

Surname
First name(s)

Centre Number

Candidate Number
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**GCSE**

3300U60-1



A23-3300U60-1

**WEDNESDAY, 15 NOVEMBER 2023 – MORNING**

**MATHEMATICS  
UNIT 2: CALCULATOR-ALLOWED  
HIGHER TIER**

1 hour 45 minutes

**ADDITIONAL MATERIALS**

A calculator will be required for this examination.  
A ruler, a protractor and a pair of compasses may be required.

**INSTRUCTIONS TO CANDIDATES**

Use black ink or black ball-point pen. Do not use gel pen or correction fluid.  
You may use a pencil for graphs and diagrams only.  
Write your name, centre number and candidate number in the spaces at the top of this page.  
Answer **all** questions.  
Write your answers in the spaces provided in this booklet. If you run out of space, use the additional page(s) at the back of the booklet, taking care to number the questions correctly.  
Take  $\pi$  as 3.14 or use the  $\pi$  button on your calculator.

**INFORMATION FOR CANDIDATES**

You should give details of your method of solution when appropriate.  
Unless stated, diagrams are not drawn to scale.  
Scale drawing solutions will not be acceptable where you are asked to calculate.  
The number of marks is given in brackets at the end of each question or part-question.  
In question 3, the assessment will take into account the quality of your linguistic and mathematical organisation, communication and accuracy in writing.

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1.	4	
2.	6	
3.	6	
4.	3	
5.	4	
6.	3	
7.	3	
8.	2	
9.	5	
10.	6	
11.	7	
12.	3	
13.	1	
14.	3	
15.	3	
16.	3	
17.	5	
18.	8	
19.	5	
<b>Total</b>	<b>80</b>	

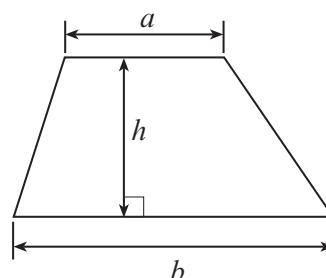
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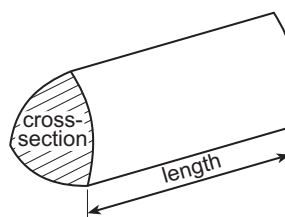
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### Formula List – Higher Tier

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

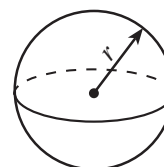


**Volume of prism** = area of cross-section  $\times$  length



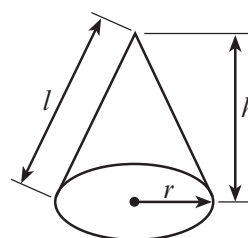
**Volume of sphere** =  $\frac{4}{3}\pi r^3$

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



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

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

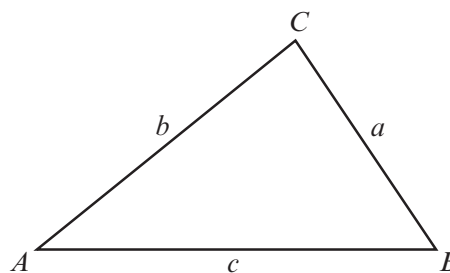


**In any triangle ABC**

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



### The Quadratic Equation

The solutions of  $ax^2 + bx + c = 0$  where  $a \neq 0$  are given by  $x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$

### Annual Equivalent Rate (AER)

AER, as a decimal, is calculated using the formula  $\left(1 + \frac{i}{n}\right)^n - 1$ , where  $i$  is the nominal interest rate per annum as a decimal and  $n$  is the number of compounding periods per annum.



1. The table below shows some of the values of  $y = x^2 + 4x + 5$  for values of  $x$  from  $-4$  to  $1$ .

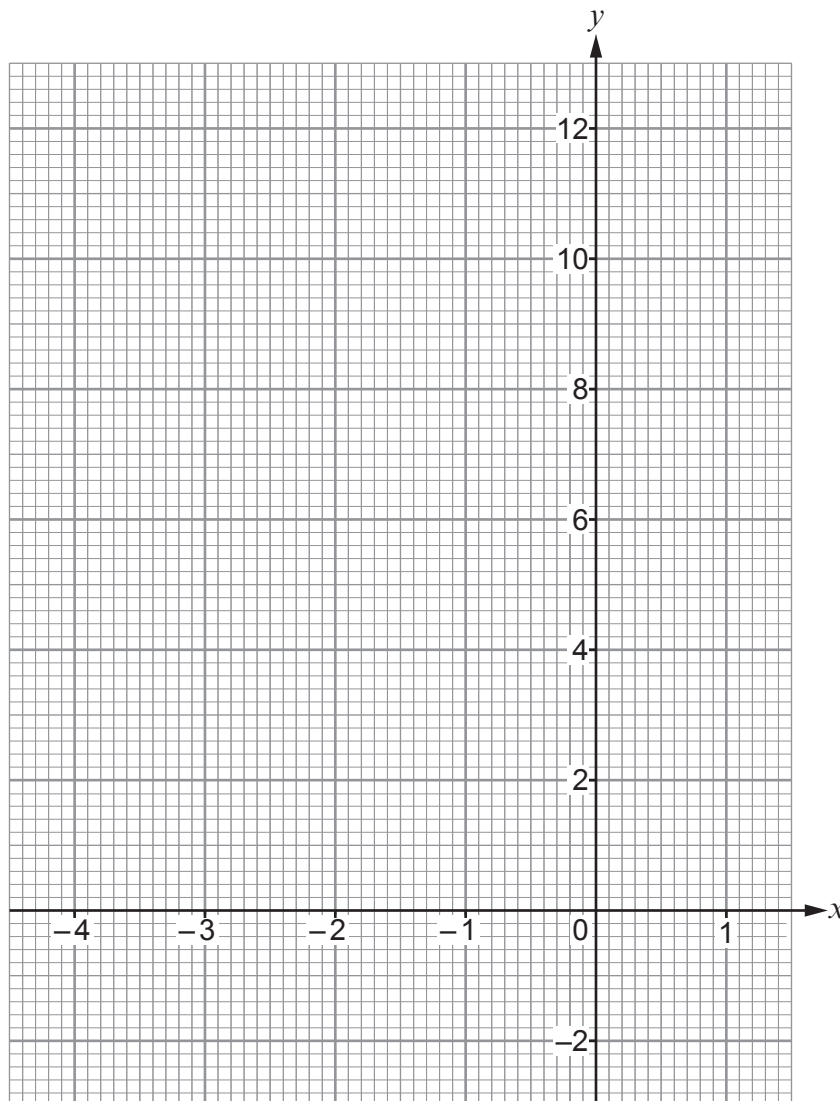
$x$	$-4$	$-3$	$-2$	$-1$	$0$	$1$
$y = x^2 + 4x + 5$	$5$	$2$		$2$	$5$	

- (a) Complete the table by finding the value of  $y$  for  $x = -2$  and for  $x = 1$ . [2]

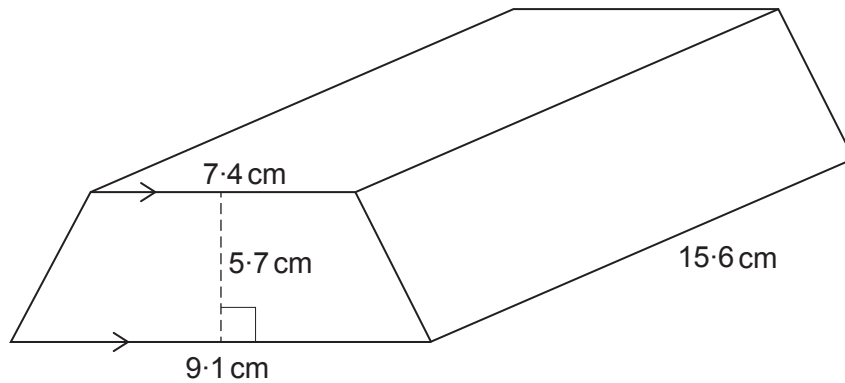
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- (b) On the graph paper below, draw the graph of  $y = x^2 + 4x + 5$  for values of  $x$  from  $-4$  to  $1$ . [2]



2.

*Diagram not drawn to scale*

- (a) Find the volume of the solid prism shown above.

[3]

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- (b) The solid prism is made of gold.  
Gold has a density of  $19.3 \text{ g/cm}^3$ .  
Calculate the mass of the prism.  
Give your answer in **kilograms**.

[3]

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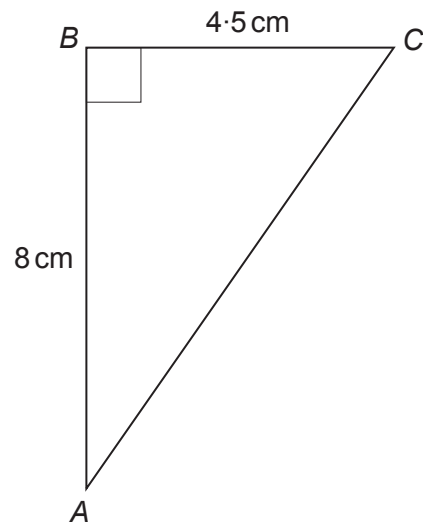
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Mass of the prism = ..... kg





4.



*Diagram not drawn to scale*

Calculate the length of the side AC.

[3]

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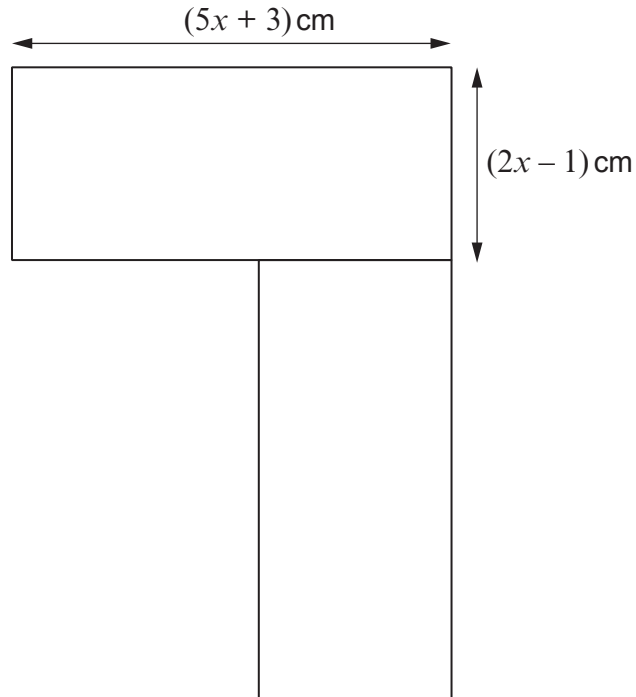
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6. The diagram below shows a shape made by joining two congruent rectangles together. The length of each rectangle is  $(5x + 3)$  cm. The width of each rectangle is  $(2x - 1)$  cm.



*Diagram not drawn to scale*

Write an expression for the total area of the shape in the form  $ax^2 + bx + c$ , where  $a$ ,  $b$  and  $c$  are whole numbers. [3]

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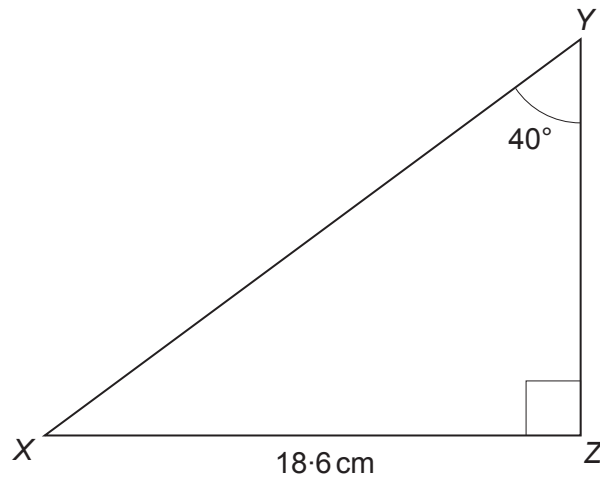
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7.

*Diagram not drawn to scale*

Calculate the length of the side YZ.

[3]

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8. 7 cubes are stacked on top of each other.  
Each of these cubes has edges of length 60 mm, measured correct to the nearest millimetre.

Calculate the greatest possible height of this stack of 7 cubes.

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11. (a) Factorise  $6x^2 + 19x + 10$ .

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(b) Fully factorise the expression  $m^3 - 25m$ .

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(c) Factorise  $(p + 7)(p + 29) + 2(p + 7)$ .

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14. A solid has a height of 225 cm.  
A larger, mathematically **similar** solid has a height of 855 cm.  
The surface area of the smaller solid is  $5300 \text{ cm}^2$ .

Calculate the surface area of the larger solid.

[3]

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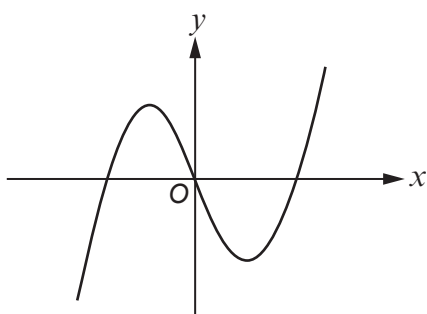
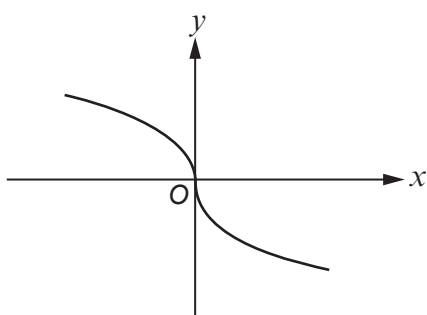
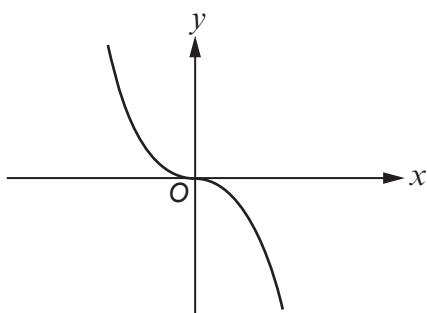
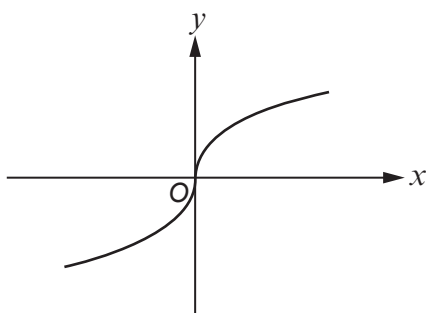
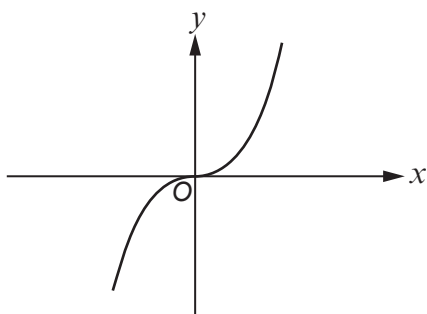
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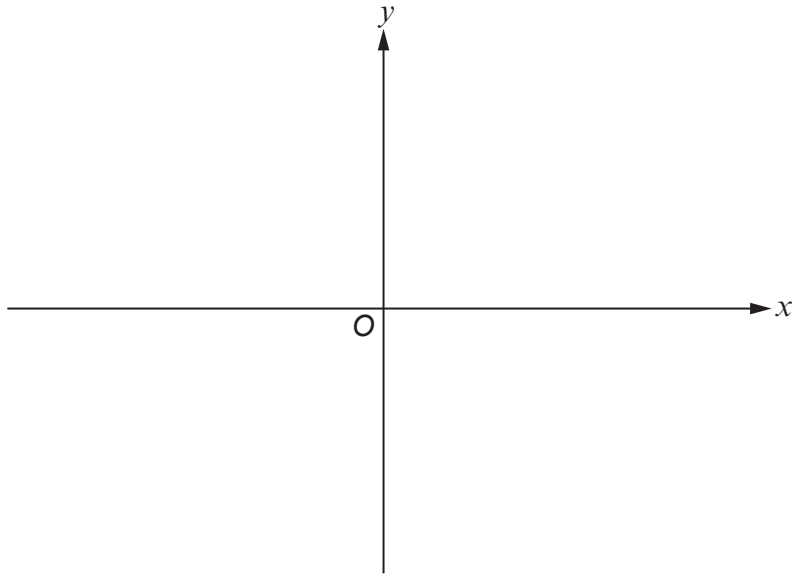
16. (a) Put a tick next to the graph that represents the equation  $y = -x^3$ .

[1]

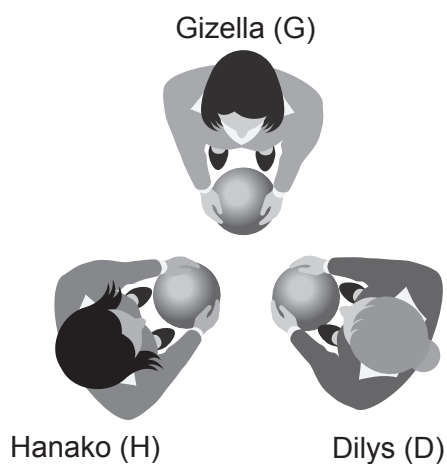
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(b) Use the axes below to sketch the graph of  $y = -\frac{1}{x}$ .

[2]



17. Three children, Gizella (G), Dilys (D) and Hanako (H), stand in a triangle, as shown below.



Each child holds a ball.

They must choose to pass their ball to the child on their left or the child on their right.

All 3 children pass their ball at the same time.

The probability that they pass it to their left is shown in the table below.

Name of child	Probability of passing to the left
Gizella	$\frac{1}{5}$
Dilys	$\frac{2}{7}$
Hanako	$\frac{3}{8}$

- (a) Calculate the probability that every child passes their ball to the left.

[2]

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(b) Calculate the probability that one of the three children does not receive a ball.

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(b) Hence, calculate the area of triangle *CGE*.

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