

**Friday 4 November 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**



Candidate forename		Candidate surname	
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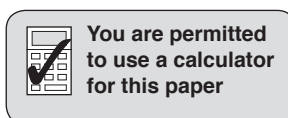
Centre number						Candidate number				
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**INSTRUCTIONS TO CANDIDATES**

- 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.

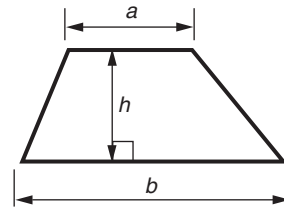
**INFORMATION FOR CANDIDATES**

- 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  $\pi$  button on your calculator or take  $\pi$  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.

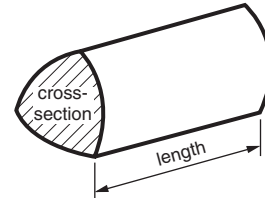


## Formulae Sheet: Higher Tier

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



**Volume of prism** = (area of cross-section)  $\times$  length

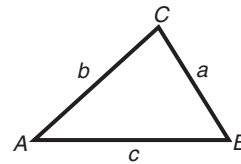


**In any triangle ABC**

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

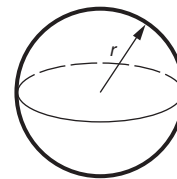
**Cosine rule**  $a^2 = b^2 + c^2 - 2bc \cos A$

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



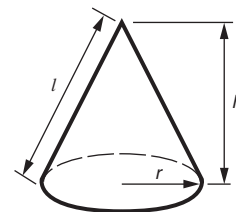
**Volume of sphere** =  $\frac{4}{3}\pi r^3$

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



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

**Curved surface area of cone** =  $\pi r l$



**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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Answer **all** the questions.

1 Luther completed a 14 mile sponsored walk for charity.

(a) He was sponsored £132.15 for every mile.

How much money did he raise altogether?

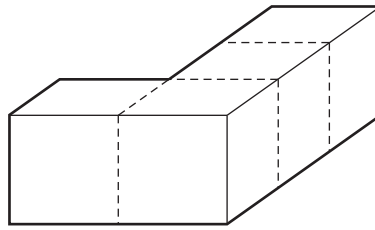
(a) £ \_\_\_\_\_ [2]

(b) Luther completed the walk at an average speed of 3 mph.

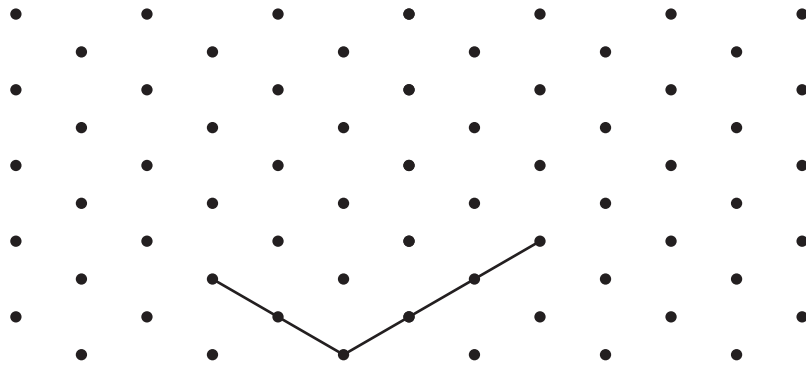
How long did it take him to complete the 14 miles?  
Give your answer in hours and minutes.

(b) \_\_\_\_\_ hours \_\_\_\_\_ minutes [3]

2 An L-shaped block is made by joining four one-centimetre cubes.



(a) On the grid, complete the isometric drawing of the block. Two edges have been drawn for you.



[2]

(b) What is the **total** surface area of the L-shaped block?

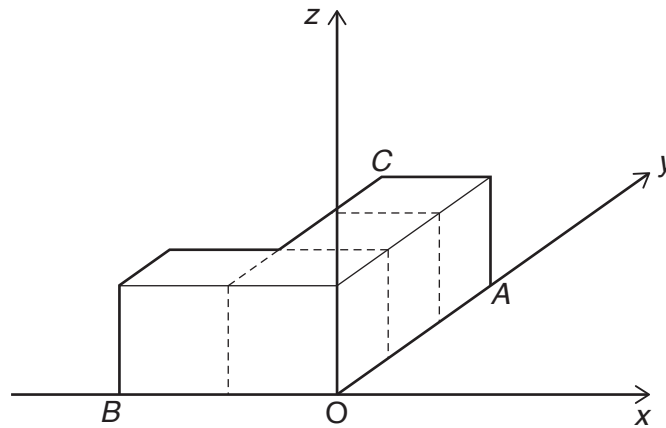
(b) \_\_\_\_\_ cm<sup>2</sup> [1]

(c) Thea has a box of these L-shaped blocks, each made from four one-centimetre cubes. The L-shaped blocks cannot be taken apart.

What is the **smallest** number of these blocks that Thea needs to make a cube?  
 What will be the edge length of this cube?

\_\_\_\_\_ of these blocks will make a cube of edge length \_\_\_\_\_ cm. [2]

- (d) The block is placed on a 3D coordinate grid.  
One centimetre is 1 unit on the grid.



- (i) Write down the coordinates of the following points.

(d)(i) A ( \_\_\_\_\_ , \_\_\_\_\_ , \_\_\_\_\_ )

B ( \_\_\_\_\_ , \_\_\_\_\_ , \_\_\_\_\_ )

C ( \_\_\_\_\_ , \_\_\_\_\_ , \_\_\_\_\_ ) [3]

- (ii) On the diagram, mark with a cross the point which has coordinates (0, 1, 1). [1]

3 You are given that  $T = 7x - y^2$ .

(a) Work out the value of  $T$  when  $x = 4$  and  $y = 5$ .

(a) \_\_\_\_\_ [2]

(b) Work out the value of  $x$  when  $T = 17$  and  $y = 2$ .

(b) \_\_\_\_\_ [3]

- 4 A rectangle has length 5.5 cm and width 2.6 cm.  
The rectangle is enlarged by a scale factor of 3.

(a) Work out the perimeter and the area of the enlarged rectangle.

(a) Perimeter of enlarged rectangle \_\_\_\_\_ cm

Area of enlarged rectangle \_\_\_\_\_ cm<sup>2</sup> [3]

(b) Complete these statements.

Perimeter of enlarged rectangle = \_\_\_\_\_ × perimeter of original rectangle

Area of enlarged rectangle = \_\_\_\_\_ × area of original rectangle [2]

5 A fair, four-sided spinner is numbered 1, 2, 3 and 4.

(a) The spinner is spun 140 times.

How many times would you expect it to land on 3?

(a) \_\_\_\_\_ [2]

(b) The spinner is spun twice and the scores added.

(i) Complete the table for the possible totals.

		First spin			
		1	2	3	4
Second spin	1			4	
	2				
	3				
	4				

[2]

(ii) What is the probability of spinning the spinner twice and getting a total of 4?

(b)(ii) \_\_\_\_\_ [2]



- 6 A 700 ml bottle of lemonade costs 95p.  
A 2 litre bottle of the same lemonade costs £2.45.

Which of the bottles is the better value for money?  
Show how you decide.

[5]

- 7 You are given the following information.

$$a + a + a = 24$$

$$a + b + b = 11$$

$$a + b + c = 7$$

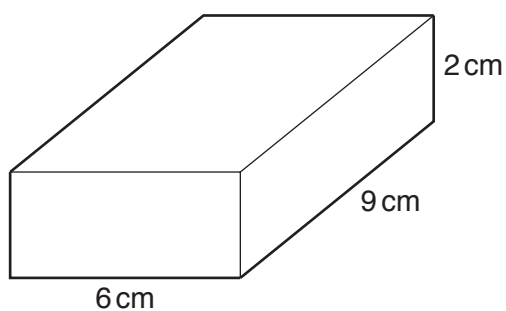
Work out the value of  $a$ , the value of  $b$  and the value of  $c$ .

$$a = \underline{\hspace{10cm}}$$

$$b = \underline{\hspace{10cm}}$$

$$c = \underline{\hspace{10cm}} \quad [4]$$

8 Here is a cuboid.



(a) Show that the volume of the cuboid is  $108 \text{ cm}^3$ . [1]

(b) Another cuboid also has a volume of  $108 \text{ cm}^3$ .  
One edge of this cuboid is  $4.5 \text{ cm}$ .  
Each of the other two edges is a whole number of centimetres.

Work out all possible pairs of lengths of the other two edges of the cuboid. [4]

(c) Change  $108 \text{ cm}^3$  into  $\text{mm}^3$ .

(c) \_\_\_\_\_  $\text{mm}^3$  [2]

- 9 A car is bought for £15 000.  
Each year the value of the car decreases by 12%.

Calculate the value of the car at the end of 4 years.

£ \_\_\_\_\_ [3]

- 10 (a) The wavelength of light is  $5.4 \times 10^{-7}$  m.

Write this as an ordinary number.

(a) \_\_\_\_\_ m [1]

- (b) How many wavelengths of light are there in 1 km?  
Give your answer in standard form to an appropriate degree of accuracy.

(b) \_\_\_\_\_ [3]

- 11 (a)\* Darius has a bag containing 3 white counters and 2 black counters.  
Ellie has a bag containing 4 white counters and 1 black counter.

Darius puts one of his counters in Ellie's bag.

Darius' bag now has 4 counters and Ellie's bag now has 6 counters.

A counter is now chosen, at random, from each bag.

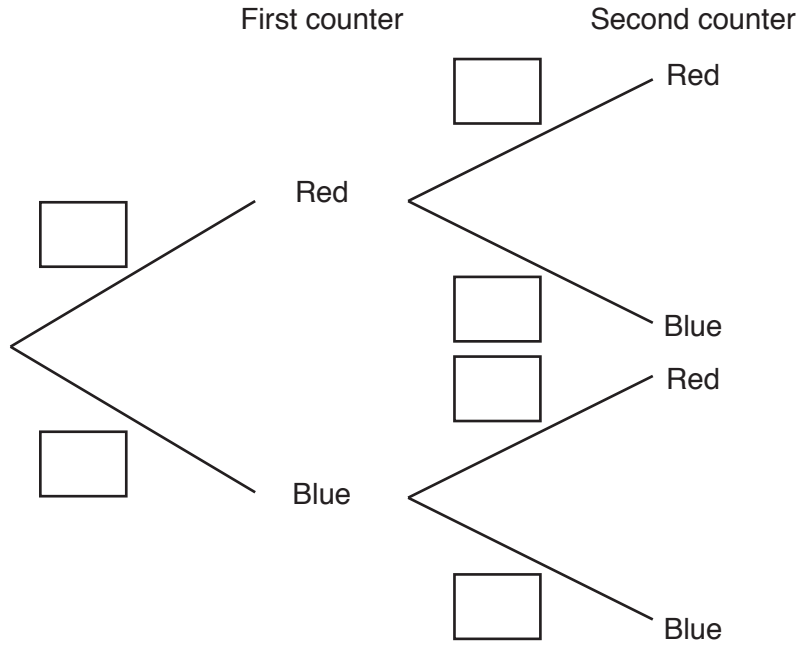
From whose bag is it now more likely that this counter will be white?

Give an answer for each of the two possible cases.

[6]

(b) Abbas has a bag containing 3 red counters and 7 blue counters. He takes one counter, at random, from the bag, records its colour and returns it to the bag. He then takes another counter, at random, from the bag and records its colour.

(i) Complete the tree diagram.



[3]

(ii) Work out the probability that Abbas chooses two blue counters.

(b)(ii) \_\_\_\_\_ [2]

12 (a) Factorise completely.

(i)  $10x^2 + 15xy$

(a)(i) \_\_\_\_\_ [2]

(ii)  $x^2 - 25$

(ii) \_\_\_\_\_ [1]

(b) Solve.

(i)  $x^2 - 2x - 35 = 0$

(b)(i) \_\_\_\_\_ [3]

(ii)  $x^2 + 6x + 2 = 0$

Give your answers correct to 2 decimal places.

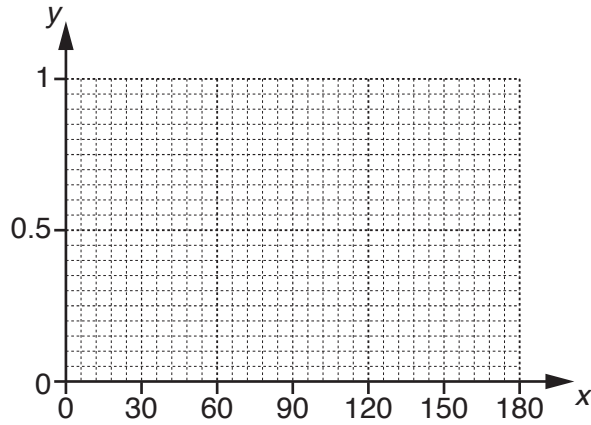
(ii) \_\_\_\_\_ [3]

13 (a) Complete the table for  $y = \sin x^\circ$ .

$x$	0	30	60	90	120	150	180
$y$			0.87				

[1]

(b) Draw the graph of  $y = \sin x^\circ$  for  $x$  from 0 to 180.



[2]

(c) Use your graph to solve this equation for  $x$  from 0 to 180.

$$\sin x^\circ = 0.3$$

(c) \_\_\_\_\_ [2]

14 You are given that  $R \propto \frac{1}{D^2}$  and  $D = 5$  when  $R = 8$ .

(a) Find a formula connecting  $R$  and  $D$ .

(a) \_\_\_\_\_ [2]

(b) Find  $D$  when  $R = 2$ .

(b) \_\_\_\_\_ [3]



- 15 A square of side 8 cm, correct to the nearest cm, is cut from a larger square of side 23 cm, correct to the nearest cm.

Work out the largest possible area remaining.

\_\_\_\_\_ cm<sup>2</sup> [3]

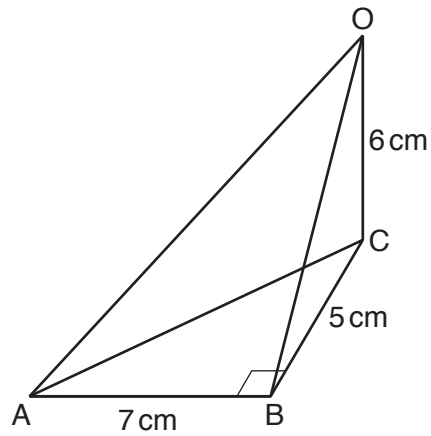
- 16 Multiply out and simplify.

$$(\sqrt{3} + 5)(\sqrt{3} - 1)$$

Give your answer in the form  $a + b\sqrt{3}$ .  
Show each step of your work.

\_\_\_\_\_ [3]

- 17 Right-angled triangle ABC is on a horizontal surface.  
O is vertically above C.



- (a) Work out the length OA.

(a) \_\_\_\_\_ cm [3]

- (b) Work out angle OAC.

(b) \_\_\_\_\_ ° [3]

18 Solve these simultaneous equations.

$$y = 3x^2 + 2x - 11$$

$$y = 2x + 1$$

$$x = \underline{\hspace{2cm}} \quad y = \underline{\hspace{2cm}}$$

$$x = \underline{\hspace{2cm}} \quad y = \underline{\hspace{2cm}} \quad [5]$$

**END OF QUESTION PAPER**

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