OCR
Oxford Cambridge and RSA

H

Thursday 9 June 2016 – Morning

GCSE MATHEMATICS A

A503/02 Unit C (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

* A 5 0 3 0 2 *

* 5 9 9 9 2 7 3 6 9 3 *

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 bar codes.

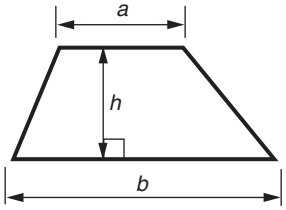
INFORMATION FOR CANDIDATES

- The number of marks is given in brackets **[ ]** at the end of each question or part question.
- Your quality of written communication is assessed in questions marked with an asterisk (*).
- Use the π button on your calculator or take π to be 3.142 unless the question says otherwise.
- The total number of marks for this paper is **100**.
- This document consists of **24** pages. Any blank pages are indicated.

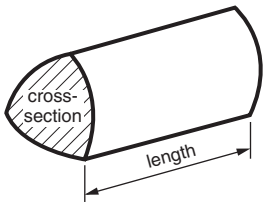
You are permitted to use a calculator for this paper

Formulae Sheet: Higher Tier

Area of trapezium $= \frac{1}{2}(a + b)h$



Volume of prism = (area of cross-section) × length

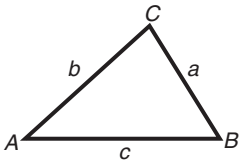


In any triangle *ABC*

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

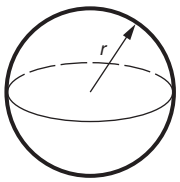
Cosine rule $a^2 = b^2 + c^2 - 2bc\cos A$

Area of triangle $= \frac{1}{2}ab\sin C$



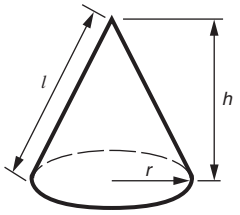
Volume of sphere $= \frac{4}{3}\pi r^3$

Surface area of sphere $= 4\pi r^2$



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

Curved surface area of cone $= \pi rl$



The Quadratic Equation

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

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

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Answer **all** the questions.

1 Terri travels to and from school by bus.
Here are the bus fares for different types of ticket.

Ticket type	Fare
1-way	£1.35
Return	£2.16
All week	£9.80

(a) One week, Terri travels to school and back by bus on 5 days.

How much cheaper is it to buy an 'All week' ticket rather than '1-way' tickets?

(a) £ ..... **[1]**

(b) Express the ratio

cost of **two** '1-way' tickets : cost of **one** 'Return' ticket

in its simplest form.

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

2 (a) (i) Louise has these numbers of different types of teeth.

8 incisors
4 canine
8 premolars
12 molars

What fraction of Louise's teeth are molars?
Give your answer in its simplest form.

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

(ii) Finn has 27 teeth.
About 18% of his teeth have fillings.

How many of Finn's teeth have fillings?

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

(iii) Kirsten has 30 teeth.

$\frac{2}{5}$ of her teeth have fillings.

How many of Kirsten's teeth have fillings?

(iii) ..... **[2]**

(b) A dentist has this information about her patients.

Number of fillings	0	1 or 2	3 or 4	More than 4
Probability	0.25	0.17		0.4

(i) Complete the table. **[2]**

(ii) One of the patients is chosen at random.

What is the probability that this person has 2 fillings or fewer?

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

(iii) Two of the patients are chosen at random.

Calculate the probability that they both have more than 4 fillings.

(iii) ..... **[2]**

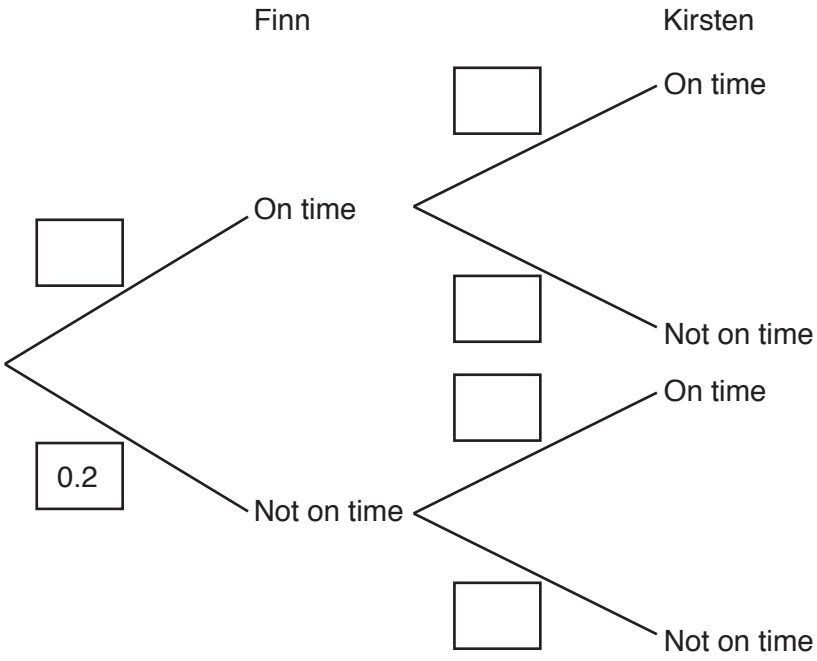
(iv) The dentist has 1500 patients altogether.

How many of these patients have 1 or 2 fillings?

(iv) ..... **[2]**

(c) Finn and Kirsten both visit the dentist.
The probability that the dentist **does not** see any patient on time is 0.2.

(i) Complete the tree diagram.

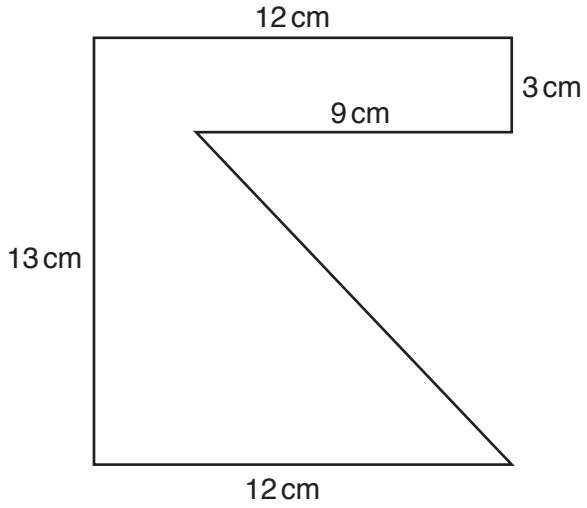


[2]

(ii) Calculate the probability that just one of Finn and Kirsten is not seen on time.

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

3 A right-angled triangle is cut from a rectangular piece of paper.



Not to scale

(a) Calculate the area of the paper remaining.

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

(b) Change your answer to part **(a)** into mm^2.

(b) ..... mm^2 **[1]**

4 **(a)** Simplify fully.

$$\frac{16y^4}{2y^2}$$

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

(b) Multiply out the brackets.

$$4x^2(x-6)$$

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

(c) Multiply out the brackets and simplify fully.

$$3(x-7)+5(2x+1)$$

(c) ..... **[3]**

5 A four-sided spinner is numbered 1 to 4.
The spinner is spun many times and, each time, the number it lands on is recorded.
The table shows the results.

Number	1	2	3	4
Frequency	132	117	128	123

(a) Explain why it is reasonable to use this information to work out an estimate of the probability of getting a 4 with this spinner.

.....

..... **[1]**

(b) Use the values in the table to work out an estimate of the probability of getting a 4 with this spinner.

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

(c) Is the spinner fair or biased?
Explain clearly how you decide.

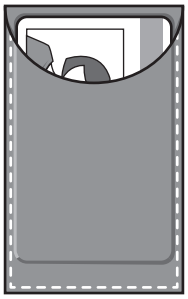
.....

..... **[2]**

6* The case shown below is used to store a travel card.

Not to scale

The case is two rectangles of leather joined together.
One of the rectangles has a semicircle cut away.



Work out the total area of leather in the case.

..... **[6]**

7 **(a)** Factorise fully.

$4xy - 10xw$

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

(b) Solve.

$x^2 = 49$

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

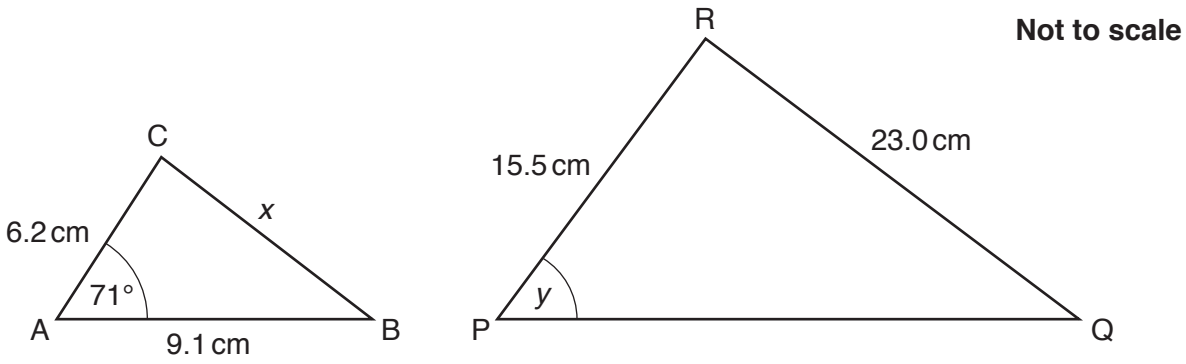
(c) Use the quadratic formula to solve this equation.

$3x^2 - 2x - 7 = 0$

Give your answers correct to 2 decimal places.

(c) ..... **[4]**

8 Triangles ABC and PQR are mathematically similar.



(a) Calculate length *x*.

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

(b) What is the size of angle *y*?

(b) ..... ° **[1]**

(c) Show that the area of triangle ABC is 26.7 cm^2, correct to 1 decimal place. **[2]**

(d) Work out the area of triangle PQR.

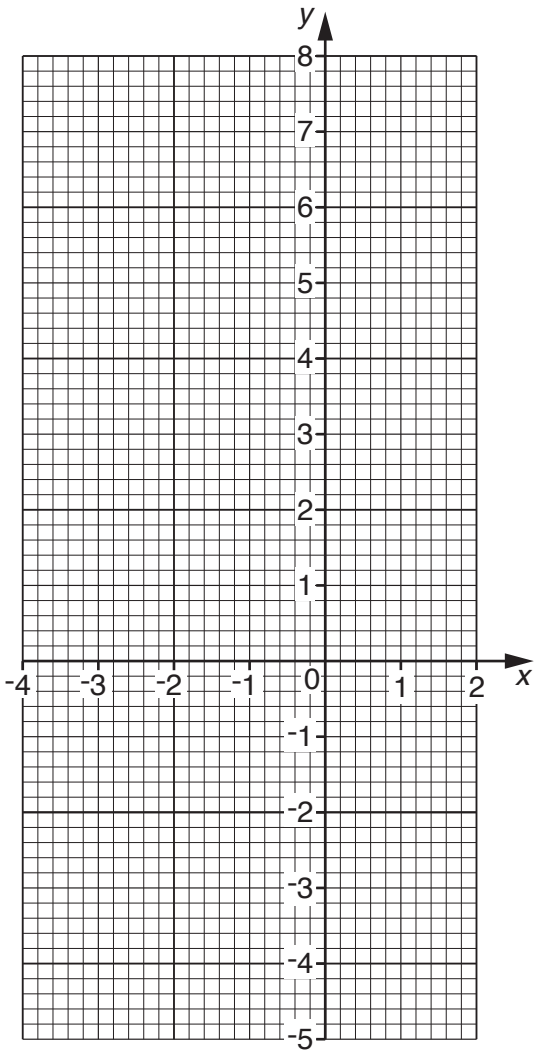
(d) ..... cm^2 **[2]**

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

x	-4	-3	-2	-1	0	1	2
y	2	-2					8

[2]

(b) On the grid, draw the graph of $y = x^2 + 3x - 2$ for $-4 \leqslant x \leqslant 2$.



[2]

(c) Use your graph to solve the equation $x^2 + 3x - 2 = 0$.

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

10 (a) Mehdi invests £4000 at a rate of 2% compound interest each year.
Calculate how much the investment is worth after 3 years.

(a) £ ..... **[3]**

(b) Alec earned £8164 in one year.
This was an increase of 4% on his earnings for the previous year.

Calculate Alec's earnings for the previous year.

(b) £ ..... **[3]**

11 **(a)** Write these in order, smallest first.

7.1×10^{5} 7.01×10^{-5} 7.1×10^{-5} 7.01×10^{-6}

.... **[3]**

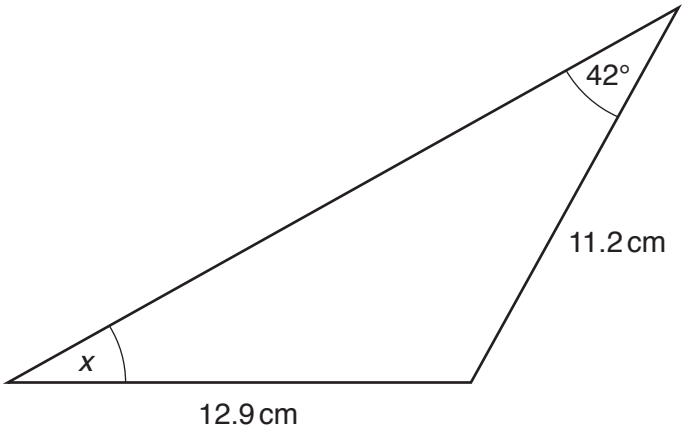
smallest

(b) The distance of the Sun from the Earth is 150 000 000 kilometres.
The speed of light is 3.0×10^{8} metres per second.

Calculate the time, in seconds, it takes for light to travel from the Sun to the Earth.

(b) ..... seconds **[3]**

12 Here is a triangle.

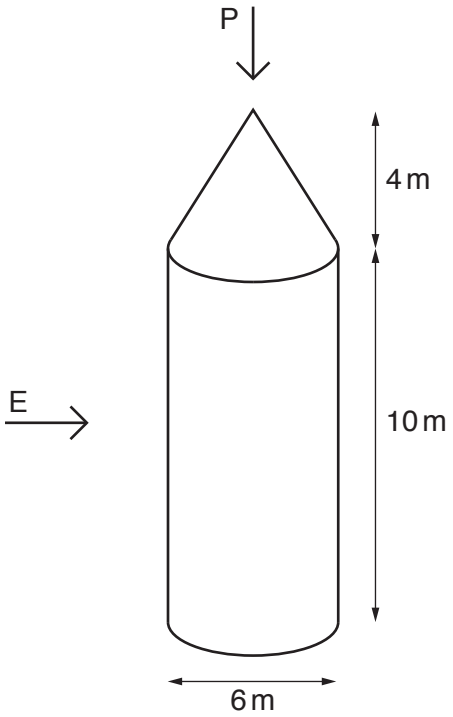


Not to scale

Work out the size of angle *x*.

..... ° **[3]**

13 The tower of a castle is a cylinder topped with a cone.

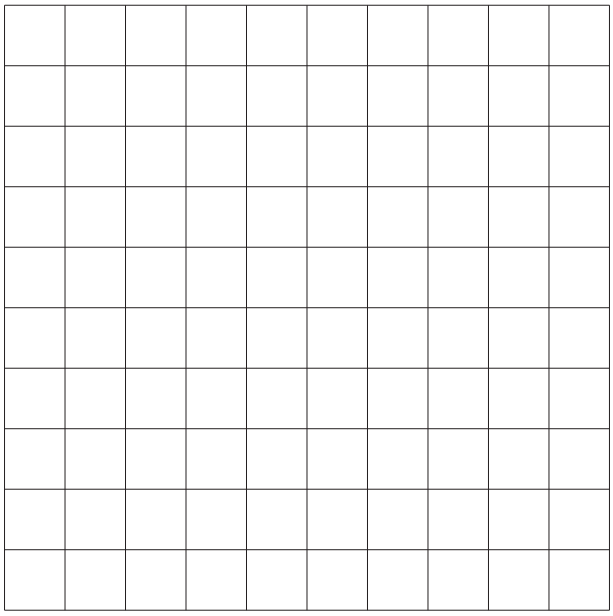


(a) Draw the side elevation (view from E) of the tower.
Use a scale of 1 square to 2 m.

Side elevation

[2]

(b) Draw the plan (view from P) of the tower.
Use a scale of 1 square to 1 m.



Plan

[2]

(c) Work out the volume of the tower.
Give your answer in terms of π, in its simplest form.

(c) ..... cm^3 **[4]**

14 **(a)** Simplify fully.

$$\frac{x^2 - 5x + 4}{x^2 - 2x - 8}$$

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

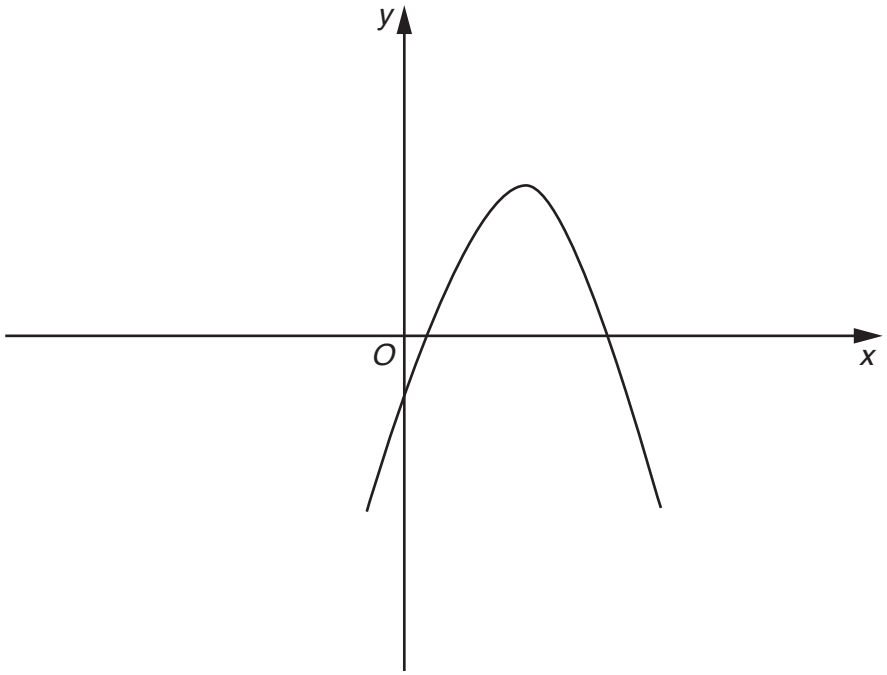
(b) Work out the value of a and the value of b in this identity.

$$x^2 - 8x + b \equiv (x + a)^2 + 2$$

(b) $a =$ .....

$b =$ ..... **[3]**

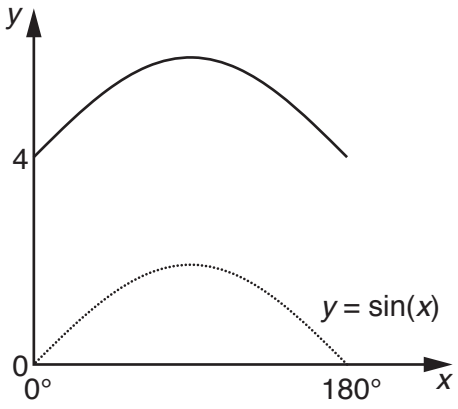
15 (a) Here is a sketch graph of $y = f(x)$.



On the same diagram, sketch the graph of $y = f(x - 2)$. **[1]**

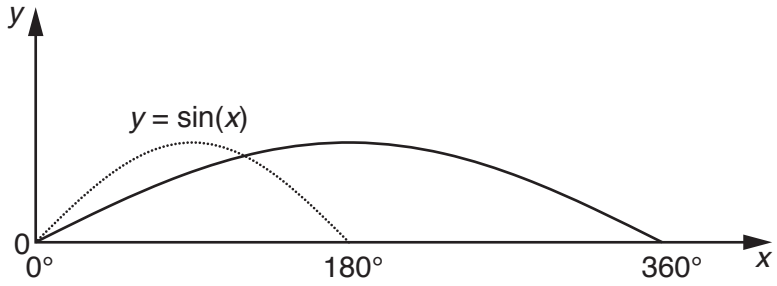
(b) In each part, write down the equation of the transformed graph.

(i)



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

(ii)



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

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