OCR

H

Friday 7 November 2014 – Morning

GCSE MATHEMATICS A

A503/02   Unit C (Higher Tier)

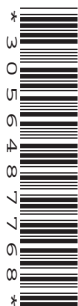Candidates answer on the Question Paper.

OCR supplied materials:
None

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

Duration: 2 hours

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**.
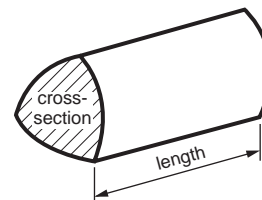*   This document consists of **20** pages. Any blank pages are indicated.

You are permitted to use a calculator for this paper

Turn over

2
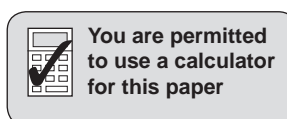
Formulae Sheet: Higher Tier

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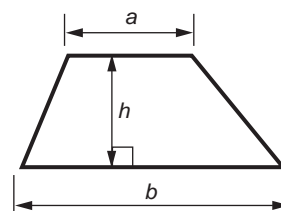
Volume of prism = (area of cross-section) × length

In any triangle *ABC*

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

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

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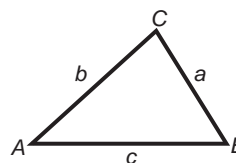
Volume of sphere $= \frac{4}{3}\pi r^3$

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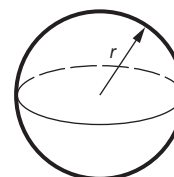
Volume of cone $= \frac{1}{3}\pi r^2 h$

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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3

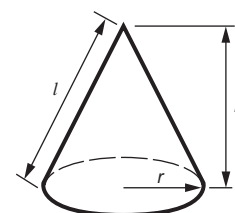Answer **all** the questions.

1   200 students from Years 10 and 11 in a school were asked whether they preferred Maths lessons or Science lessons.

The table below summarises how they responded.

	Year 10	Year 11	Total
Maths	73		
Science			81
Total	110		200

(a) Complete the table.   **[3]**

(b) One of the 200 students is chosen at random.

What is the probability that this student is from Year 10?

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

(c) One of these 200 students is chosen at random.

What is the probability that this student is from Year 11 and prefers Maths lessons?

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

Turn over

4

2 Toni makes this solid prism using one-centimetre cubes.

P

F
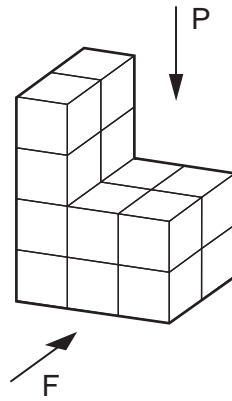
(a) (i) Draw the plan (view from P) of this solid shape.
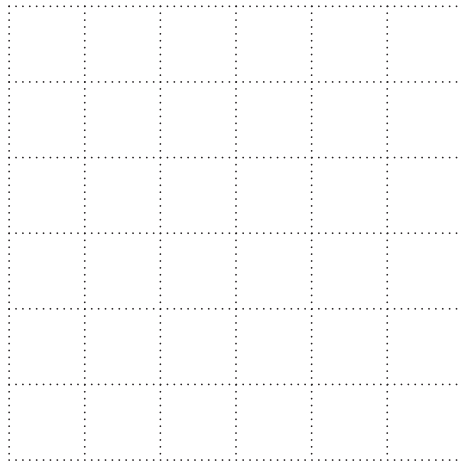
[1]

(ii) Draw the front elevation (view from F) of this solid shape.
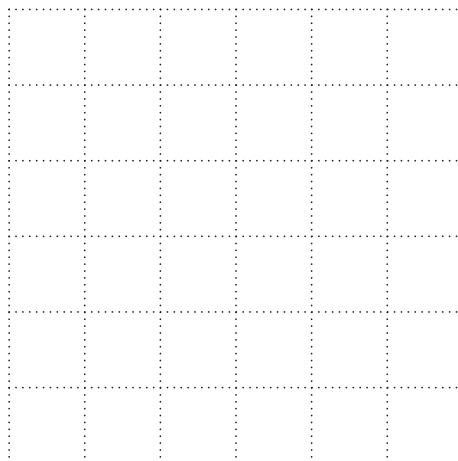
[1]

5

(b) Toni had a box containing 100 one-centimetre cubes.

How many cubes did she have left after making the solid prism?

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

3 Work out the total area of this shape.
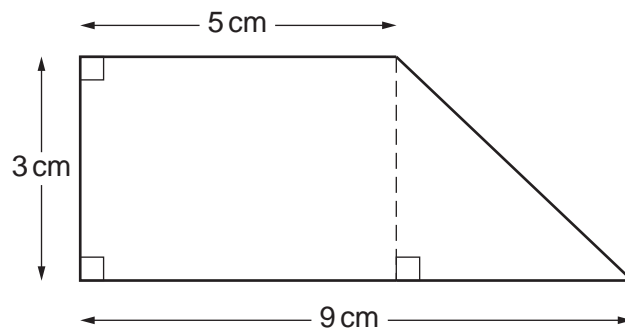
Not to scale

.... cm² **[3]**

6

4 **(a)** Ravi has a 500 g bag of sugar.
He uses 150 g of the sugar to make a cake.

What fraction of the bag of sugar does he use?
Give your answer as a fraction in its simplest form.

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

(b) Elaine is making bread.
She uses 3 pounds of flour.

Roughly how many kilograms of flour is this?

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

5 **(a)** Simplify fully.

$$\frac{4xy}{6x}$$

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

(b) Multiply out the brackets and simplify fully.

$3(2x - 1) + 4(3x - 2)$

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

6   18 men take 20 days to build a house.

How long will it take 15 men, working at the same rate, to build an identical house?

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

7   There are only red counters, white counters and blue counters in a box.
The table shows the probability of choosing a red counter or a white counter at random
from the box.

Colour	Red	White	Blue
Probability	0.15	0.7	

(a)   Complete the table to show the probability of choosing a blue counter.   **[2]**

(b)   Work out the probability that a counter, chosen at random from the box, is either red or white.

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

(c)   Write **two** different facts about the **number** of counters of each colour that are in the box.

1..

....

2..

....

[2]

Turn over

8

8 A fence in Phil's garden is a rectangle 15 m long and 1.8 m high.
He is going to paint both sides of the fence.
One tin of paint covers 10 m^2.

What is the smallest number of tins of paint that Phil needs to buy?

.... **[3]**

9 One solution of the equation $x^3 - 4x = 25$ lies between 3 and 4.

Use trial and improvement to find this solution correct to 1 decimal place.
Show all your trials and their outcomes.

.... **[4]**
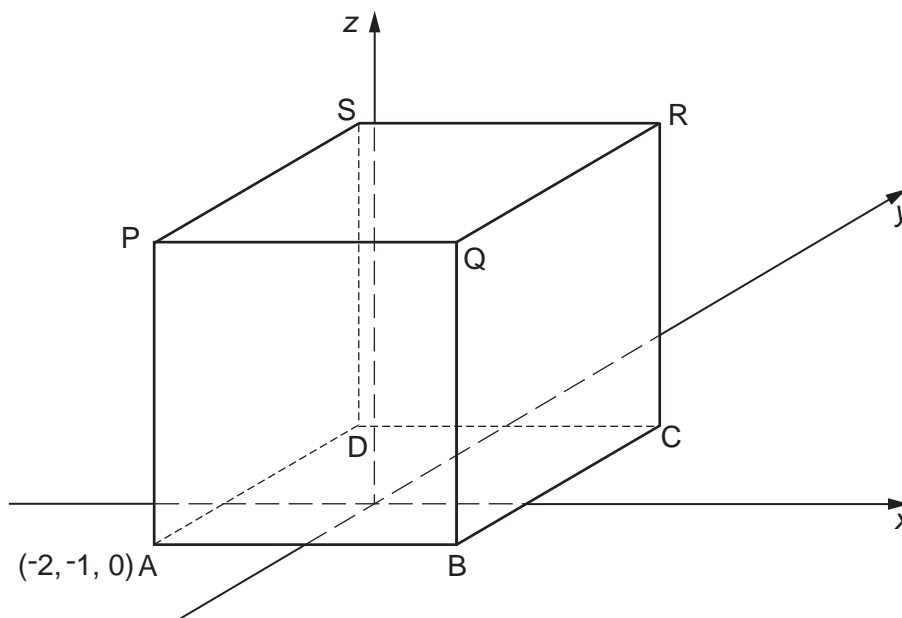
10 The cube ABCDPQRS has sides 4 cm long.

It is drawn on 3D axes where each axis uses a one-centimetre scale.
AB is parallel to the *x*-axis.
BC is parallel to the *y*-axis.
CR is parallel to the *z*-axis.
Point A has coordinates (⁻2, ⁻1, 0).

Work out the coordinates of the points P, B and R.

P (.............. , ... , ...)

B (.............. , ... , ...)

R (.............. , ... , ...) **[3]**

11 (a) It takes Amelie half an hour to travel 13 miles into town.

Calculate her average speed in miles per hour.

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

(b) One day Amelie drives down the motorway.

The speedometer of her car shows 69 mph correct to the nearest 2 mph.
A speed camera on the motorway checks the speed of cars to see if they exceed 70 mph correct to the nearest mph.

Is it possible the speed camera records that Amelie has exceeded the speed limit?
Show clearly how you decide. **[3]**

12 A biased five-sided spinner is numbered 1 to 5.
Terry spins this spinner 200 times and it lands on the number three 62 times.
Pat spins this spinner 300 times and it lands on the number three 88 times.

(a) Who will obtain the more reliable estimate of the probability that it lands on the number three?
Give a reason for your answer.

.... because ....

.... **[1]**

(b) Use the results to work out the best possible estimate of the probability that the spinner will land on the number three.

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

11

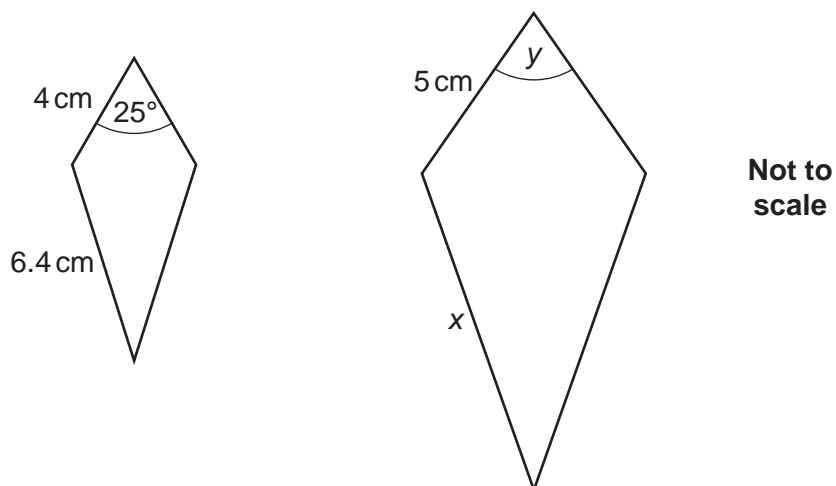**13** On the 1st of January, a car was valued at £15 000.
Each year, the value of the car decreases by 18% of its value at the start of that year.

By how much will the value of the car have decreased after 3 years?

£ .... **[4]**

14 These two kites are mathematically similar.

4 cm 25°

6.4 cm

5 cm

y

x

Not to scale

(a) Calculate length *x*.

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

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

(b) ....° **[1]**

Turn over

15 (a) Multiply out and simplify fully.

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

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

(b) Solve.

$(x - 1)(2x + 5) = 0$

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

(c) Factorise.

$x^2 - 2x - 24$

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

13

16 A ball is kicked into the air.
The height, h metres, of the ball above the ground after t seconds is given by this formula.

$$h = 17t - 5t^2$$

(a) Complete the table of values.

t	0	0.5	1	2	2.5	3
h	0	7.25		14		6

[2]

(b) Draw the graph of $h = 17t - 5t^2$.

Height
(h metres)

Time (t seconds)
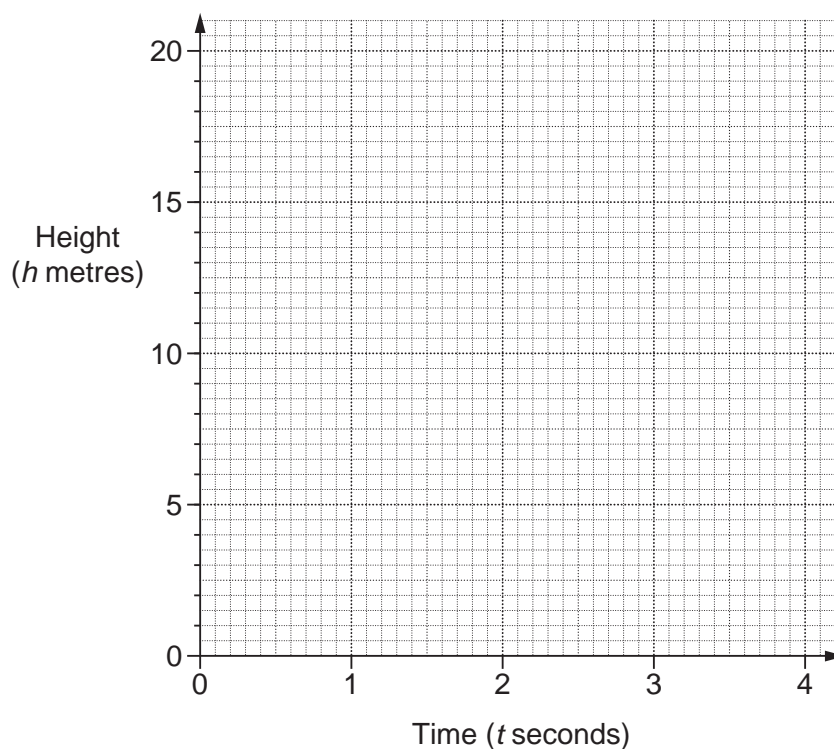
[2]

(c) Use your graph to estimate the maximum height of the ball.

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

(d) Use your graph to estimate the time when the ball hits the ground.

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

Turn over

14

17 (a) Write this ordinary number in standard form.

725 000

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

(b) Which of these numbers is bigger?
Explain how you know.

3.6×10^{-4} 3.6×10^{-5}

.... is bigger because ....

.... **[2]**

18 A spherical football has a **circumference** of 60 cm.

Calculate the surface area of the football.
Give your answer in its simplest form, in terms of π.

.... cm^2 **[5]**

19* In the diagram below, the perimeter of the square is equal to the perimeter of the rectangle.
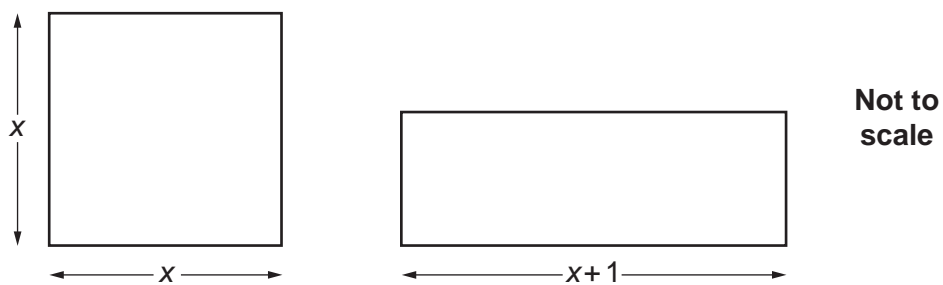
Show algebraically that the area of the square is greater than the area of the rectangle. **[6]**

20 There are 10 boys and 15 girls in a maths class.
Two of the class are selected at random to take part in a survey.

What is the probability that two boys are chosen?
Give your answer as a fraction in its simplest form.

.... **[4]**

21 A box is a cuboid measuring $3\,\text{cm}$ by $7\,\text{cm}$ by $8\,\text{cm}$.
A stick of length $10\,\text{cm}$ is placed in the box with one end of the stick in one corner of the box, as shown in the diagram.
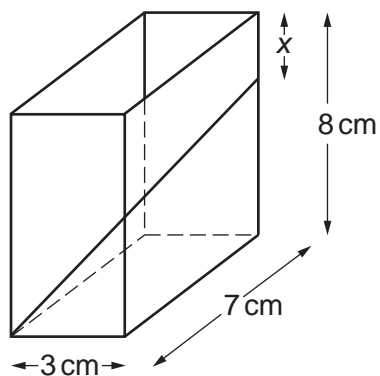
(a) Show that x, the distance of the upper end of the stick from the top corner of the box, is $1.5\,\text{cm}$ correct to 1 decimal place. **[5]**

(b) Work out the angle that the stick makes with the base of the box.

(b) ....° **[3]**

Turn over

22 A graph has this equation, where *a* and *b* are positive numbers.

$$y = a(b^x)$$

Here is a table of values for the graph.

x	0	2
y	3	75

(a) Use values from the table to find *a* and *b*.

(a) a = ...

b = ... **[4]**

(b) Find the value of *y* when *x* = 4.

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

END OF QUESTION PAPER

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20

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