

**GENERAL CERTIFICATE OF SECONDARY EDUCATION**

**MATHEMATICS A**

**A503/02**

Unit C (Higher)

**SPECIMEN**

**Duration: 2 hours**

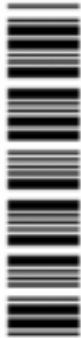
Candidates answer on the Question Paper

**OCR Supplied Materials:**

None

**Other Materials Required:**

- Geometrical instruments
- Tracing paper (optional)
- Scientific or graphical calculator



<b>Candidate Forename</b>		<b>Candidate Surname</b>	
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<b>Centre Number</b>						<b>Candidate Number</b>				
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**INSTRUCTIONS TO CANDIDATES**

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that 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.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- Write your answer to each question in the space provided.

**INFORMATION FOR CANDIDATES**

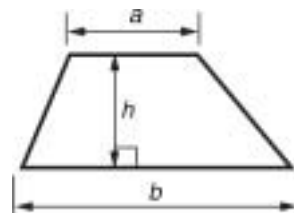
- The number of marks is given in brackets [ ] at the end of each question or part question.
- Use the  $\pi$  button on your calculator or take  $\pi$  to be 3.142 unless the question says otherwise.
- Your Quality of Written Communication is assessed in questions marked with an asterisk (\*).
- The 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.**

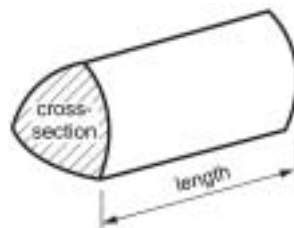


## Formulae Sheet: Higher Tier

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



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

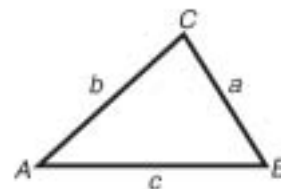


**In any triangle ABC**

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

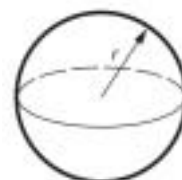
**Cosine rule**  $a^2 = b^2 + c^2 - 2bc \cos A$

**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

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

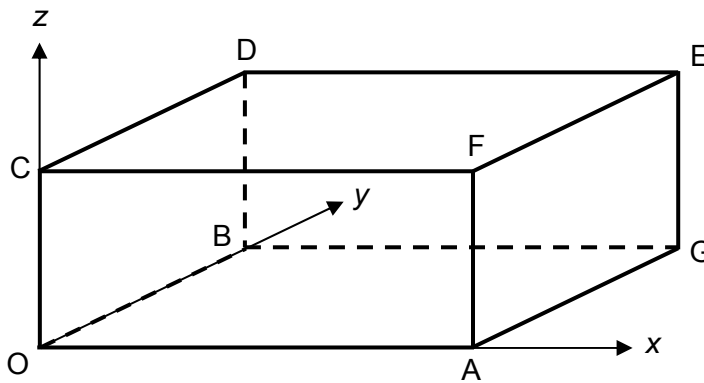
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- 1 Pam gives her cat  $\frac{2}{3}$  of a tin of cat food at each meal.  
The cat has 2 meals each day.

How many tins of cat food will Pam need to buy to feed her cat for 7 days?

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

- 2 The diagram shows a classroom in the shape of a cuboid.  
O is the origin, A is (8, 0, 0), B is (0, 7, 0) and C is (0, 0, 3).  
All lengths are in metres.



- (a) Write down the coordinates of these corners of the classroom.

(i) D

(a)(i) ( \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_ ) [1]

(ii) E

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

- (b) A light is to be fitted at the midpoint of the ceiling edge CF.

Write down the coordinates of this point.

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

- (c) A projector is to be fitted at the centre of the ceiling.

Write down the coordinates of this point.

(c) ( \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_ ) [1]


- 3 In a school there are 5 House teams, A, B, C, D and E.  
In a football competition, each team plays every other team once.


- (a) Complete the table to show all the games to be played.  
The game when B plays D has been entered for you.

	A	B	C	D	E
A					
B				B,D	
C					
D					
E					

[2]

- (b) Explain why parts of the table are shaded.

(i) Some parts are shaded  because \_\_\_\_\_  
\_\_\_\_\_ [1]

(ii) Other parts are shaded  because \_\_\_\_\_  
\_\_\_\_\_ [1]

4 Use your calculator to work these out.

(a)  $\frac{8 \cdot 7 + 3 \cdot 9}{2 \cdot 1 \times 5 \cdot 4}$

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

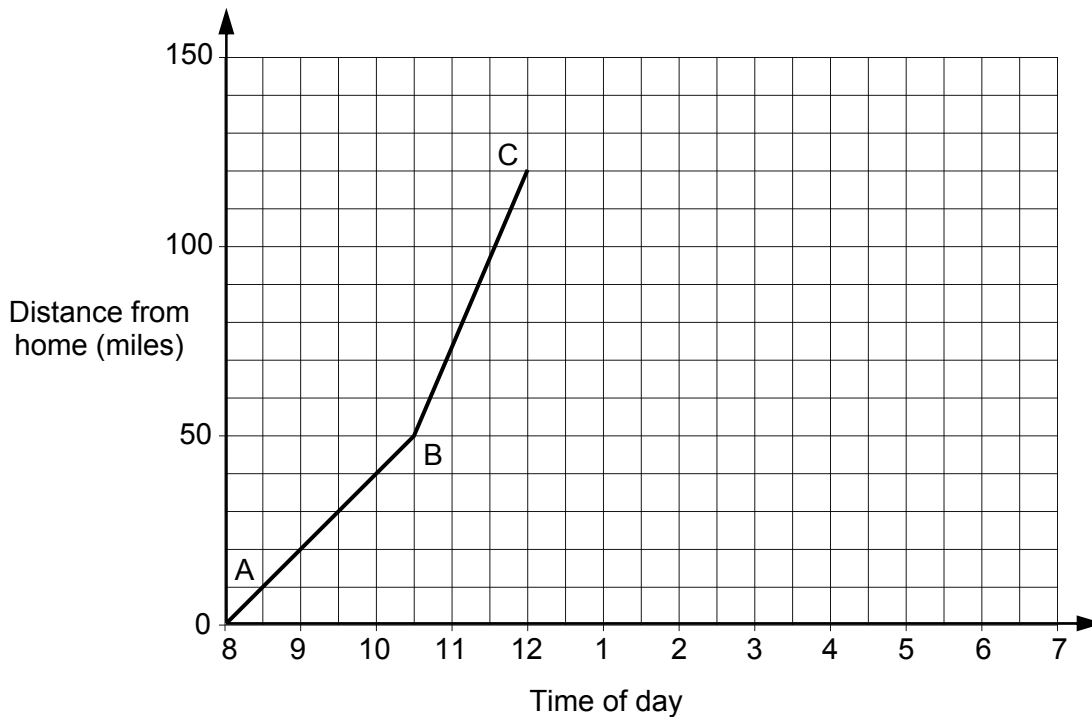
(b)  $\frac{4}{5} - \frac{3}{7}$

(b) \_\_\_\_\_ [1]

(c)  $\sqrt{6 \cdot 3^2 + 5 \cdot 2^2}$

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

- 5 The Khan family went on a day trip to a theme park.  
The graph represents their car journey to the theme park.



- (a) Work out the speed of the car on the section of the journey AB.

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

- (b) On which part of the journey was the car travelling faster?  
How can you tell this?

\_\_\_\_\_ because \_\_\_\_\_  
\_\_\_\_\_ [1]

- (c) The family stayed at the theme park for 4 hours.  
The return car journey took 2 hours.

Complete the graph to show the rest of their day out.

[2]

- 6 Use trial and improvement to find the solution of this equation correct to 1 decimal place.

$$x^3 + 2x^2 = 13$$

Show all your trials and their outcomes.

---

[4]

7\* Brian wants to invest £10 000 for one year.  
His bank offers two plans.

- 'Annual Booster': 6.5% per year, with the interest added at the end of the year.
- 'Monthly Plus': 0.5% per month compound interest, with the interest added at the end of each month.

Brian will make no withdrawals during the year.

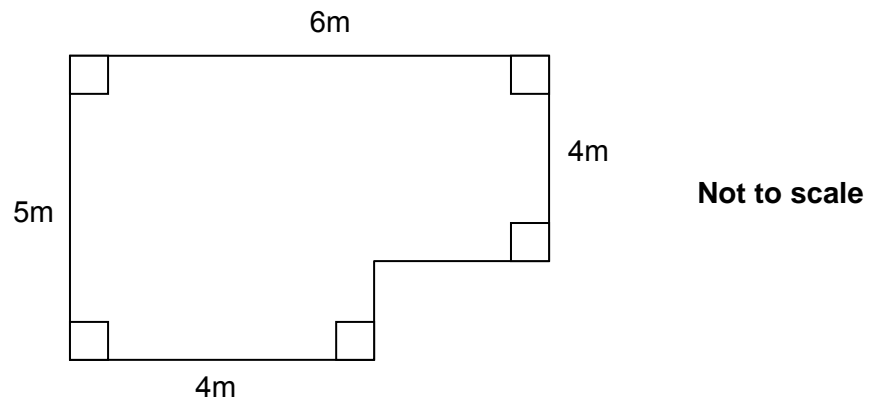
Recommend which plan Brian should use, and why.

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[5]



8 This is the plan of Catalina's bedroom.



Catalina has chosen to use carpet costing £8.99 per square metre to cover her bedroom floor.

Work out the cost of the carpet.

£ \_\_\_\_\_ [5]

9 (a) Multiply out the brackets.

$$3(2x + 5)$$

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

(b) (i) Rearrange this equation to make  $p$  the subject.

$$t = 7p - 50$$

(b)(i)  $p =$  \_\_\_\_\_ [2]

(ii) Rearrange this equation to make  $x$  the subject.

$$y = \sqrt{2x}$$

(ii)  $x =$  \_\_\_\_\_ [2]

**10** A one ounce measure of poppy seeds contains approximately  $1.4 \times 10^5$  seeds.

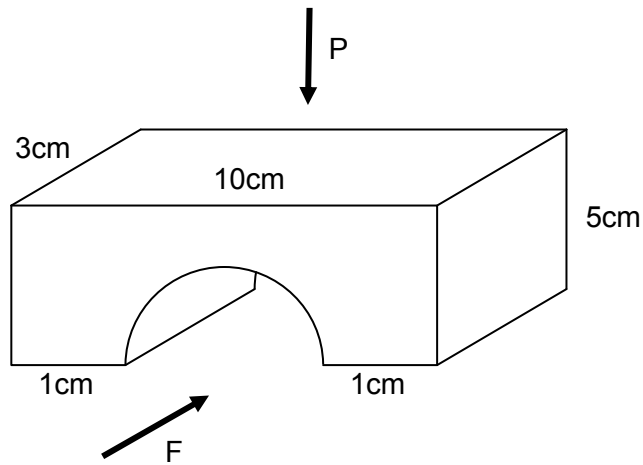
Given that 1 ounce is equal to 28.3 g, work out how many poppy seeds would be in a 1 kg measure of seeds.

Give your answer in standard form.

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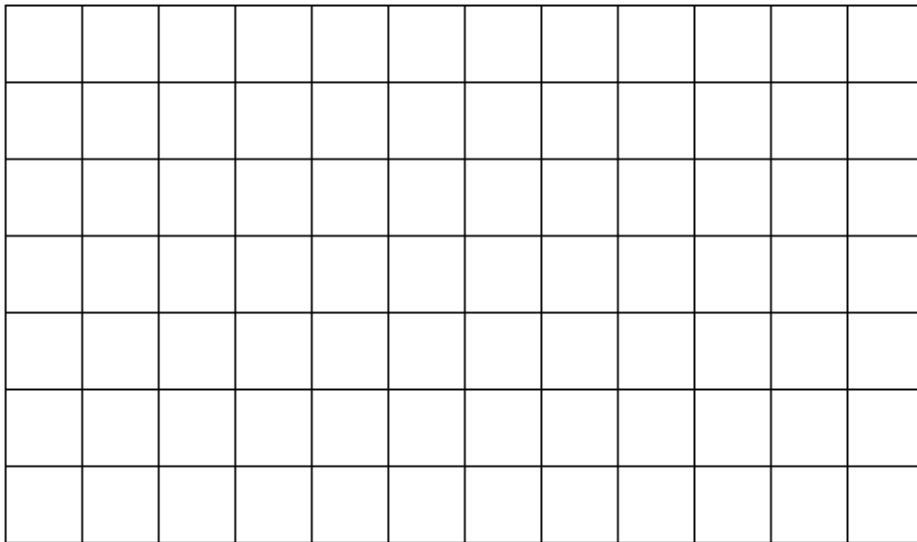
[3]

- 11 The diagram shows a child's building brick.  
The brick is a cuboid with a semi-circular tunnel.

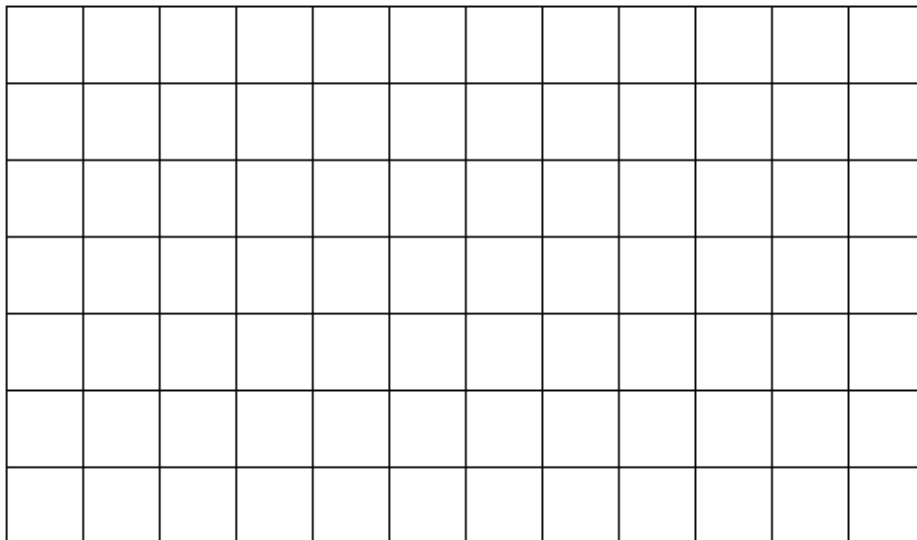


- (a) On the grids, draw the front elevation (from F) and the plan (from P).

Front elevation



Plan



[4]

(b) Calculate the volume of the brick.

(b) \_\_\_\_\_ cm<sup>3</sup> [5]

12 In normal conditions, the stopping distance,  $D$  feet, of a car travelling at  $V$  mph is given by this formula.

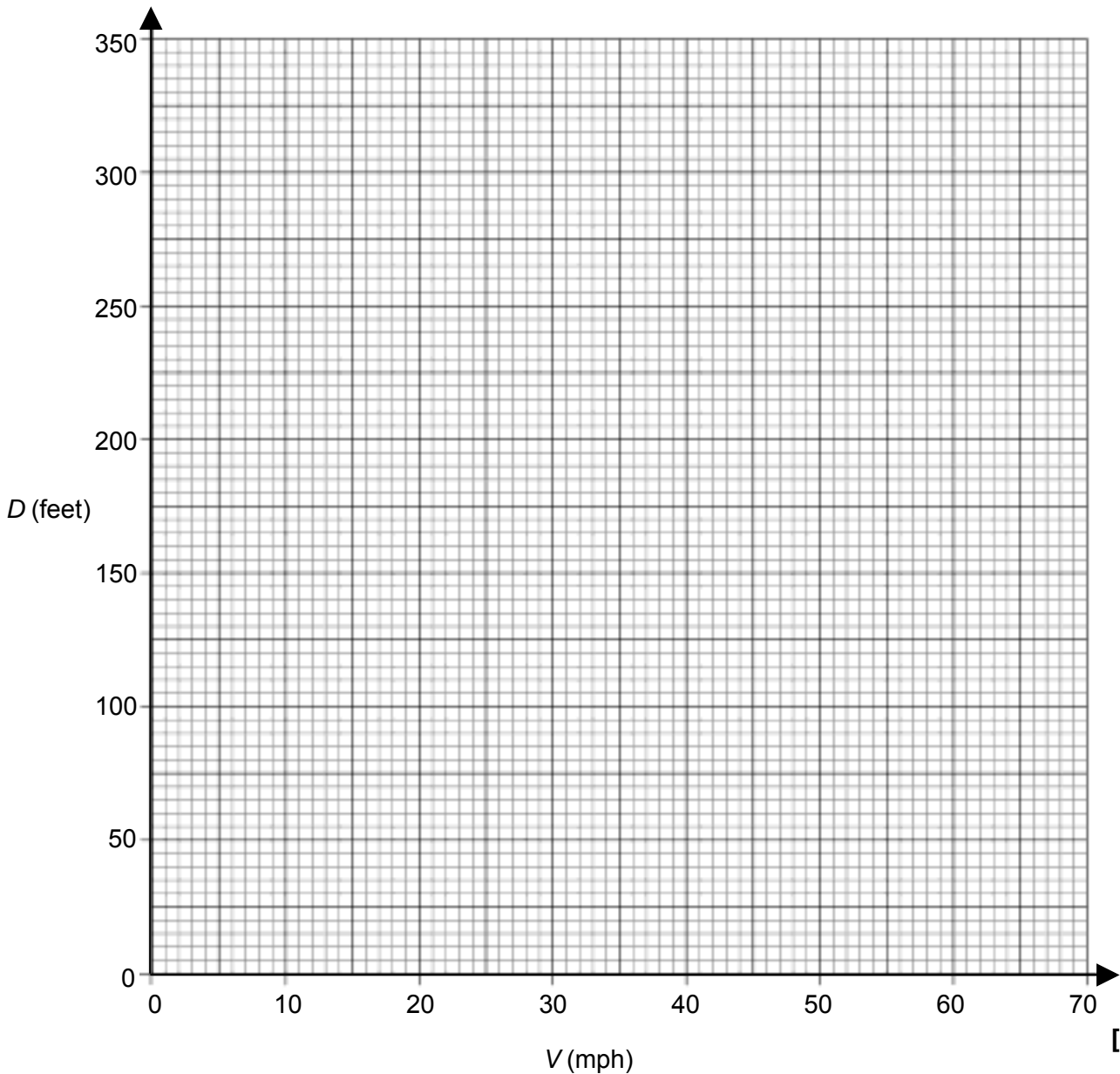
$$D = V + \frac{V^2}{20}$$

(a) Complete the table.

$V$ (mph)	0	10	20	30	40	50	60	70
$D$ (feet)			40			175	240	315

[2]

(b) Draw the graph of  $D = V + \frac{V^2}{20}$ .



[3]

- (c) Use your graph to find the stopping distance of a car travelling at 66 mph in normal conditions.

(c) \_\_\_\_\_ feet [1]

- (d) On wet roads the stopping distance is twice as far as in normal conditions.

Use your graph to find the maximum speed a car could travel at if it must stop in a distance of 200 feet on a wet road.

(d) \_\_\_\_\_ mph [2]

- 13 (a) Factorise these expressions.

(i)  $4x^2 - 20x$

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

(ii)  $x^2 - 25$

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

- (b) Multiply out the brackets and simplify.

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

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

- 14 One year, a company director paid £35 460 tax at the higher rate of 40%.  
The following year, this higher rate increases to 50%.

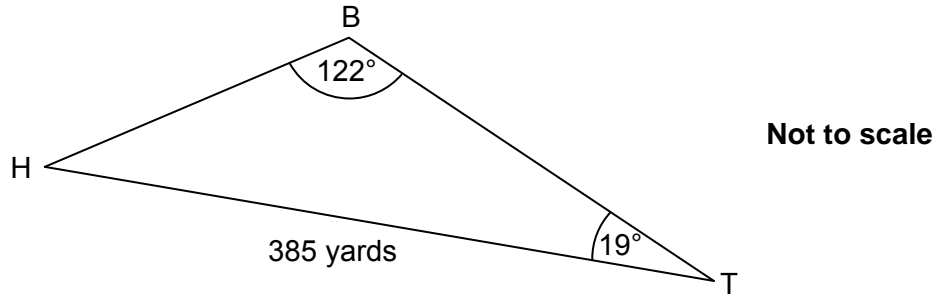
If her salary stays the same, how much will she pay in tax at the new higher rate?

£ \_\_\_\_\_ [4]



15 On a golf course, the distance from the tee, T, to the hole, H, is 385 yards.

After his first shot, a golfer's ball lands at B.  
Angle HTB =  $19^\circ$  and angle TBH =  $122^\circ$ .



Calculate the distance, BH, of the ball from the hole.

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

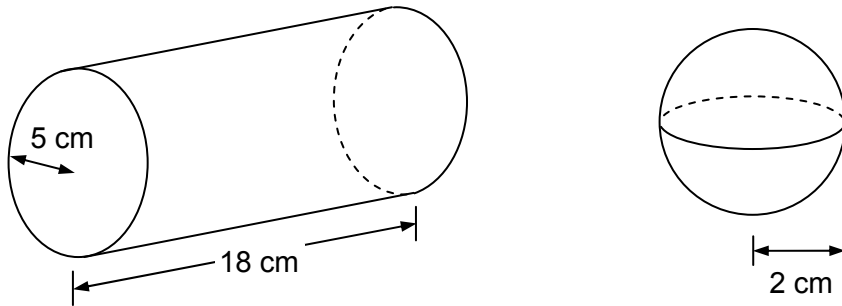
16 A line and a curve have the following equations.

$$\begin{aligned}3x + 2y &= 7 \\ y &= x^2 - 2x + 3\end{aligned}$$

Find the coordinates of the points of intersection of the line and the curve by solving these simultaneous equations algebraically.

( \_\_\_\_\_ , \_\_\_\_\_ ) ( \_\_\_\_\_ , \_\_\_\_\_ ) [8]

- 17 A solid metal cylinder of radius 5 cm and length 18 cm is melted down and made into spheres of radius 2 cm.



Assuming that none of the metal is lost in the process, work out how many of the spheres can be made.

---

[5]

- 18 Anya, Bill and Chris are playing basketball.  
They have the following probabilities of getting a basket on their next shot.

$$\text{Anya } \frac{2}{5} \quad \text{Bill } \frac{1}{3} \quad \text{Chris } \frac{1}{4}$$

They each take one shot at the basket. Anya goes first, then Bill and finally Chris.

- (a) Calculate the probability that exactly one of them gets a basket.

(a) \_\_\_\_\_ [4]

(b) Calculate the probability that Bill is the first of the three of them to get a basket.

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

- 19 The length of the base of a triangle is 12 cm, correct to the nearest cm.  
The area of the triangle is  $60 \text{ cm}^2$ , correct to the nearest  $10 \text{ cm}^2$ .

Calculate the upper and lower bounds of the height of the triangle.

Upper bound \_\_\_\_\_ cm

Lower bound \_\_\_\_\_ cm [5]

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**OXFORD CAMBRIDGE AND RSA EXAMINATIONS**

**General Certificate of Secondary Education**

**MATHEMATICS A**

**A503/02**

Unit C (Higher)

**Specimen Mark Scheme**

The maximum mark for this paper is **100**.

This document consists of **6** printed pages and **2** blank pages.

1		10	3	<b>B2</b> for 9·3 or better <b>Or M1</b> for $\frac{2}{3} \times 2 \times 7$
2	(a)	(i) (0,7,3)	1	
		(ii) (8,7,3)	1	
	(b)	(4,0,3)	2	<b>SC1</b> for correct 3 values in any order
	(c)	(4,3.5,3) oe	1	
3	(a)	All 9 pairs correct	2	<b>B1</b> for 4 correct pairs Ignore entries in shaded sections
	(b)	(i) Cannot play themselves oe	1	
		(ii) Play each other once only	1	
4	(a)	1·11(11...) oe	2	<b>B1</b> for 12·6 ÷ 11·34
	(b)	$\frac{13}{35}$ or 0·371...	1	
	(c)	8·169 or 8·17 or 8·2	2	<b>B1</b> for 66·73 seen
5	(a)	20	2	<b>M1</b> for 50 ÷ 2·5 oe Condone 2·30 for <b>M1</b>
	(b)	BC, steeper line	1	
	(c)	Horizontal line to (4,120) Line(s) from <i>their</i> (4,120) to (6,0)	1 <b>ft1</b>	By eye May be curve as long as no vertical part
6		Value between 1 and 2 inclusive 1·8 or 1·9 Value between 1·8 and 1·9 1·8	1 1 1 1	Or after 1·8 <b>and</b> 1·9 used, mention of closer to 1·8

7 *	<p>Calculates correct amount of interest (AB: 650, MP: 616.77 or 616.78 or 617) or correct total sum (AB: 10 650, MP: 10 616.77 or 10 616.78 or 10 617) for each plan <b>and</b> recommends that Brian uses Annual Booster plan as he will earn more money. Well laid-out answer with correct and clear language throughout.</p> <p>Makes minor errors in calculating amount of interest or total sum for each plan <b>and</b> makes a recommendation based on their calculations. Some structure to the calculations or recommendation with minor errors in spelling, punctuation or grammar.</p> <p>Correctly calculates amount of interest or total sum for one plan, and may or may not make a recommendation. Little structure evident.</p> <p>No relevant calculations</p>	<p><b>5</b></p> <p><b>3-4</b></p> <p><b>1-2</b></p> <p><b>0</b></p>	<p>For lower mark – calculates amount of interest or total sum for each plan but makes no recommendation/incorrect recommendation based on their calculations <b>or</b> there are a number of errors in spelling, punctuation or grammar.</p> <p>For lower mark – attempts to calculate amount of interest or total sum for one plan (working must be seen) and no recommendation made.</p>
8	<p>Missing length 1 or 2 soi  <math>5 \times 4 + 4 \times 2</math> or <math>6 \times 4 + 1 \times 4</math> or  <math>6 \times 5 - 2 \times 1</math>  <i>Their</i> <math>28 \times 8.99</math>  <math>251.72</math></p>	<p><b>1</b>  <b>M2</b>  <b>M1</b>  <b>A1</b></p>	<p><b>M1</b> for correct area of one rectangle</p>
9	<p>(a) <math>6x + 15</math>  (b) (i) <math>\frac{t + 50}{7}</math>  (ii) <math>\frac{y^2}{2}</math></p>	<p><b>2</b>  <b>2</b>  <b>2</b></p>	<p><b>B1</b> for <math>6x</math> or <math>+ 15</math> seen  <b>M1</b> for <math>t + 50 = 7p</math> or other correct first step  <b>M1</b> for <math>y^2 = 2x</math></p>
10	<p>4.9 to <math>4.95 \times 10^6</math></p>	<p><b>3</b></p>	<p><b>M1</b> for <math>1.4 \times 10^5 \div 28.3 \times 1000</math> oe  <b>And A1</b> for 4900000 to 4950000</p>

11	(a)	Correct front elevation including semi-circle radius 4 Correct plan including two dotted 'hidden' lines	2 2	<b>B1</b> for 10 by 5 rectangle <b>B1</b> for 10 by 3 rectangle
	(b)	$3 \times 10 \times 5$ 150 $(0.5 \times) \pi \times 4^2 \times 3$ 75.4 74.5 to 74.7	<b>M1</b> <b>A1</b> <b>M1</b> <b>A1</b> <b>A1</b>	<u>Alternative method</u> <b>Or M1</b> for $10 \times 5$ <b>And M1</b> for $-(0.5 \times) \pi \times 4^2$ <b>And A1</b> for 24.87 or 24.9 <b>And M1</b> for $(24.87 \text{ or } 24.9) \times 3$ <b>And A1</b> for 74.5 to 74.7
12	(a)	0, 15, 75, 120	2	<b>B1</b> for two values correct
	(b)	8 points correctly plotted Curve through <i>their</i> points	2 1	<b>B1</b> for 4 points correctly plotted $\pm \frac{1}{2}$ sm sq. $\pm \frac{1}{2}$ small square
	(c)	275 to 287	1	
	(d)	35.5 to 37	2	<b>M1</b> for reading from 100 feet
13	(a)	(i) $4x(x - 5)$	2	<b>M1</b> for $4(x^2 - 5x)$ or $x(4x - 20)$
		(ii) $(x - 5)(x + 5)$	1	
	(b)	$6x^2 + 5x - 4$	3	<b>B1</b> for each of $6x^2$ , $5x$ , $-4$
14		44 325	4	<b>M2</b> for $35\,460 \div 0.4$ <b>Or M1</b> for 40% of pay = 35 460 <b>And A1</b> for 88 650
15		$147.8^\circ$ to $148^\circ$	3	<b>M2</b> for $385 \times \sin 19 \div \sin 122$ <b>Or M1</b> for $\frac{x}{\sin 19} = \frac{385}{\sin 122}$
16		$3x + 2(x^2 - 2x + 3) = 7$ $2x^2 - x - 1 = 0$  $(2x + 1)(x - 1)$  $x = 1$ <u>and</u> $x = -\frac{1}{2}$ oe $y = 2$ $y = 4\frac{1}{4}$ oe  $(1, 2)$ and $(-\frac{1}{2}, 4\frac{1}{4})$	<b>M1</b> <b>A1</b>  <b>FTM2</b>      <b>B1</b> <b>B1</b> <b>B1</b> <b>B1</b>	oe method to eliminate one variable or $4y^2 - 25y + 34 = 0$ oe of these terms  or $(4y - 17)(y - 2)$ or factorisation for their trinomial <b>or M1</b> for $(2x \pm 1)(x \pm 1)$ or for $(4y \pm 17)(y \pm 2)$ or ft "correct", wrong signs  Last four marks are independent of any previous method

17		$\pi \times 5^2 \times 18$ $\frac{4}{3} \times \pi \times 2^3$ <i>their 1413.7 ÷ their 33.5</i> 42.(...) 42	1 1 <b>M1</b> <b>A1</b> 1	soi by 1413.7 soi by 33.5
18	(a)	$\frac{27}{60}$ oe	4	<b>M1</b> for $\frac{2}{5} \times \frac{2}{3} \times \frac{3}{4}$ <b>And M1</b> for $\frac{3}{5} \times \frac{1}{3} \times \frac{3}{4}$ <b>And M1</b> for $\frac{3}{5} \times \frac{2}{3} \times \frac{1}{4}$ <u>After 0 scored</u> <b>SC1</b> for sight of two of $\frac{3}{5}, \frac{2}{3}, \frac{3}{4}$
	(b)	$\frac{12}{60}$ oe	3	<b>M2</b> for $\frac{3}{5} \times \frac{1}{3}$ <b>Or M1</b> for $\frac{3}{5} \times \frac{1}{3} \times \frac{1}{4}$ <b>And M1</b> for $\frac{3}{5} \times \frac{1}{3} \times \frac{3}{4}$
19		Using $\frac{2 \times 60}{12}$ soi $\frac{2 \times 65}{11.5}$ oe 11.3 $\frac{2 \times 55}{12.5}$ oe 12.5 8.8	<b>M1</b> <b>M1</b> <b>A1</b> <b>M1</b> <b>A1</b>	

### Assessment Objectives and Functional Elements Grid

GCSE MATHEMATICS A

A503/02: Unit C (Higher)

Qn	Topic	AO1	AO2	AO3	Functional
1	Fractions			3	3
2	3-D coordinates	2	3		
3	Listing		4		2
4	Calculator work	5			
5	Dist/time graph		3	2	
6	Trial and improvement	4			
7	Repeated percentage change			5	5
8	Compound area		5		5
9	Expand brackets, Rearrange formula	6			
10	Standard form			3	
11	Views. Volume	4		5	
12	Quadratic graph	6		2	2
13	Factorise, Expand brackets	6			
14	Reverse percentages		4		4
15	Sine rule	3			
16	Line and curve	8			
17	Cylinder and sphere			5	
18	Probability		7		
19	Bounds	5			
	TOTAL	49	26	25	21

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