



General Certificate of Secondary Education
November 2022

Centre Number

--	--	--	--	--

Candidate Number

--	--	--	--

Mathematics

Unit M8 Paper 1
(Non-Calculator)

Higher Tier



[GMC81]

GMC81

THURSDAY 1 DECEMBER, 9.15am–10.30am

TIME

1 hour 15 minutes.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page. **You are provided with Higher Tier Additional Support Materials for use with this paper.**

You must answer the questions in the spaces provided.

Do not write outside the boxed area on each page, on blank pages or tracing paper.

Complete in black ink only. **Do not write with a gel pen.**

Answer **all eleven** questions.

All working should be clearly shown in the spaces provided. Marks may be awarded for partially correct solutions.

You **must not** use a calculator for this paper.

INFORMATION FOR CANDIDATES

The total mark for this paper is 50.

Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.

You should have a ruler, compasses and a protractor.

The Formula Sheet is on page 2.

13335



16GMC8101

Formula Sheet

Volume of prism = area of cross section \times length



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



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

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

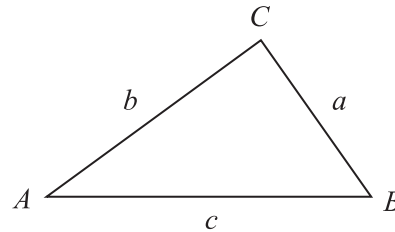


Volume of cone = $\frac{1}{3}\pi r^2 h$

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



In any triangle ABC



Quadratic Equation

The solutions of $ax^2 + bx + c = 0$
where $a \neq 0$, are given by

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

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



1 A shape has a perimeter of 16 cm and an area of 10 cm^2

It is enlarged using a scale factor of 2

(a) What is the perimeter of the enlarged shape?

Answer _____ cm [1]

(b) How many times bigger is the area of the enlarged shape than the area of the original shape?

Answer _____ [1]

2 Each interior angle of a regular polygon is 140° .

How many sides has the polygon?

Answer _____ [2]

[Turn over

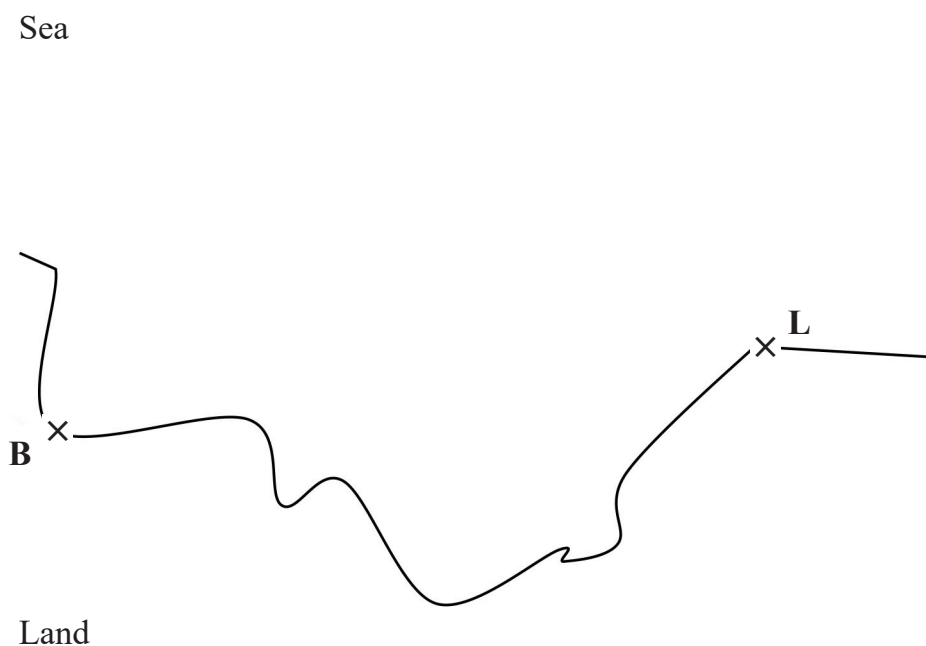


- 3 The diagram shows a section of coastline with a lifeboat station marked at B and a lighthouse marked at L.

A sinking ship sends a distress signal.

The ship is less than 70 km from B and less than 30 km from L.

Using a scale of 1 cm = 10 km, **shade the region** in which the ship could be.



[3]



4 Tom has some 20p coins and some 50p coins.

The total value of Tom's coins is £8.60

Seana has twice as many 20p coins as Tom, but only half as many 50p coins as Tom.

The total value of Seana's coins is £8.20

Find how many of each type of coin Tom has.

A solution by trial and improvement will not be accepted.

Answer _____ 20p coins, _____ 50p coins [5]

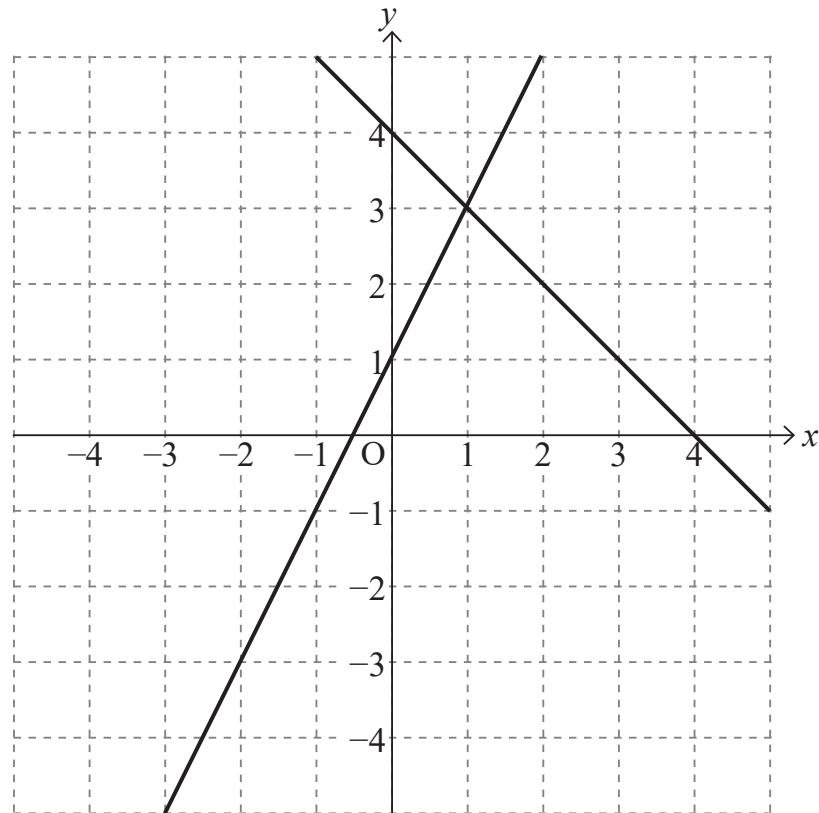
[Turn over

13335



16GMC8105

5 (a)



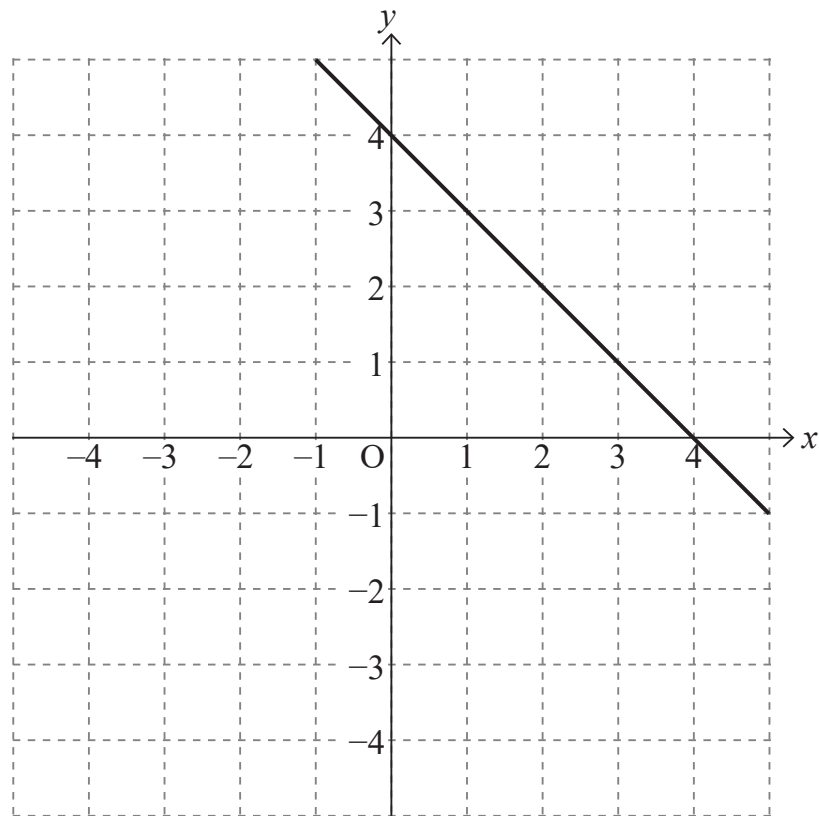
The lines $y = 2x + 1$ and $x + y = 4$ have been drawn on the grid.

By drawing another line on the grid above, indicate clearly by the letter R

the region satisfying $y \geq 2x + 1$ and $x + y \leq 4$ and $x \geq -1$ [2]



(b)



By drawing more lines on the grid above, indicate clearly by the letter B the region satisfying $y \leq 2x$ and $x + y \leq 4$ and $y \geq 1$ [2]

[Turn over



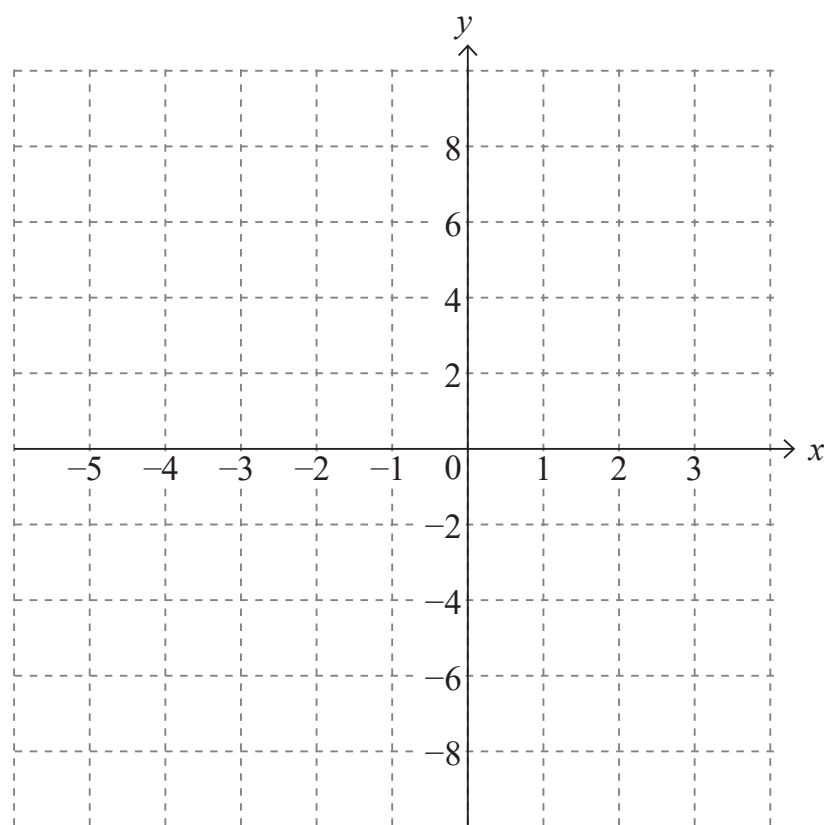
6 (a) Complete the table for $y = x^2 + 3x - 3$

x	-4	-3	-2	-1	0	1	2
y	1		-5	-5	-3	1	

[2]

(b) Draw the graph of $y = x^2 + 3x - 3$ from $x = -4$ to $x = 2$

[2]



(c) Use your graph to estimate the solutions to $x^2 + 3x - 3 = 0$

Answer _____ [2]



(d) (i) By drawing a line on the grid, solve $x^2 + 3x - 3 = x + 1$

Answer _____ [2]

(ii) Write down in simplest form the quadratic equation that has been solved in (i).

Answer _____ [1]

(e) What line would be drawn on the grid to solve $x^2 + 4x - 6 = 0$?

Answer _____ [2]

[Turn over



7 (a) Write the decimal number 15 as a binary number.

Answer _____ [1]

(b) Write the binary number 1000000 as a decimal number.

Answer _____ [1]

8 Change 0.081818181... into a fraction.

Answer _____ [2]





BLANK PAGE
DO NOT WRITE ON THIS PAGE
(Questions continue overleaf)

[Turn over

13335



16GMC8111

9 A (8, -6) and B (-8, 6) are ends of the diameter AB of a circle.

(a) What is the centre of the circle?

Answer _____ [1]

(b) What is the equation of the circle?

Answer _____ [1]

(c) What is the gradient of the diameter AB?

Answer _____ [1]

(d) Find the equation of the tangent to the circle at A.

Answer _____ [3]



(e) Write down the equations of the two tangents to this circle which are parallel to the y axis.

Answer _____ and _____ [2]

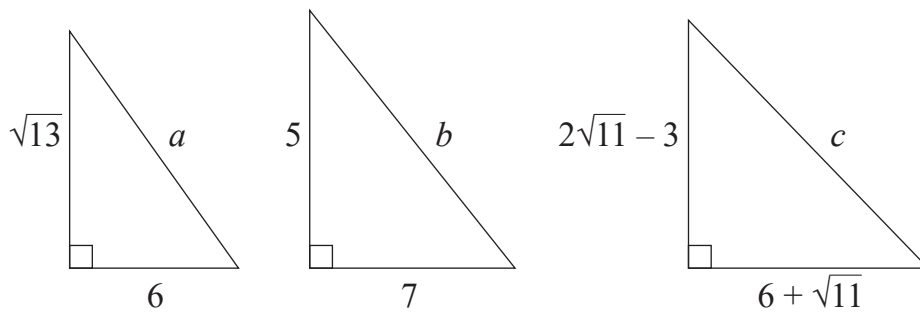
(f) Find the points of intersection of these tangents with the tangent at A.

Answer _____ and _____ [2]

[Turn over



10



diagrams
not
drawn
accurately

For each of the right-angled triangles above, state whether the length of the hypotenuse is rational or irrational, giving reasons for your answers.

Answer a is _____ because _____

b is _____ because _____

c is _____ because _____

[6]



11

$$4^{-\frac{1}{2}}$$

$$\left(\frac{1}{9}\right)^{-\frac{1}{2}}$$

$$64^{\frac{2}{3}}$$

$$3^{\frac{3}{2}}$$

$$1^{\frac{5}{7}}$$

Prove that one of the above is a prime number and one is a surd.

[3]

THIS IS THE END OF THE QUESTION PAPER

13335



16GMC8115

Sources: All images © CCEA unless stated

DO NOT WRITE ON THIS PAGE

For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	

Total Marks	
--------------------	--

Examiner Number

Permission to reproduce all copyright material has been applied for.
In some cases, efforts to contact copyright holders may have been unsuccessful and CCEA will be happy to rectify any omissions of acknowledgement in future if notified.

13335/4



16GMC8116



Rewarding Learning

**General Certificate of Secondary Education
November 2022**

GCSE Mathematics

HIGHER TIER ADDITIONAL SUPPORT MATERIALS (For use in November 2022)

HIGHER TIER ADDITIONAL SUPPORT MATERIALS (November 2022)

Numbers

Highest Common Factor (HCF): The highest common factor is the largest number that divides evenly into two or more numbers, e.g. 4 is the HCF of 8 and 20

Trial and Improvement

This is a method of trying different values in an equation until you get a suitable solution (e.g. to 1 decimal place).

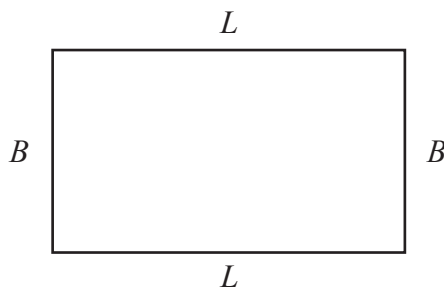
Range

The range of a set of data is the difference between the largest value and the smallest value in the data set.

Mean

The mean of a set of data is the sum of all the data values divided by the number of data values.

Area and Volume



The area of a rectangle is found by multiplying the length of the rectangle by the breadth.

$A = L \times B$ where A is area, L is length and B is breadth.

The area of a triangle is found by multiplying half the length of the base by the perpendicular height of the triangle.

$A = \frac{1}{2}bh$ where b is the base and h is the perpendicular height of the triangle.

The area of a circle is $A = \pi r^2$ where r is the radius of the circle.

The volume of a cuboid is found by multiplying the length by the breadth by the height of the cuboid.

$V = L \times B \times H$ where V is volume, L is length, B is breadth and H is height.

Angles

There are 180° on a straight line.

There are 180° inside a triangle.

An isosceles triangle is a triangle with 2 equal sides and 2 equal angles.

The sum of all the angles inside a polygon is given by $180(n - 2)$ where n is the number of sides in the polygon.

Pie Chart

In a pie chart, the total angle that corresponds to the entire data set is 360°

Probability

The sum of the probabilities of all outcomes equals 1

Compound Measures

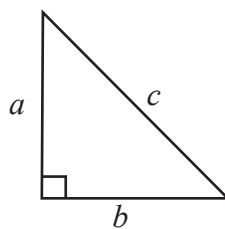
$$\text{Average Speed} = \frac{\text{Distance}}{\text{Time}}$$

$$\text{Density} = \frac{\text{Mass}}{\text{Volume}}$$

Pythagoras' Theorem

If a , b and c are the sides of a right angled triangle shown below, then

$$a^2 + b^2 = c^2$$



Midpoint of a line

If (x_1, y_1) and (x_2, y_2) are the end points of a line, then the coordinates of the midpoint M of the line are

$$M = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

Gradient of a line

If (x_1, y_1) and (x_2, y_2) are two points on a line, then the gradient m of the line is

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

Lines

Parallel lines have the same gradient.

If a straight line has gradient m , then a line which is perpendicular to this line has a gradient $-\frac{1}{m}$

Equation of a circle

The equation of a circle of radius r and centre, the origin $(0, 0)$, is given by $x^2 + y^2 = r^2$ where (x, y) are the coordinates of any point on the circumference of the circle.

Tangent/Radius property

The tangent to a circle is perpendicular to the radius at the point of contact with the circle.

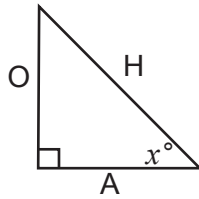
Cyclic Quadrilateral property

The opposite angles of a cyclic quadrilateral add up to 180°

Alternate Segment Theorem

In a circle, the angle between a chord and a tangent through one of the end points of the chord is equal to the angle in the alternate segment.

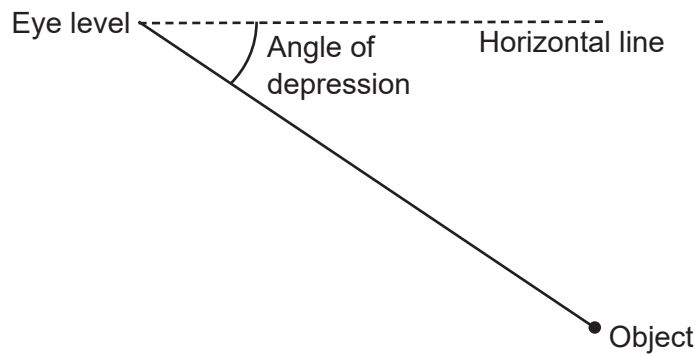
Trigonometric ratios in right angled triangles



$$\sin x^\circ = \frac{O}{H} \quad \cos x^\circ = \frac{A}{H} \quad \tan x^\circ = \frac{O}{A}$$

Angle of depression

If a person stands and looks down at an object, the **angle of depression** is the angle between the horizontal line of sight and the object.



Frequency density in histograms

$$\text{Frequency density} = \frac{\text{Frequency}}{\text{Class width}}$$