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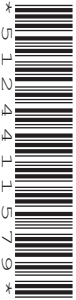## Friday 6 November 2015 – Morning

GCSE MATHEMATICS A

A503/02 Unit C (Higher Tier)

Duration: 2 hours

A50302

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).
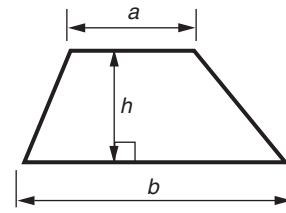*   Do **not** write in the bar codes.

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.
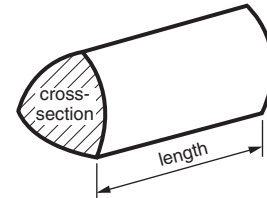
You are permitted to use a calculator for this paper

OCR is an exempt Charity

Turn over
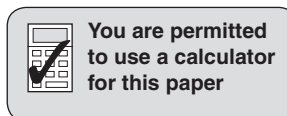
Formulae Sheet: Higher Tier

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

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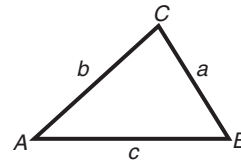
Volume of sphere $= \frac{4}{3}\pi r^3$

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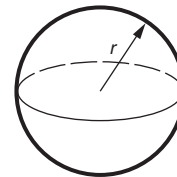
Volume of cone $= \frac{1}{3}\pi r^2 h$

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

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

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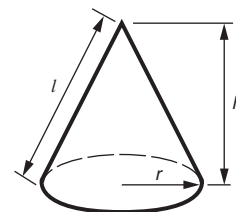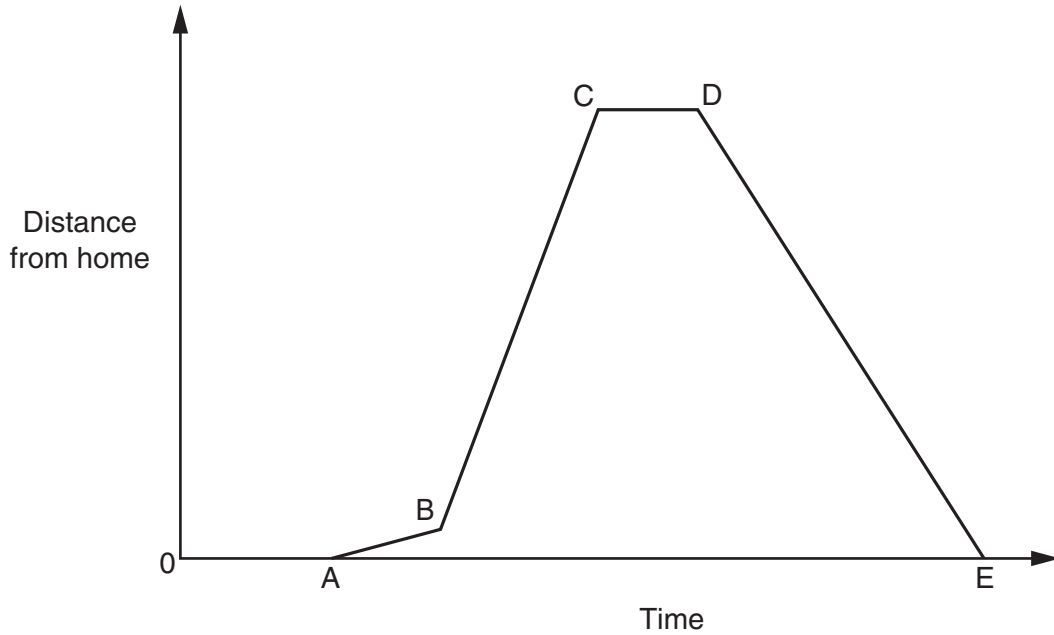**1** **(a)** Joe goes for a ride on his motorbike.

The graph below represents his journey.

Write a sentence to describe each part of Joe's journey.

The first has been done for you.

A to B – Joe sets off from home and then travels at a slow speed.

B to C – ....

C to D – ....

D to E – .... **[3]**

(b) On one part of his journey Joe travels for $\frac{3}{4}$ hour at an average speed of 28 km/h.

Calculate how far he travels in this part of his journey.

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

Turn over

(c) The petrol tank of Joe's motorbike holds 15 litres, correct to the nearest litre.
Petrol costs £1.30 per litre.

What is the **smallest** amount he would have to pay to fill the empty tank?

(c) £ .... **[2]**

2 Four friends go tenpin bowling.
They each pay for 3 games.
Each person pays £1.99 for the hire of shoes.
The total cost is £60.76.

Work out the cost each person pays for one game.

£ .... **[3]**

3 Multiply out and simplify.

$$2(3x-5)+3(x-4)$$

.... **[3]**

4 A dice is biased.

The table shows the probability of obtaining each of the scores on the dice.

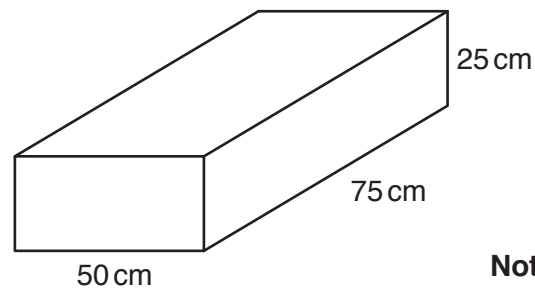| Score	1	2	3	4	5	6
Probability	x	$2x$	$3x$	$4x$	$5x$	$6x$

Work out the probability of obtaining a score of 3.

Give your answer as a fraction in its simplest form.

.... **[3]**

Turn over

5 A closed, empty box is a cuboid.
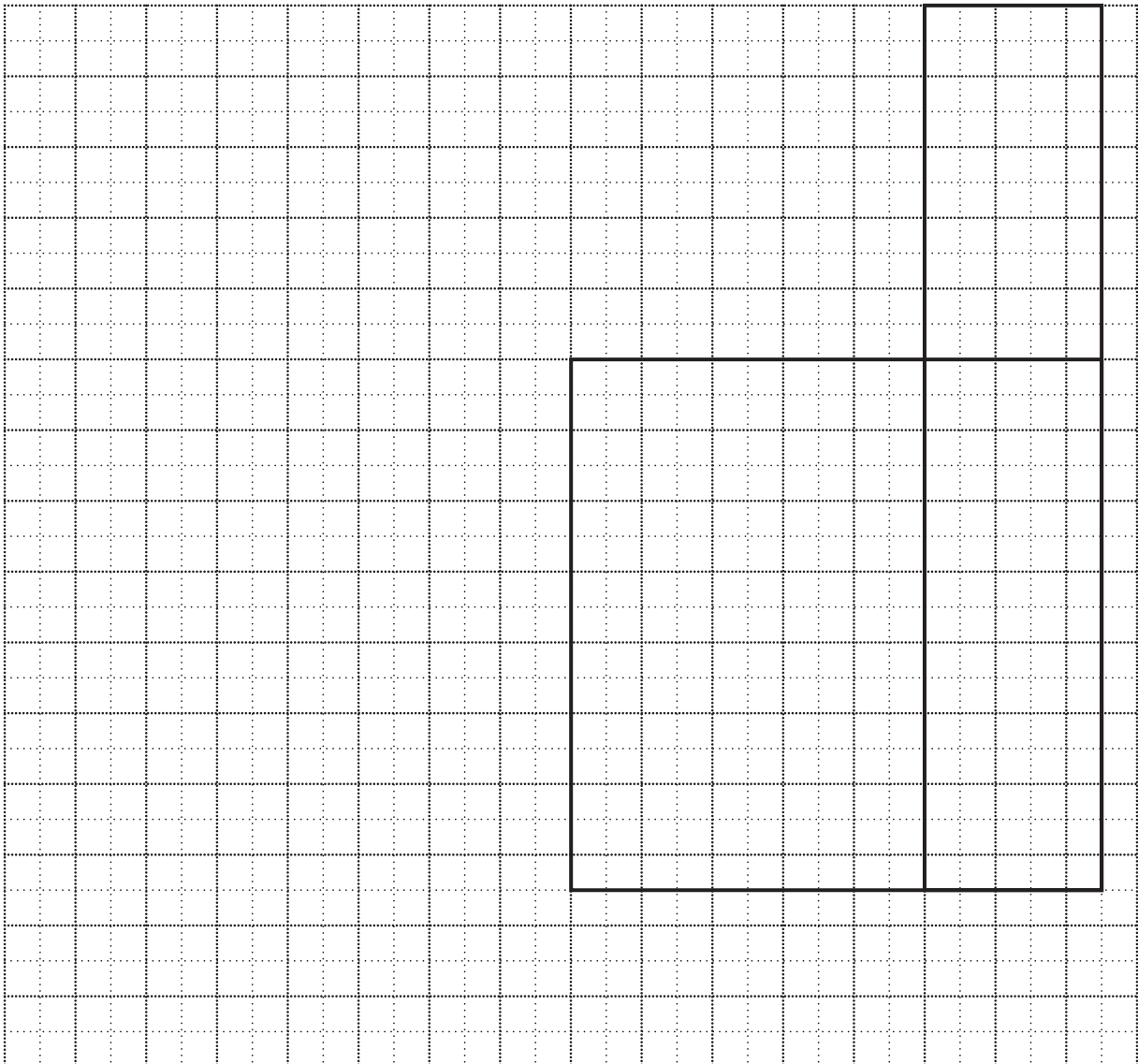

25 cm

75 cm

50 cm   **Not to scale**

(a) On the grid below, complete the net of the box.

The base and two of the sides have been drawn.
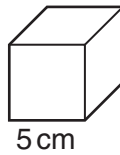
Use a scale of 1 cm to represent 10 cm.

[3]

(b) Work out the total area of the card used to make the **full size** box.

(b) .... cm² **[3]**

(c) The empty box is filled with small boxes which are all cubes of edge 5 cm.

5 cm

(i) Calculate the volume of one of these small boxes.

(c)(i) .... cm³ **[2]**

(ii) How many of these small boxes are needed to fill the large box?

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

Turn over

6 Georgina stops at a petrol station to put petrol in her car.

The gauge on the car shows that the petrol tank is $\frac{1}{4}$ full.
Georgina puts 42 litres of petrol into the tank.

The gauge now shows the petrol tank is $\frac{5}{6}$ full.

How many litres of petrol would be in the tank when it is full?

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

7 A fair dice is numbered 1 to 6.

    (a) The dice is thrown 100 times.

        How many times might you expect the dice to land on 6?

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

    (b) A fair spinner is numbered 1 to 4.
        The dice is thrown and the spinner is spun.

        Calculate the probability that the **total** of the two scores is 4.

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

Turn over

8 **(a)** Show that this is a formula for the total surface area, A, of a cube of edge length x.

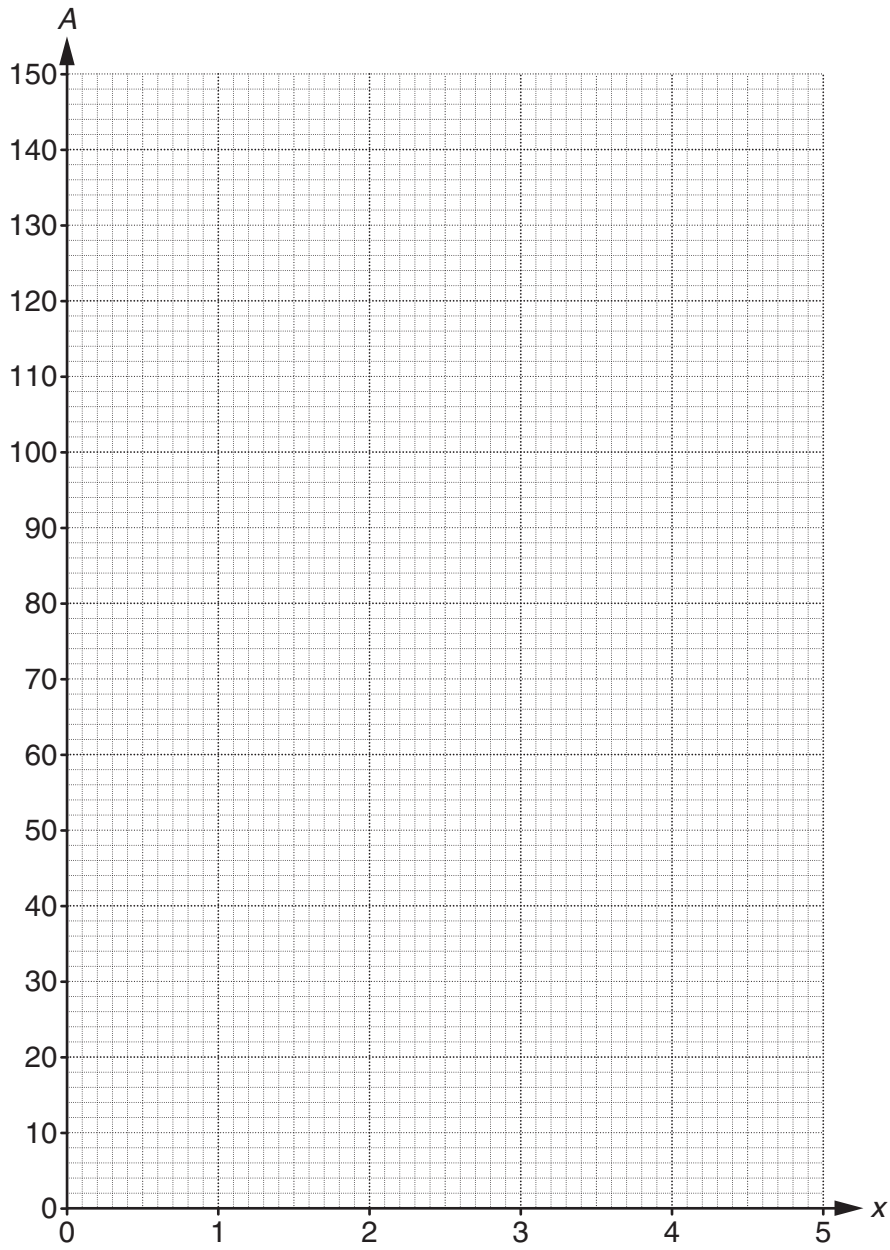$$A = 6x^2$$

Explain clearly each step of your work. **[2]**

(b) Complete the table for $A = 6x^2$ for $0 \leqslant x \leqslant 5$.

x	0	1	2	3	4	5
A	0					

[2]

(c) Draw the graph of $A = 6x^2$ for $0 \leqslant x \leqslant 5$.

[Graph grid with vertical axis labelled A from 0 to 150 in intervals of 10, and horizontal axis labelled x from 0 to 5.]

[2]

(d) Use your graph to find the length of the edge of a cube which has a total surface area of 70 cm^2.

(d) .... cm **[1]**

Turn over

9 **(a)** Factorise.

$$x^2 - 25x$$

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

(b) Factorise.

$$x^2 - 25$$

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

(c) Multiply out and simplify.

$$(x - 25)(x + 10)$$

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

10 (a) The shape of a badge on a school uniform is a square joined to a semi-circle.

$\leftarrow$ 6 cm $\rightarrow$

6 cm
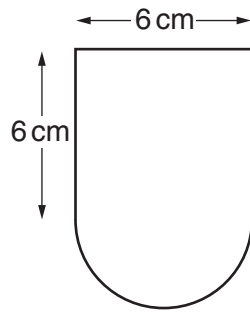
Not to scale

Show that the area of material used to make this badge is 50.1 cm², correct to 3 significant figures. **[3]**

(b) A sign in front of the school has a picture of this badge.
The picture is an enlargement of the badge.
The area of the picture is 16232.4 cm².

Work out the linear scale factor of the enlargement.

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

11 A baby weighs 7 pounds at birth.
It is expected that her weight will increase by 9% each month in the first year.

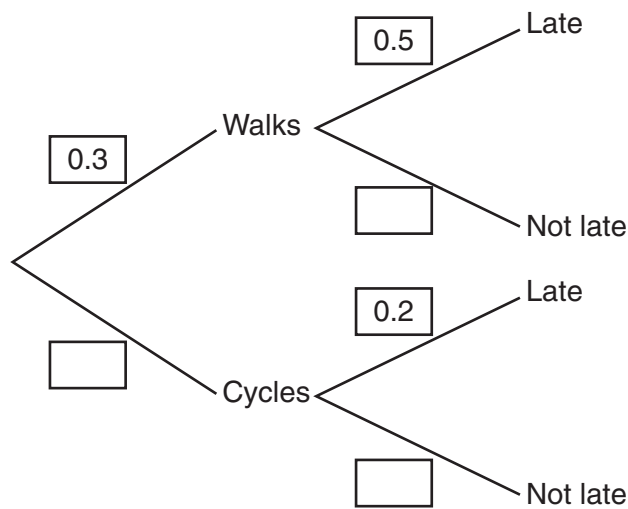Calculate the expected weight of the baby after 1 year (12 months).

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

12 Tariq either walks or cycles to school.
The probability that he walks is 0.3.

When he walks, the probability that he is late for school is 0.5.
When he cycles, the probability that he is late for school is 0.2.

(a) Complete the tree diagram.

[3]

(b) Calculate the probability that, on any day, Tariq is **not** late for school.

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

13 Solve these simultaneous equations.

$$3x - 2y = 13$$
$$7x + 6y = 9$$

x = ...

y = ... **[3]**

Turn over

14 (a) Write 6.9×10^{-3} as an ordinary number.

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

(b) The table shows the population and area of each of the countries in the United Kingdom in 2012.

	England	Scotland	Wales	Northern Ireland
Population	5.4×10^{7}	5.3×10^{6}	3.1×10^{6}	1.8×10^{6}
Area (km²)	1.3×10^{5}	7.8×10^{4}	2.1×10^{4}	1.4×10^{4}

(i) Use the table to work out the total population of the United Kingdom in 2012.
Give your answer in standard form.

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

(ii) Which of the four countries has the smallest population density?
You must show all your working to justify your answer. **[4]**

15 The television news stated that, this year, unemployment had decreased by 3% to 2.56 million people.

Work out how many people were unemployed last year.

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

16 Fill in the blank spaces of the working to demonstrate the method of completing the square being used to solve this quadratic equation.

$$x^2 - 10x - 7 = 0$$

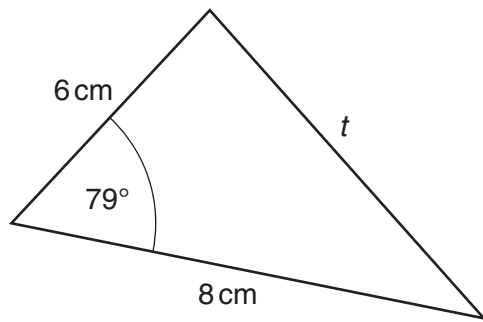Give your answers correct to 1 decimal place.

$$x^2 - 10x - 7 = 0$$

$$(x - \quad)^2 \quad - 7 = 0$$

$$(x - \quad)^2 =$$

$$x - \quad =$$

$$x = \quad \text{or} \quad \text{correct to 1 dp}$$

[5]

Turn over

17 Here is a triangle.

6 cm

t

Not to scale

79°

8 cm

(a) Work out the length *t*.

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

(b) Work out the area of the triangle.

(b) .... cm² **[2]**

18 Solve these simultaneous equations algebraically.

$$y = 2x^2 + 7x - 6$$
$$y = 2x + 6$$

$x = $ …………..…… $y = $ …………..……

$x = $ …………..…… $y = $ …..…………… **[7]**

Turn over

19 Here is an ice cream cone.
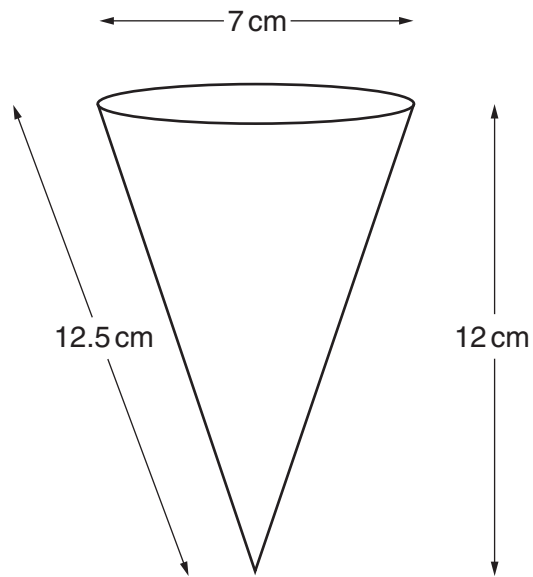
The cone is filled with ice cream so that the ice cream is level with the top of the cone.

Calculate the area of the wrapper used to **completely** cover the cone and the ice cream.

.... cm² **[3]**

20* A cuboid ABCDEFGH has dimensions 6 cm by 7 cm by 5 cm.
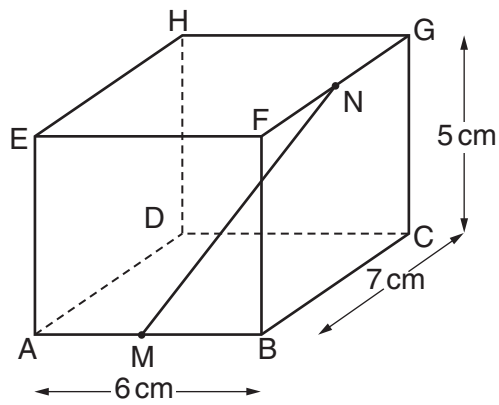
M is the midpoint of AB and N is the midpoint of FG.
Work out the angle that the line MN makes with the base, ABCD, of the cuboid.

....° **[5]**

END OF QUESTION PAPER

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