OCR

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Friday 13 June 2014 – 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

A503/02

12696562 17

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

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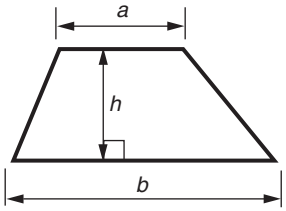
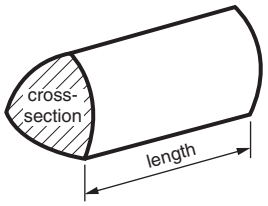
Formulae Sheet: Higher Tier

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



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

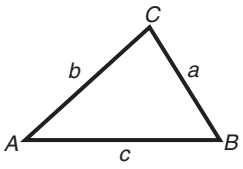


In any triangle *ABC*

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

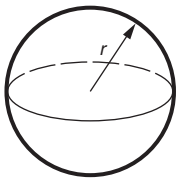
Cosine rule $a^2 = b^2 + c^2 - 2bc\cos A$

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



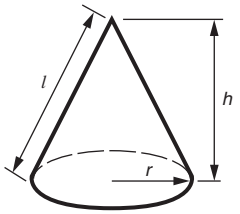
Volume of sphere $= \frac{4}{3}\pi r^3$

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

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

PLEASE DO NOT WRITE ON THIS PAGE

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Answer **all** the questions.

1 A school has a delivery of identical maths textbooks.
6 of these books, placed side by side, take up 15.9 cm of shelf length.

(a) What shelf length is taken up by 10 of these books, placed side by side?

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

(b) Another shelf is 90 cm long.

How many of these books will fit, side by side, on this shelf?

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

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2 Paula has two ordinary, fair, six-sided dice.
One is pink and the other is blue.
The two dice are thrown and the scores added.

(a) List the different ways in which Paula can throw a total of 5.

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

(b) What is the probability that Paula will throw a total of 5?

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

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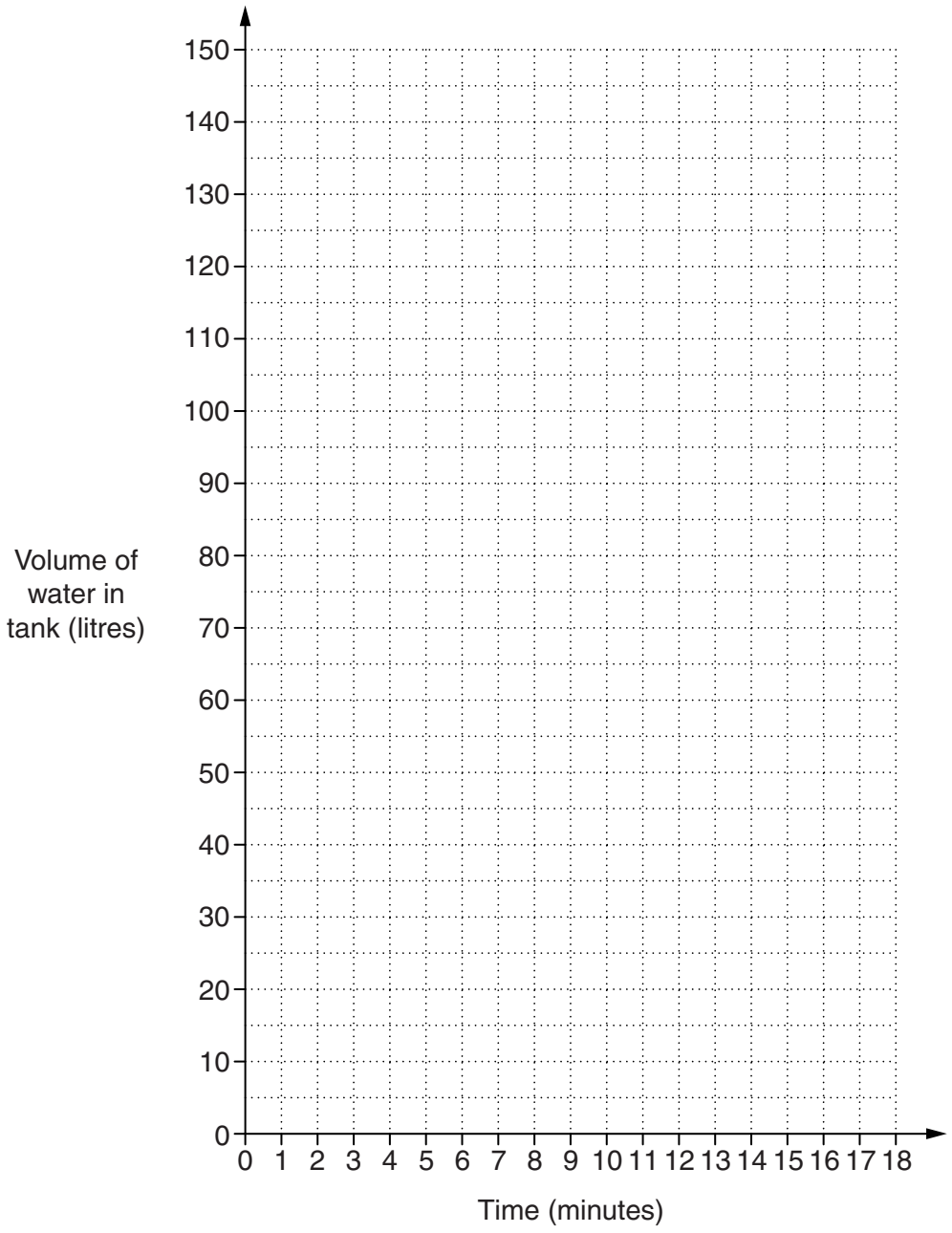
3 An empty water tank is to be filled with water and then emptied.
For the first 4 minutes it is filled at a constant rate of 20 litres per minute.
For the next 3 minutes it is filled at a constant rate of 15 litres per minute.
It is then left for 2 minutes.
It is then emptied at a constant rate of 25 litres per minute.

Show this information on the grid below.



[4]

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4 Simon is asked to solve an equation.

Here is his solution.

$$\begin{aligned} 2(3x - 1) &= 7 \\ 6x - 2 &= 14 \\ 6x &= 14 - 2 \\ 6x &= 12 \\ x &= \frac{1}{2} \end{aligned}$$

Simon has made **three** errors.

(a) Explain the errors that he has made.

1 .....

.....

2 .....

.....

3 .....

..... **[3]**

(b) Show by substitution that $x = \frac{1}{2}$ is **not** the solution to the equation $2(3x - 1) = 7$.

.....

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

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5 One week, Ahmed did a Maths test, an English test and a Science test.

(a) He scored 48 out of 60 in his Maths test.

Write 48 out of 60 as a fraction in its simplest form.

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

(b) Ahmed scored 34 out of 40 in his English test.

Work out 34 out of 40 as a percentage.

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

(c) Ahmed scored 54 out of 70 in his Science test.

In which of the three tests did Ahmed do best?
Show your working clearly.

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

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6 A random sample of students in a school is asked about their lunch arrangements.
The table shows their responses.

	School dinner	Sandwiches	Home	Local shop
Frequency	82	58	36	24

(a) (i) Complete the table of relative frequencies for these data.
Give each answer as a decimal.

	School dinner	Sandwiches	Home	Local shop
Relative frequency				

[3]

(ii) Explain why it is reasonable to use the relative frequencies as estimates of probability.

.....

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

(b) Use the data to work out an estimate of the probability that a student, chosen at random, either goes home or goes to the local shop for lunch.

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

(c) There are 3200 students in the school altogether.

How many of these would you expect to have a school dinner?

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

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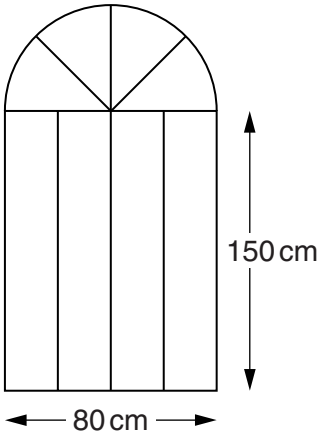
7 A gate is made from strips of metal.
The outline of the gate is a rectangle topped by a semicircle.



Not to scale

(a) Explain why the maximum height of the gate is 190 cm.

.....

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

(b)* Work out the total length of metal strip needed to make the gate.
Give your answer correct to 3 significant figures.

(b) ..... cm **[7]**

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8 **(a)** Simplify fully.

$$\frac{14x^2}{2x}$$

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

(b) Multiply out the brackets and simplify fully.

$$5y(3y - 2) + 4(3y^2 - 2y + 5)$$

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

(c) Factorise fully.

$$10x - 15$$

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

(d) Solve.

$$x^2 + 5 = 21$$

(d) ..... **[3]**

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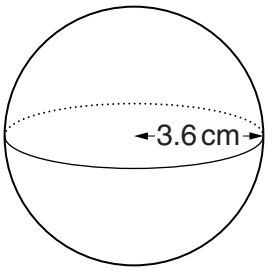
9 A cricket ball is a sphere of radius 3.6 cm.



(a) Work out the volume of the cricket ball.

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

(b) The mass of the cricket ball is 160 g.

Work out the density of the cricket ball.
Give the units of your answer.

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

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10 One year, a furniture store spent £15 000 on advertising.
This was a 20% increase on the amount spent in the previous year.

How much was spent on advertising in the previous year?

£ ..... **[3]**

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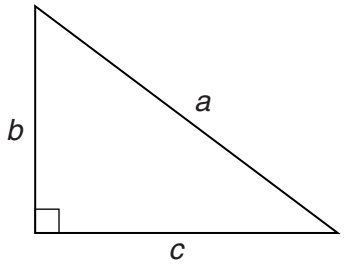
11 Here is a right-angled triangle.



For this triangle

$$a^2 = b^2 + c^2.$$

Calculate the value of c when $a = 2.1 \times 10^5$ cm and $b = 7.6 \times 10^4$ cm.
Give your answer in standard form to an appropriate degree of accuracy.

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

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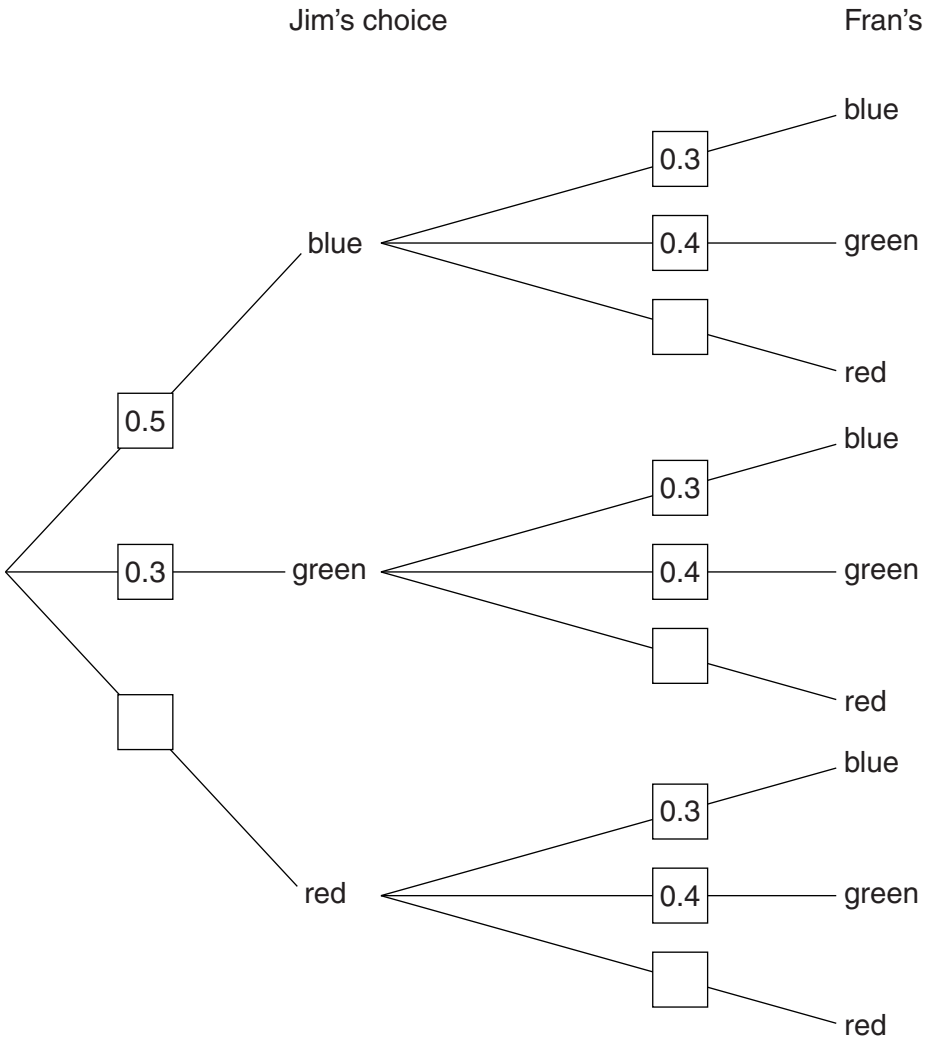
12 Jim and Fran each have a bag containing different numbers of blue, green and red counters only. Jim chooses a counter at random from his bag and then Fran chooses a counter at random from her bag.
The probabilities of randomly choosing blue and green counters are shown in the tree diagram.

(a) Complete the tree diagram.



[2]

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(b) Calculate the probability that one of the counters chosen is blue and the other is green.

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

(c) Calculate the probability that the two counters chosen are **the same colour**.

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

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13 At an awards ceremony, both the first prize and the second prize are statues.
The statues are mathematically similar and made from the same material.
The first prize statue is 20 cm tall and the second prize statue is 15 cm tall.

(a) The diameter of the base of the **smaller** statue is 6 cm.

Calculate the diameter of the base of the larger statue.

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

(b) The **larger** statue has a mass of 700 g.

Calculate the mass of the smaller statue.

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

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14 Solve.

$$x^2 + 4x + 1 = 0$$

Give your answers correct to 2 decimal places.

..... **[3]**

15 The distance from the Earth to the Moon varies as they move in their orbits.
The largest distance is 406 700 km correct to the nearest 100 km.
The smallest distance is 356 400 km correct to the nearest 100 km.

Calculate the largest possible difference between these two measurements.

..... km **[3]**

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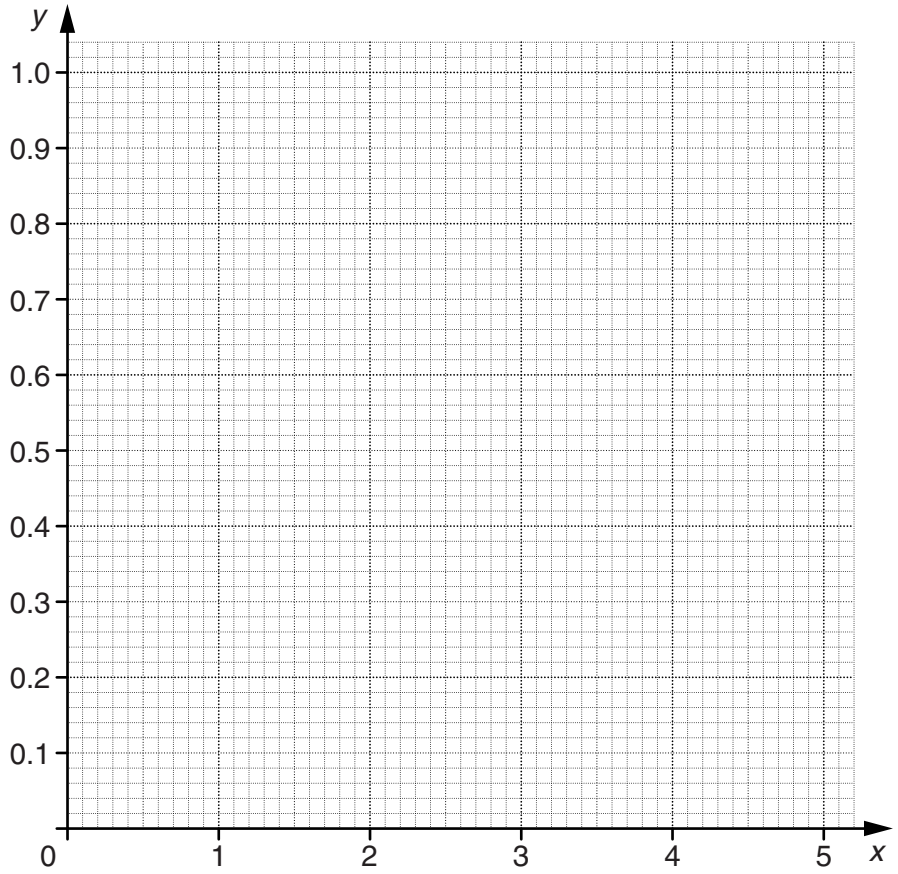
16 **(a)** Complete the table of values for $y = 0.5^x$.

x	0	1	2	3	4	5
y		0.5			0.0625	0.03125

[2]

(b) Draw the graph of $y = 0.5^x$ for $0 \leqslant x \leqslant 5$.



[2]

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(c) Use your graph to solve this equation.

$0.5^x = 0.4$

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

17 Solve algebraically these simultaneous equations.

$y = x^2 + 6x - 5$

$y = 2x + 7$

$x =$ ..... $y =$ .....

$x =$ ..... $y =$ ..... **[6]**

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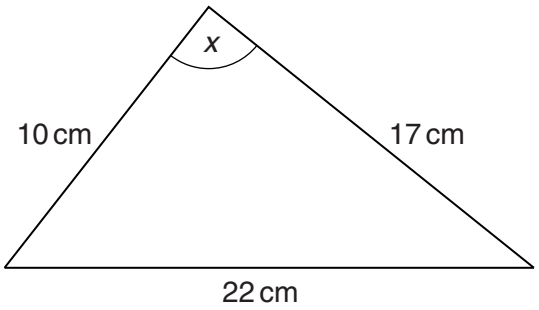
18 Elaine has this triangular piece of material.



Not to scale

(a) Show that $x = 106°$ correct to the nearest degree. **[3]**

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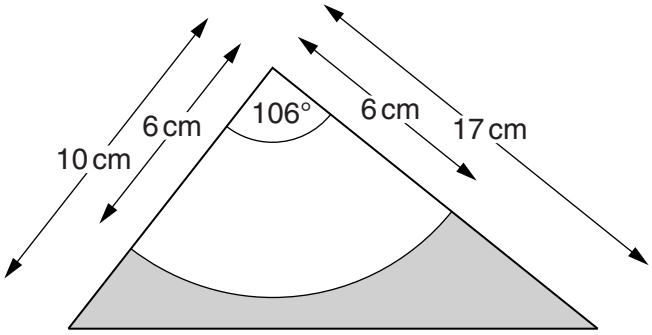
(b) From the material, Elaine cuts out a sector of a circle, radius 6 cm.



Not to scale

Find the area of the material left over, shown shaded.

(b) ..... cm^2 **[6]**

END OF QUESTION PAPER

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