(ii) Calculate angle DAE

(ii) ....° **[2]**

3 **(a)** Complete the table for $y = x^2 - 3$.

x	$^-3$	$^-2$	$^-1$	0	1	2	3
y		1		$^-3$			6

[2]

(b) Draw the graph of $y = x^2 - 3$ for $^-3 \leqslant x \leqslant 3$.
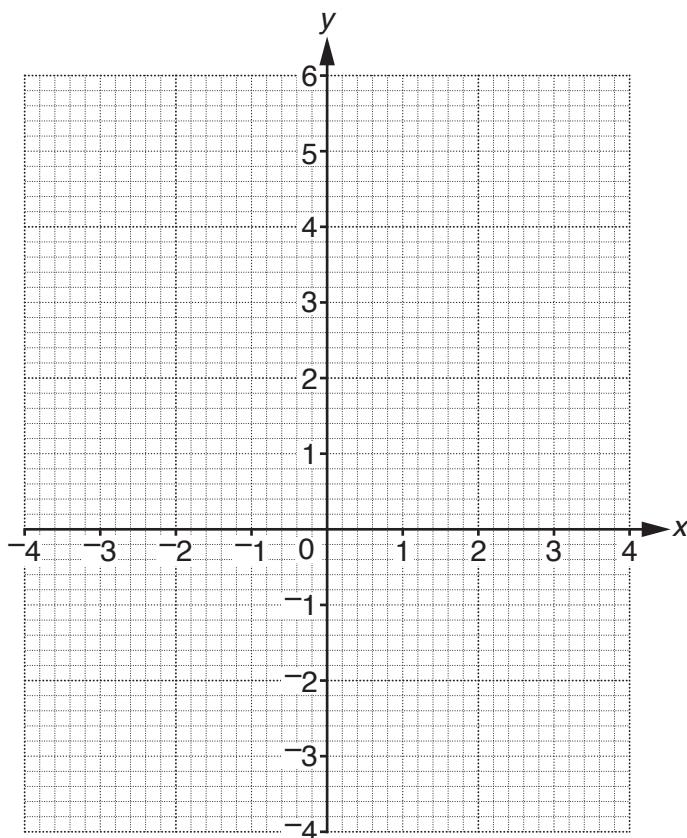
[2]

(c) Use your graph to solve the equation $x^2 - 3 = 4$.
Give your answers correct to 1 decimal place.

(c) .... [2]

6

4   (a)   A shop reduces everything by 20% in a sale.

What is the sale price of a pair of shoes that originally cost £35?

(a) £ .... **[2]**

(b)* Sara has a discount card that gives her an extra 10% off the sale price. Sara thinks she gets a total of 30% off the original price when she uses the discount card. Decide whether Sarah is correct.

....

....

.... **[3]**

(c)* Which of the two offers below gives the better reduction compared to the original price? Explain your reasoning.

Buy two Get another one free	Buy one Get another one half price

....

....

.... **[3]**

5 **(a)** Write the ratio 8 : 12 in the form 1 : *n*.

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

(b) **(i)** Peter works out $\frac{2}{5} \div \frac{1}{7}$.

If he multiplies his answer by $\frac{1}{7}$, what answer should he get if all his working is correct?

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

(ii) Work out.

$$\frac{2}{5} \div \frac{1}{7}$$

(ii) .... **[1]**

(c) **(i)** A sequence of numbers starts with the number 120.

The next term is obtained by multiplying a term of the sequence by $\frac{1}{2}$.

Find the next two terms of the sequence.

Term 1	Term 2	Term 3	Term 4
120	60		

[2]

(ii) What is the 10th term in the sequence?

(c) (ii) .... **[2]**

6 **(a)** Solve.

$$2(x - 5) = 4x + 1$$

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

(b) Solve.

$$x^2 - 6x + 8 = 0$$

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

9

(c) The L-shape below is made up of horizontal and vertical lines.
The measurements, in cm, of some of the sides are given.

Not to scale
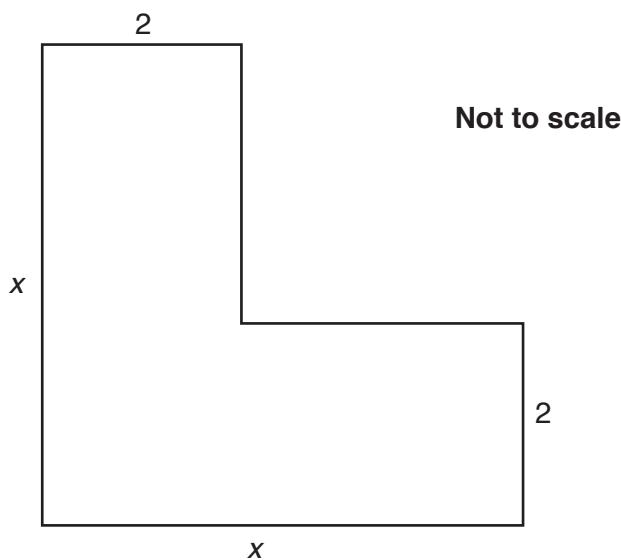
Find an expression for the area of the L-shape.
Give your answer in its simplest form.

(c) .... cm^2 **[3]**

7 ABC is a right-angled triangle.
AB = 4 cm, AC = 7 cm.

A

Not to scale

7 cm

4 cm

B

C
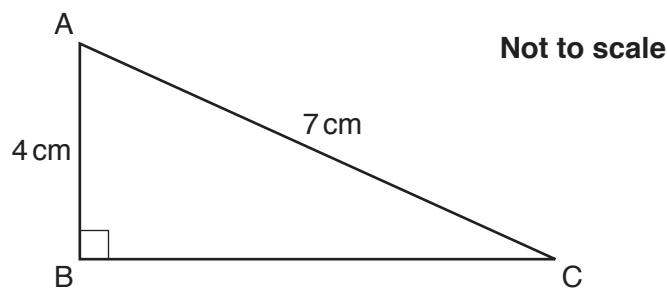
(a) Calculate the length of BC.

(a) .... cm **[3]**

(b) Calculate the size of angle BCA.

(b) .... ° **[3]**

8 **(a)** **(i)** Draw the locus of all the points with distance 3 cm from the origin on the grid below.
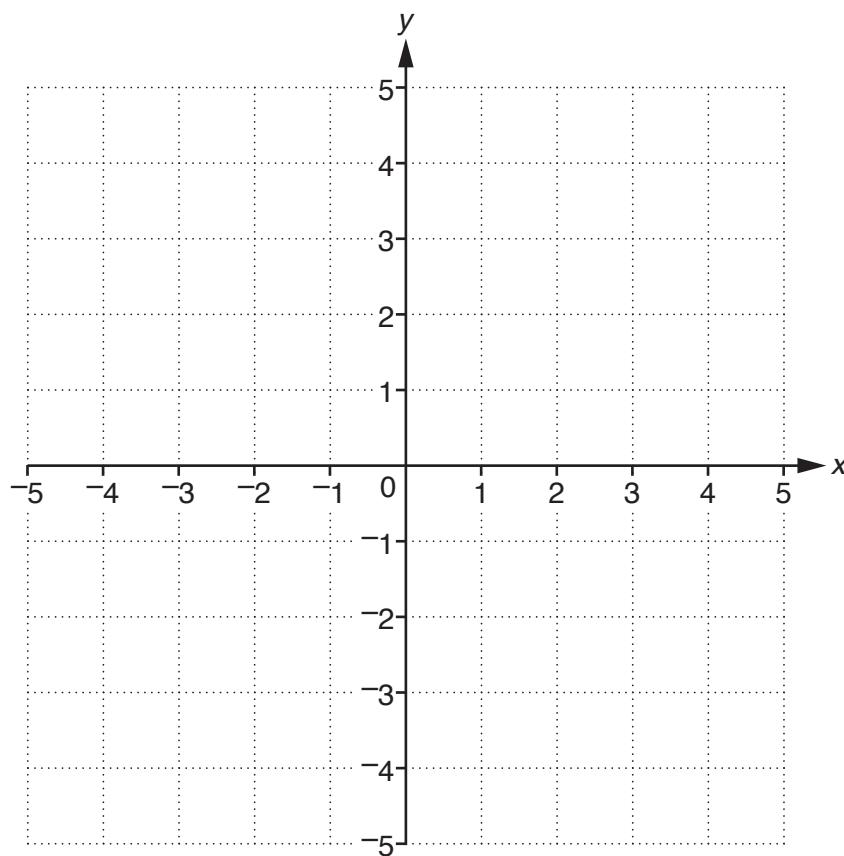
[2]

(ii) Write down the equation of the locus you sketched above.

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

Turn over

(b) The graph of $y = \dfrac{1}{x}$ is shown on the grid below.

Sketch the graph of $y = \dfrac{1}{(x-1)}$ on the same grid.
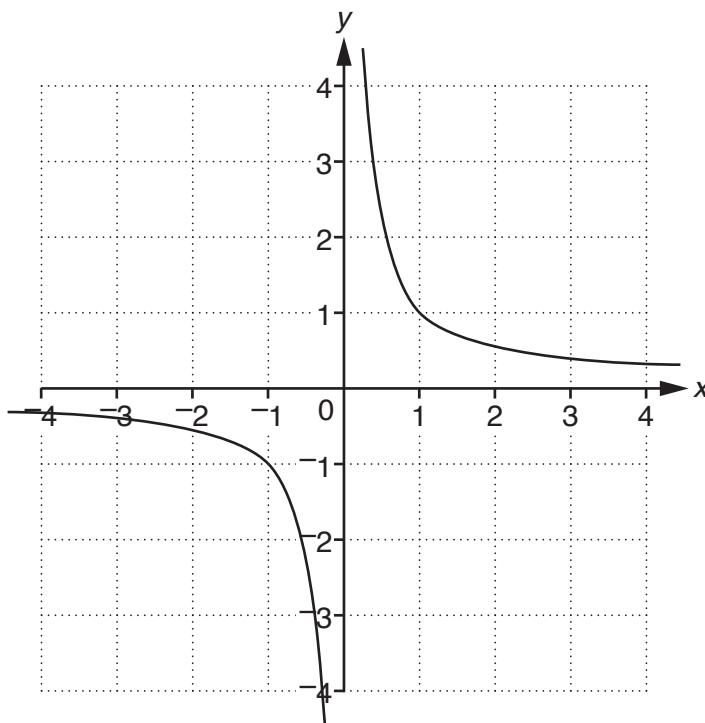
[2]

9 The radius of the Earth is 6371 km.
The radius of Mars is 3390 km.

Assume that the Earth and Mars are both spheres.

How many times bigger is the volume of Earth compared with Mars? Give your answer to an appropriate level of accuracy.

.... **[3]**

10 Find an expression for the nth term of the following sequence.

3,   8,   15,   24,   35,   48,.....

.... **[2]**

11 In the diagram below, triangles ABD and BDC are right-angled.
Angle BAD = angle BDC = 90°.
AB = 3 cm, AD = DC = 1 cm.

Not to scale
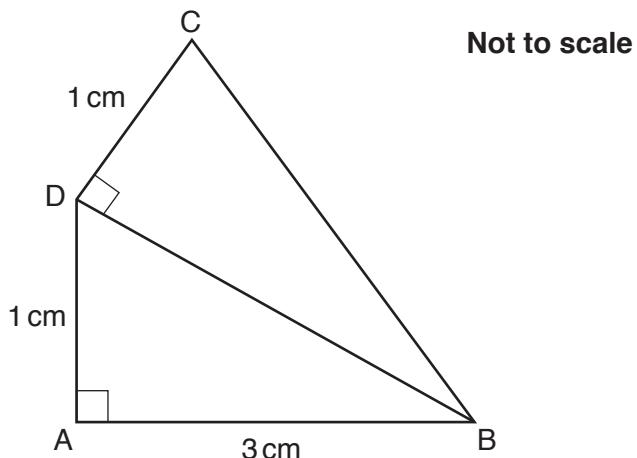
Calculate the length of BC. Give your answer in surd form.

.... cm **[4]**

Turn over

12 Part of the graphs of $y = x^2$ and $y = 100x$ are shown below.

Not to scale
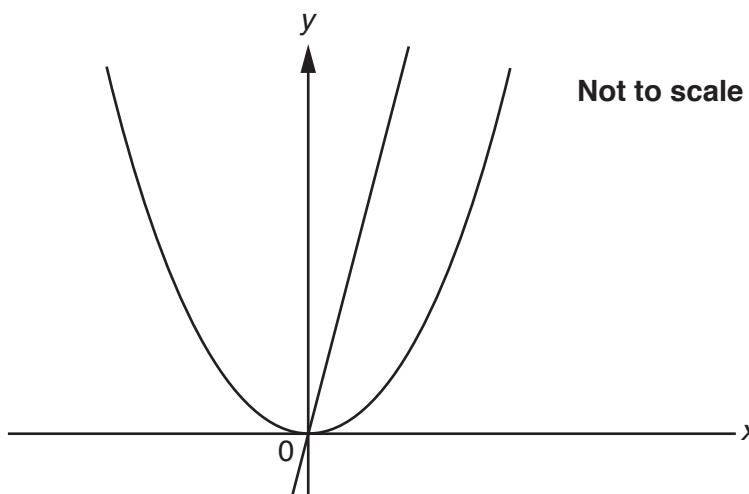
(a)* Explain why the intersection point(s) of the two graphs give(s) the solution of the simultaneous equations $y = x^2$ and $y = 100x$.

....

....

.... **[2]**

(b) Solve the simultaneous equations $y = x^2$ and $y = 100x$.

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

(c) In how many points do the graphs $y = x^2$ and $y = 100x$ intersect?

(c) .... **[1]**

13 The graph of $y = \dfrac{1}{x}$ is shown below.

Points A and B lie on the graph.
The x-coordinate of A is a. The x-coordinate of B is b. $b > a$.
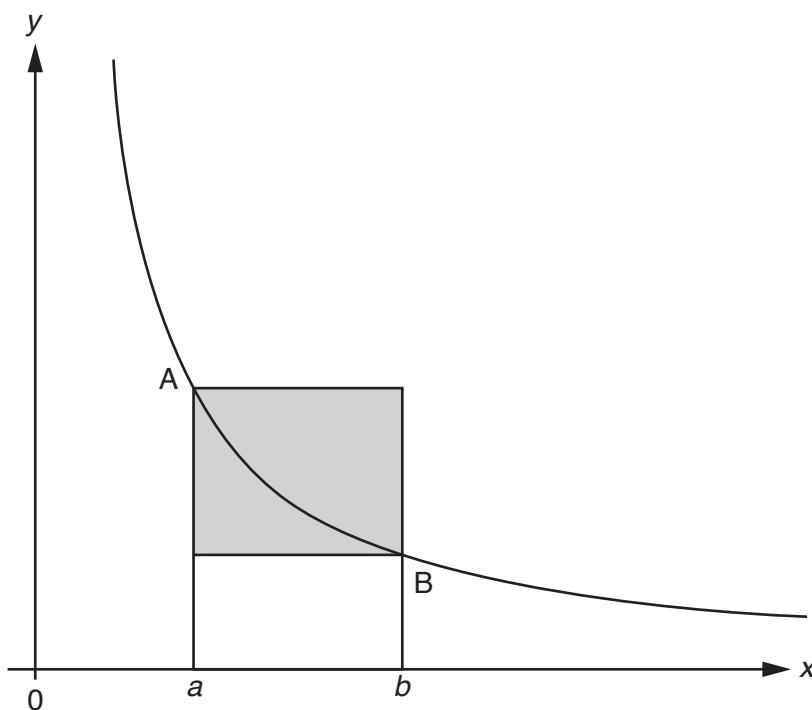
Lines parallel to the axes are drawn through points A and B to make a rectangle. This rectangle is shaded in the diagram.

Prove that the area of the shaded rectangle is $\dfrac{(b-a)^2}{ab}$.

....

....

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....

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....

....

.... **[5]**

Turn over

14 Points A, B, C, D, E and F lie on a straight line. The distance separating each of the points is 2 cm.
A semicircle with diameter AE crosses a semicircle with diameter BF.
The semicircles cross at G.
The region where the two semicircles overlap is shaded.
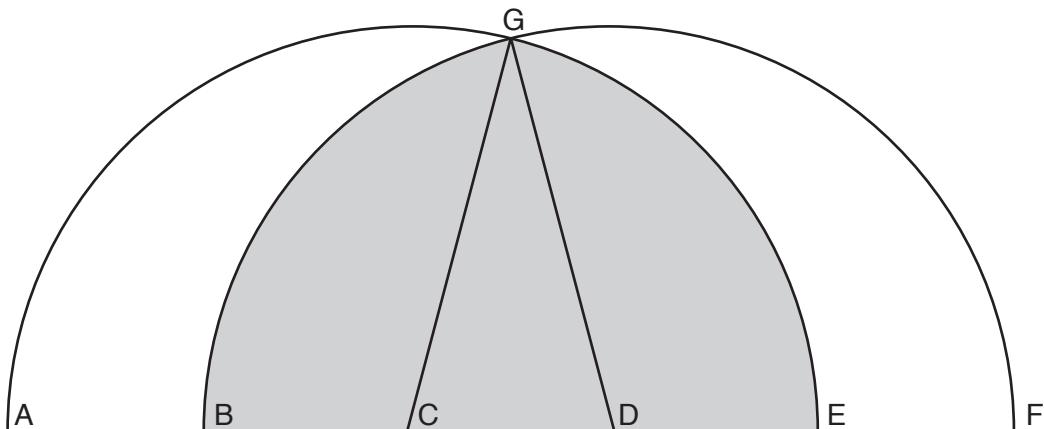
(a) Explain why GC is 4 cm long.

....

.... **[1]**

(b) Calculate the area of the shaded region.

(b) .... cm² **[8]**

END OF QUESTION PAPER