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H

GENERAL CERTIFICATE OF SECONDARY EDUCATION

MATHEMATICS A

A503/02

Unit C (Higher)

Candidates answer on the Question Paper

OCR Supplied Materials:
None

Other Materials Required:
- Geometrical instruments
- Tracing paper (optional)
- Scientific or graphical calculator

SPECIMEN

Duration: 2 hours

Candidate Forename		Candidate Surname	

Centre Number						Candidate Number				

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 π button on your calculator or take π 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.

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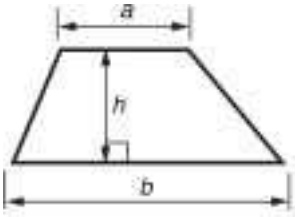
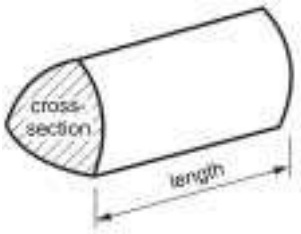
Formulae Sheet: Higher Tier

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



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

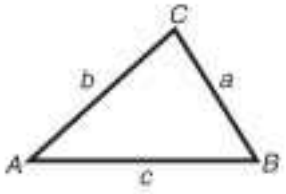


In any triangle *ABC*

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

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

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

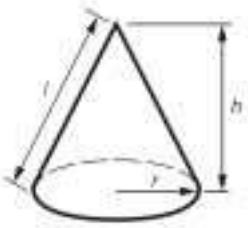


Volume of sphere $= \frac{4}{3}\pi r^3$

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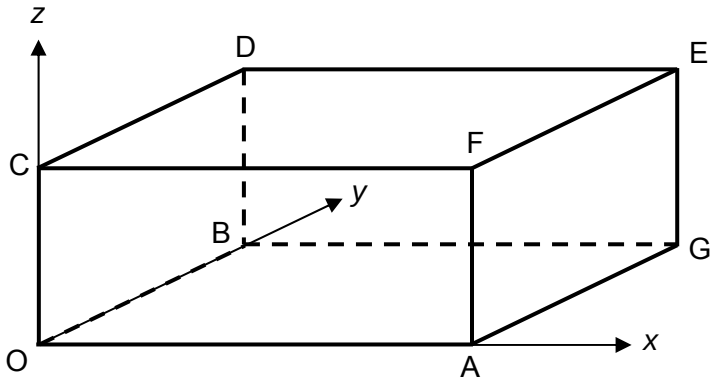
1 Pam gives her cat $\frac{2}{3}$ of a tin of cat food at each meal.
The cat has 2 meals each day.

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]**

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4 Use your calculator to work these out.

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

(a) _____ **[2]**

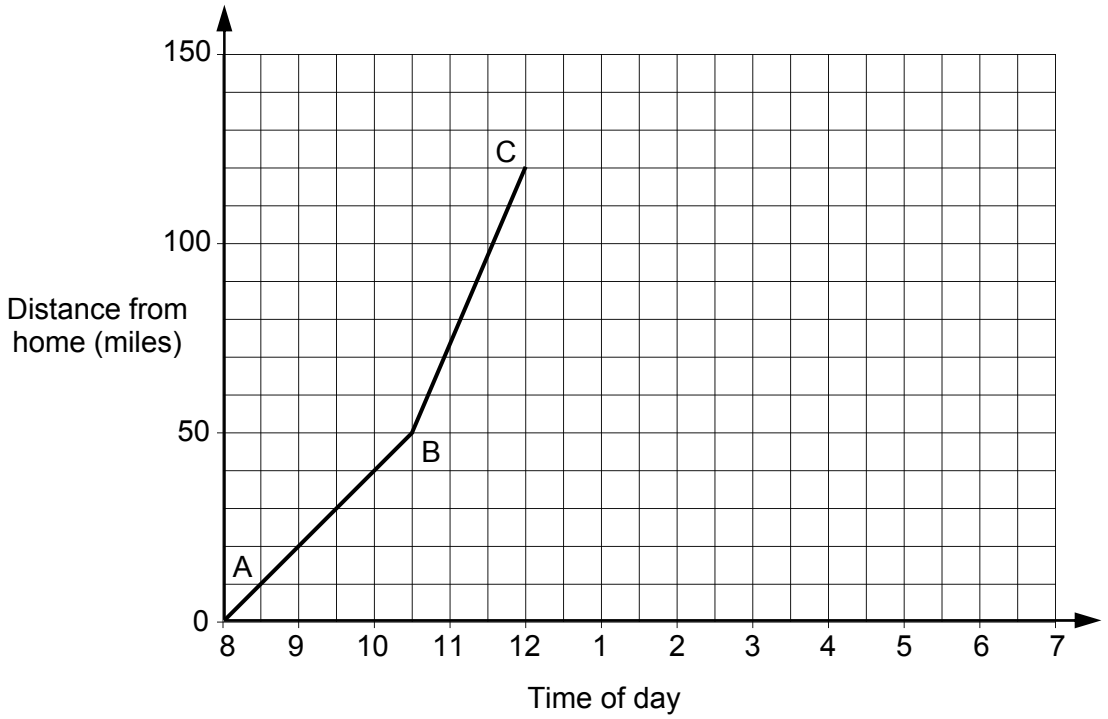
(b) $\dfrac{4}{5} - \dfrac{3}{7}$

(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]**

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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.

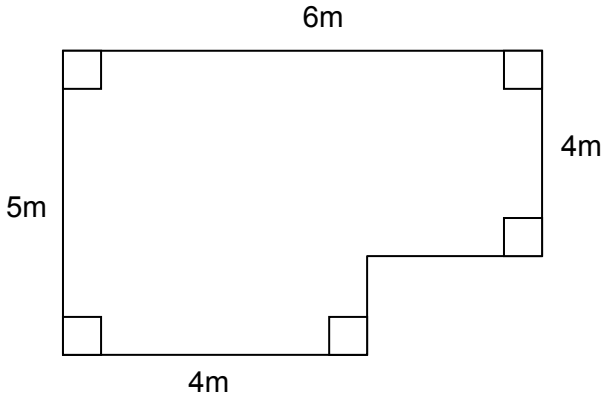
- 'Annual Booster': 6·5% per year, with the interest added at the end of the year.
- 'Monthly Plus': 0·5% per month compound interest, with the interest added at the end of each month.

Brian will make no withdrawals during the year.

Recommend which plan Brian should use, and why.

[5]

8 This is the plan of Catalina's bedroom.



Not to scale

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]**

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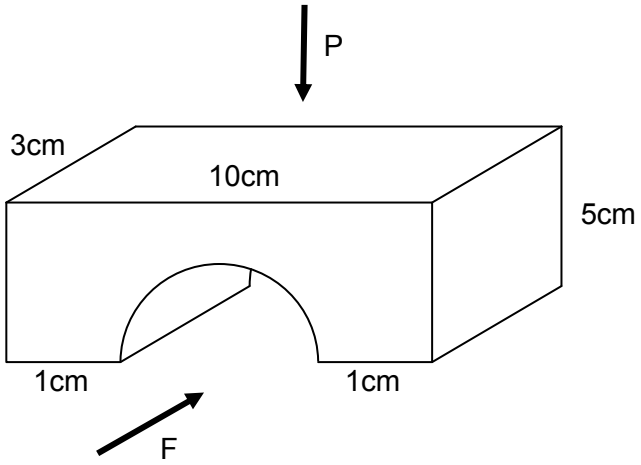
10 A one ounce measure of poppy seeds contains approximately $1{\cdot}4 \times 10^5$ seeds.

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.

_____ **[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^3 **[5]**

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

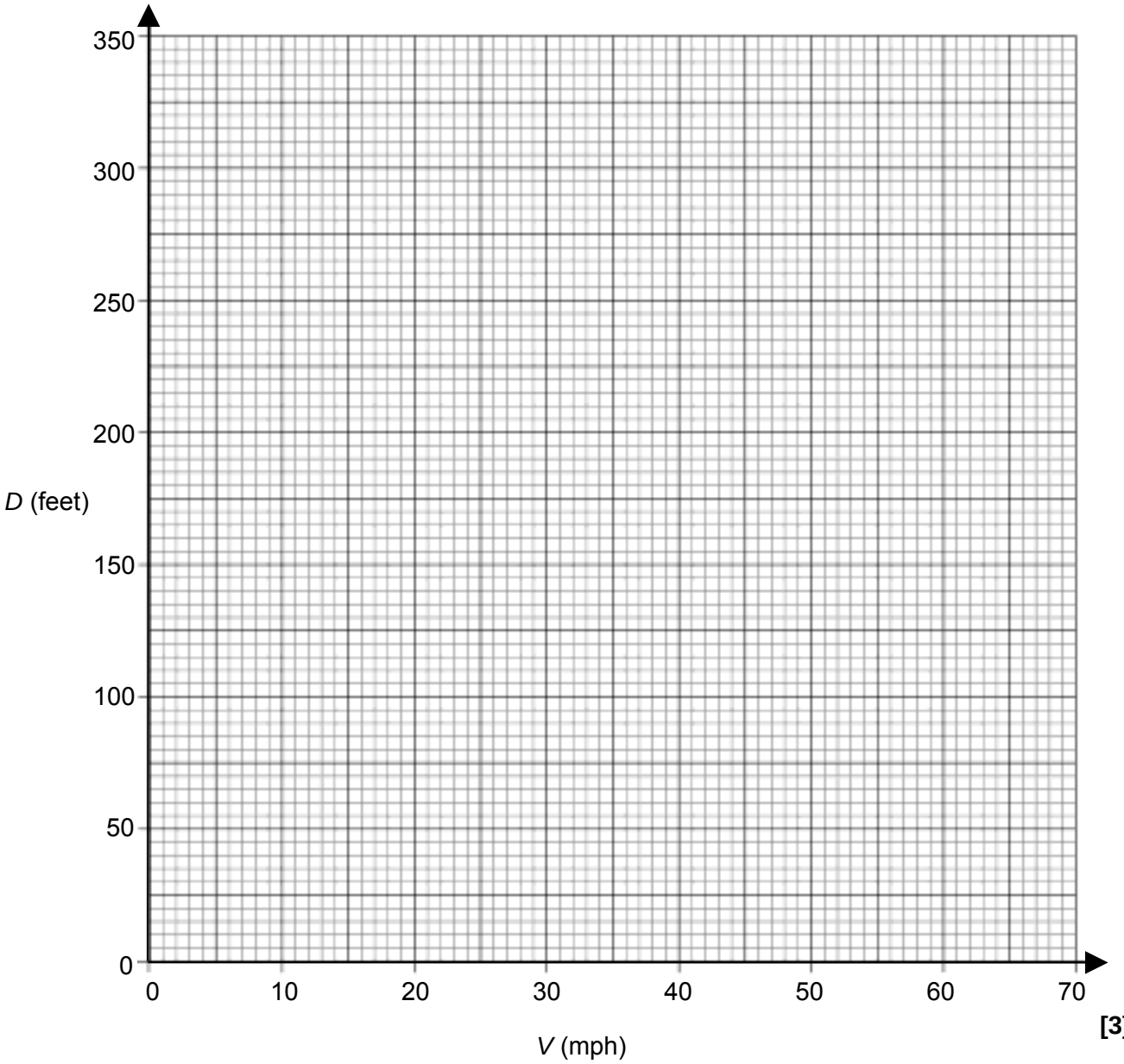
$$D = V + \frac{V^2}{20}$$

(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]

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(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]**

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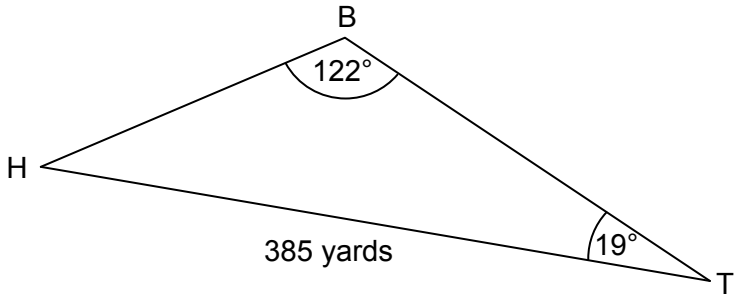
15 On a golf course, the distance from the tee, T, to the hole, H, is 385 yards.

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



Not to scale

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

_____ yards **[3]**

16 A line and a curve have the following equations.

$$3x + 2y = 7$$
$$y = x^2 - 2x + 3$$

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

(_____ , _____) (_____ , _____) **[8]**

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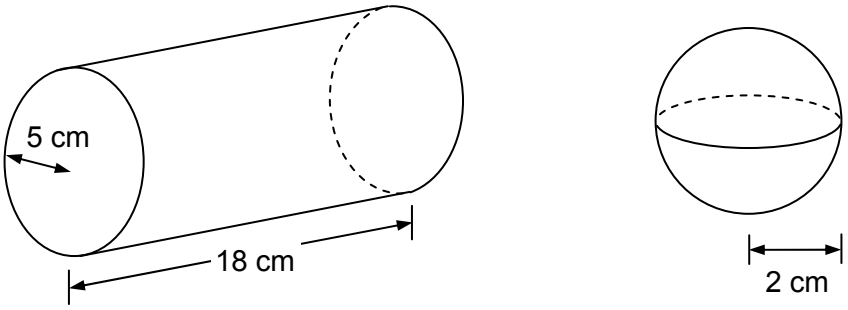
17 A solid metal cylinder of radius 5 cm and length 18 cm is melted down and made into spheres of radius 2 cm.



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.

Anya $\frac{2}{5}$ Bill $\frac{1}{3}$ 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]**

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(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 cm^2, correct to the nearest 10 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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