Surname	Centre Number	Candidate Number
First name(s)		0

GCSE

3300U60-1

A24-3300U60-1

WEDNESDAY, 13 NOVEMBER 2024 – MORNING

MATHEMATICS
UNIT 2: CALCULATOR-ALLOWED
HIGHER TIER

1 hour 45 minutes

ADDITIONAL MATERIALS

A calculator will be required for this examination.

A ruler, 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 question(s) correctly.

Take π as 3·14 or use the π 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 **1**, 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.	**7**	
2.	**4**	
3.	**3**	
4.	**3**	
5.	**6**	
6.	**4**	
7.	**5**	
8.	**5**	
9.	**4**	
10.	**2**	
11.	**3**	
12.	**3**	
13.	**2**	
14.	**4**	
15.	**4**	
16.	**3**	
17.	**1**	
18.	**4**	
19.	**5**	
20.	**8**	
Total	**80**	

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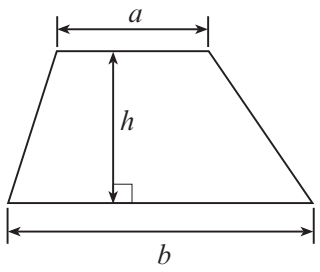
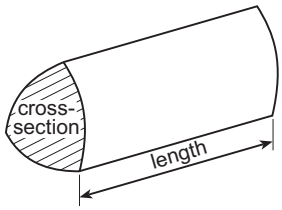
Formula List – Higher Tier

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

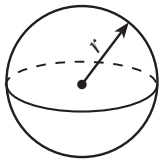


Volume of prism = area of cross-section × length



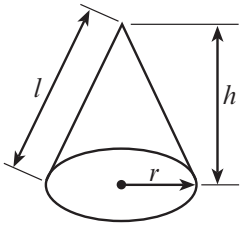
Volume of sphere $= \frac{4}{3}\pi r^3$

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



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

Curved surface area of cone $= \pi rl$

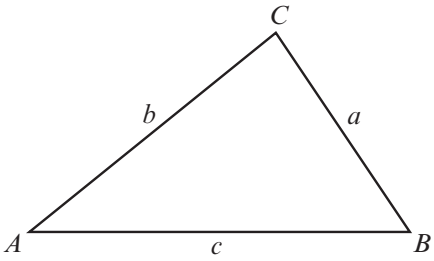


In any triangle ABC

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.

Examiner only

1. *In this question, you will be assessed on the quality of your organisation, communication and accuracy in writing.*

A money box contains some 20p coins and some 50p coins.
The value of the 20p coins is £19.20.

The ratio of the number of 20p coins to the number of 50p coins is 8 : 5.

Find the total value of the coins in the money box.
You must show all your working. [5 + 2 OCW]

Examiner only

2. A solution of the equation

$$x^3 + 5x - 4 = 0$$

lies between 0 and 1.

Use the method of trial and improvement to find this solution correct to 1 decimal place. You must show all your working. [4]

Examiner only

3. Find five numbers so that:

- their mean is 4·5
- their mode is 3·5.

Write your five numbers in the boxes below. [3]

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The five numbers are ☐ ☐ ☐ ☐ ☐

4. The interior angle of a regular polygon is 171°.

How many sides does the polygon have? [3]

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Turn over.

Examiner only

5. (a) Calculate the length of *AC*. [3]

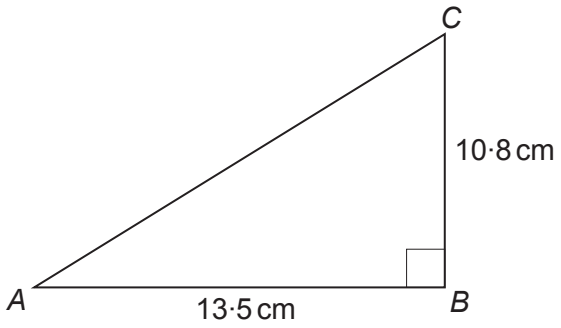


Diagram not drawn to scale

(b) Calculate the value of x. [3]

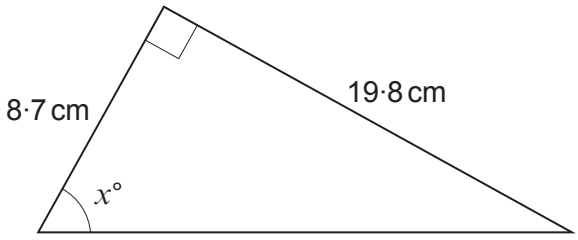


Diagram not drawn to scale

Examiner only

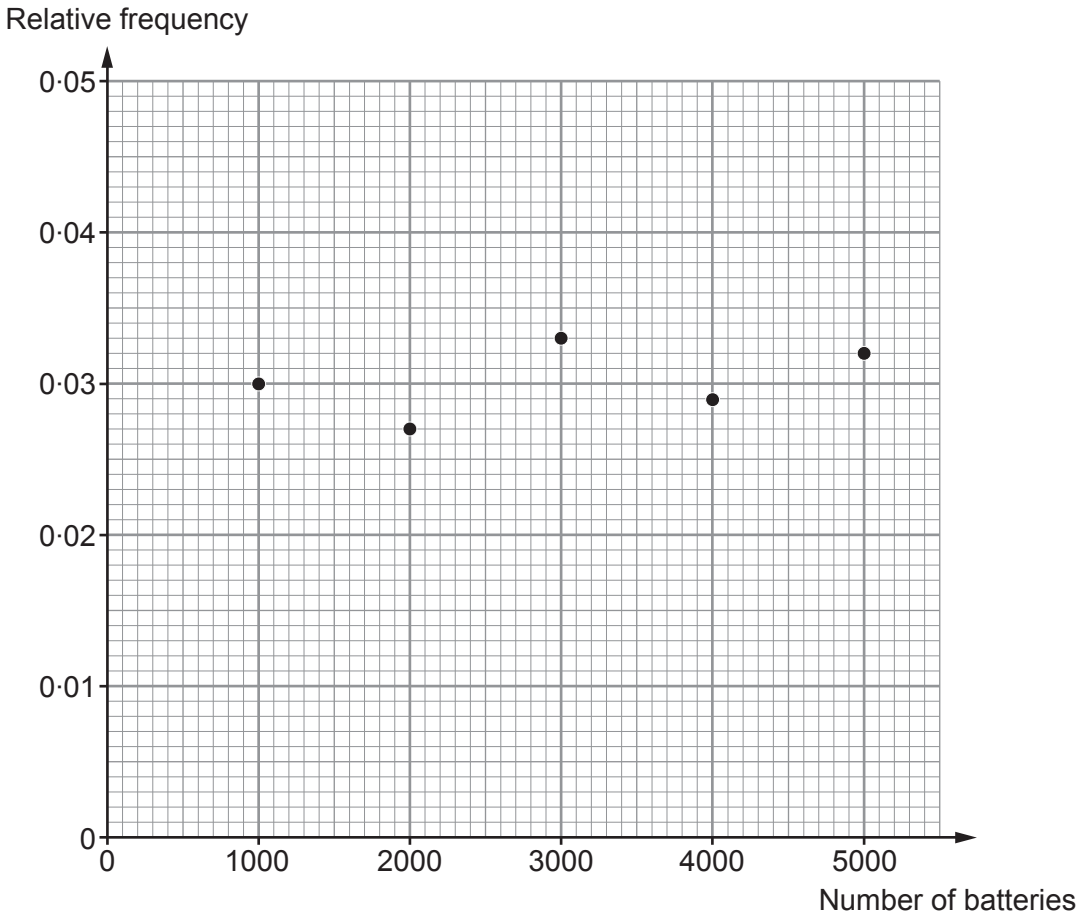
6. Line AB is drawn below.
Point C lies **below** the line AB.
The region in which point C is located is such that:

- $A\hat{B}C \leqslant 30°$
- line $BC \leqslant 5\,\text{cm}$.

Use a ruler and a pair of compasses to **construct** suitable arcs and lines to show this region.
You must show your construction arcs.
Shade the region in which point C is located. [4]

Examiner only

7. PowrUp is a company that makes batteries.
The quality of the batteries is tested regularly.
PowrUp calculates the relative frequency of faulty batteries after checking a total of 1000, 2000, 3000, 4000 and 5000 batteries.
The results are plotted on the graph below.



(a) One battery is selected at random.
Write down the best estimate for the probability that this battery will be faulty.
You must give a reason for your choice. [2]

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Probability = ...

Reason:

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Examiner only

(b) It costs the company 2·6p to dispose of each of the faulty batteries.
How much will it cost the company to dispose of all the faulty batteries after testing the first 3000 batteries?
You must show all your working. [3]

Turn over.

Examiner only

8. The diagram shows a **solid** cylinder with radius 10 cm.
The total **surface area** of the solid cylinder is 1570·8 cm^2.

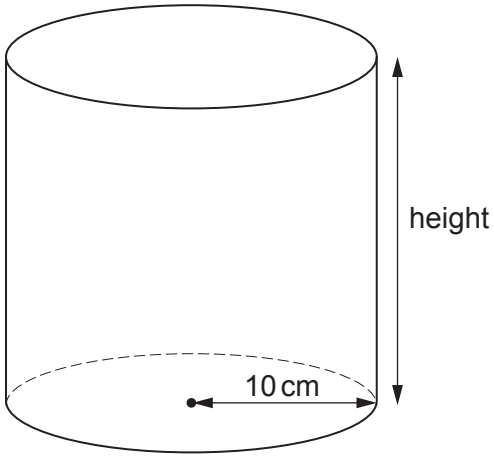


Diagram not drawn to scale

Find the height of the cylinder. [5]

Examiner only

9. 2400 tickets were sold for a concert.
The table below shows the cost of the different types of ticket.

Ticket	Cost per ticket
SEATED	£45
STANDING	£23

The total cost of all the 2400 tickets sold was £89 520.

Let x represent the number of seated tickets sold.
Let y represent the number of standing tickets sold.

(a) Complete the following table. [1]

	Equation in terms of x and y
Total number of tickets sold	$x + y = 2400$
Total cost of tickets sold	

(b) Use an algebraic method to find the value of x and the value of y.
You must show all your working. [3]

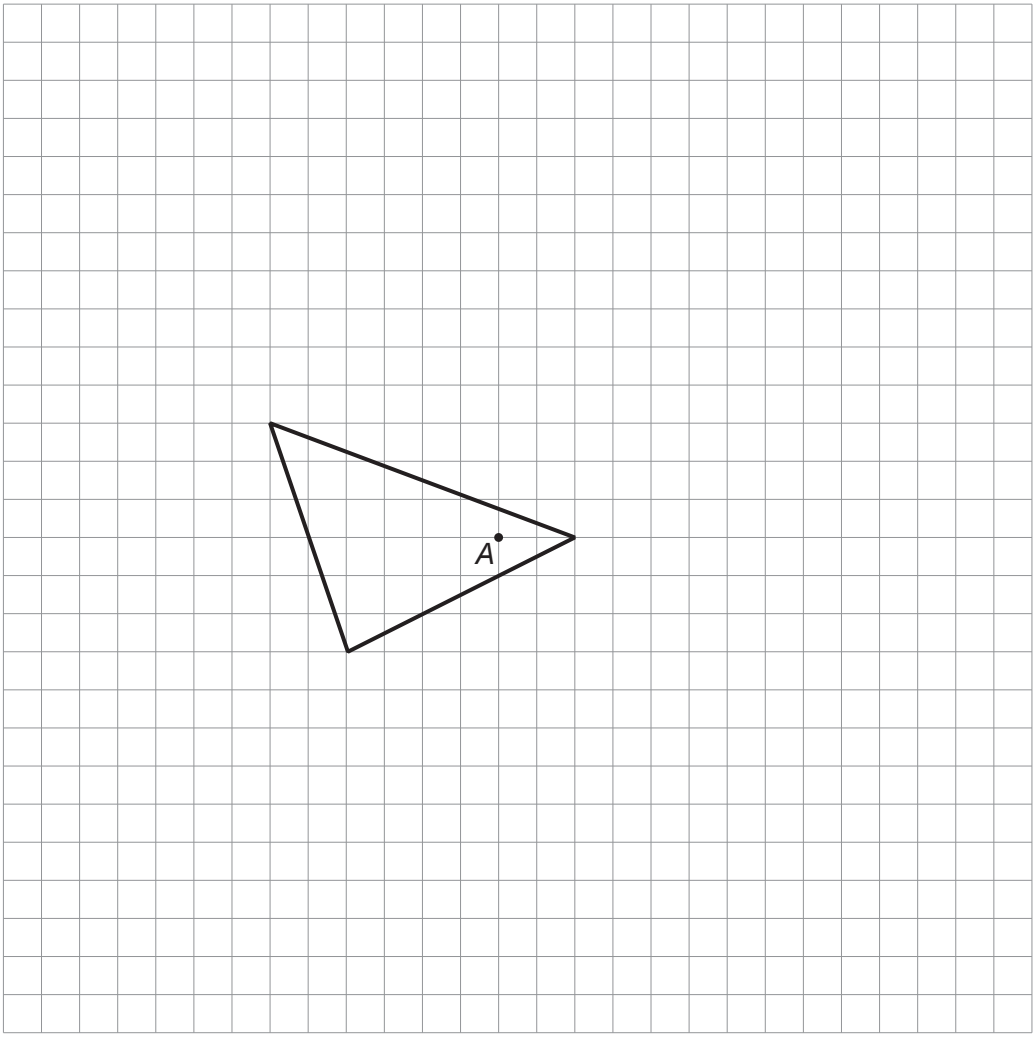
The number of seated tickets sold, x = ...

The number of standing tickets sold, y = ...

Turn over.

Examiner only

10. Enlarge the given triangle by a scale factor of –2, using point *A* as the centre of enlargement. [2]



Examiner only

11. A solid has a height of 11 cm.
A **similar** solid has a height of 23 cm.
The volume of the smaller solid is 107 cm^3.
Calculate the volume of the larger solid. [3]

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12. The solid shown below is a quarter of a sphere with radius 7·3 cm.

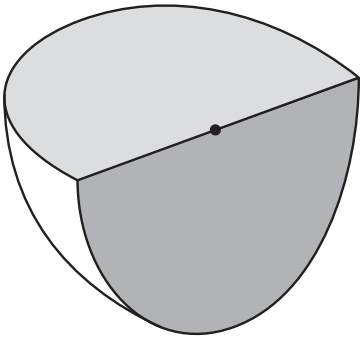

Diagram not drawn to scale

Calculate the volume of this solid.
Give your answer correct to 3 significant figures. [3]

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Examiner only

13. *FD* is the tangent to the circle at point *E*, as shown below.
ABCD is a straight line.
$A\hat{B}E = 130°$ and $B\hat{E}C = 60°$.

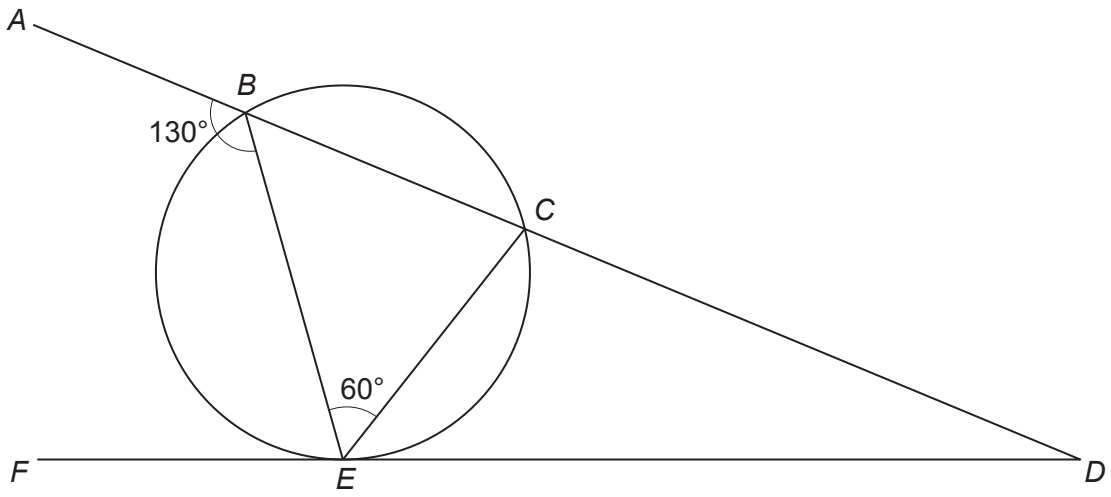

Diagram not drawn to scale

Calculate the size of $C\hat{D}E$. [2]

$C\hat{D}E =$ ..... °

Examiner only

14. Factorise $(2x+3)^2 - 16$. [4]

15. Use the quadratic formula to solve the equation $11x^2 = 23x + 19$.
Give your answer correct to 2 decimal places.
You **must** show all your working. [4]

Examiner only

16. The first four terms of a sequence are

2, 11, 26, 47, ...

Find the nth term of the sequence.
Hence, find the 250th term. [3]

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nth term = ...

250th term = ...

Examiner only

17. Circle the expression that is equivalent to $(m^{64})^{\frac{3}{2}}$. [1]

m^{16} $m^{\frac{125}{2}}$ $m^{\frac{131}{2}}$ m^{96} m^{512}

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Examiner only

18. A bag contains 3 red counters, 5 blue counters and 7 yellow counters.

Sali takes three counters at random from the bag. These counters are not replaced.

Calculate the probability that **at least two** of the counters are the same colour. [4]

Examiner only

19. Make d the subject of the following formula. [5]

$$\sqrt{\frac{3d}{d+g}} = h$$

Examiner only

20. In the shape shown below, $CD = 6\,\text{cm}$, $CH = 7\,\text{cm}$ and $GH = 5\,\text{cm}$.
$C\hat{G}H = x$.
GH is the radius of the circle with centre G.
CDG is a straight line.

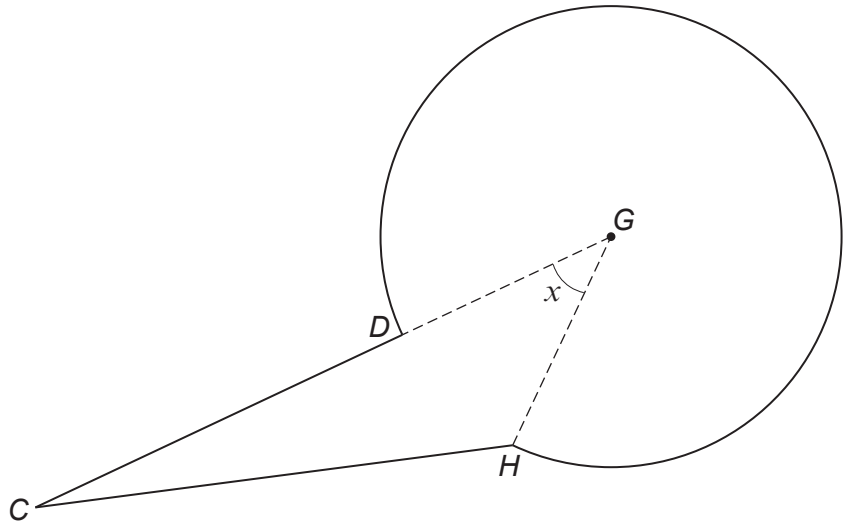

Diagram not drawn to scale

(a) Calculate the size of angle x. [3]

Angle x = ... °

Examiner only

(b) Hence, calculate the total area of the shape. [5]

END OF PAPER

Question number	Additional page, if required. Write the question number(s) in the left-hand margin.

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