



Rewarding Learning

General Certificate of Secondary Education
November 2023

Centre Number

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Candidate Number

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Mathematics

Unit M8 Paper 1
(Non-Calculator)

Higher Tier

[GMC81]



GMC81

THURSDAY 23 NOVEMBER, 9.15 am – 10.30 am

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 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 fourteen** 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.

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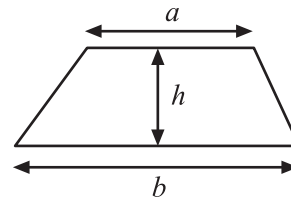
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Formula Sheet

Volume of prism = area of cross section \times length



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



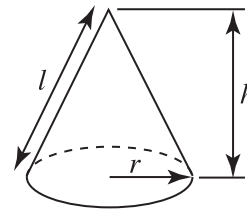
Volume of sphere = $\frac{4}{3}\pi r^3$

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

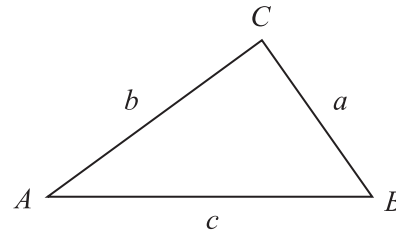


Volume of cone = $\frac{1}{3}\pi r^2 h$

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 110110 is a binary number.

20 is a decimal number.

Work out the total of the two numbers.

Give your answer as a binary number.

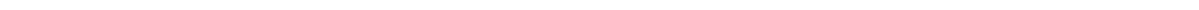
Answer _____ [3]



- 2 Use a ruler and compasses to construct the perpendicular from the point P to the line shown.

Leave all construction arcs and lines.

P ×



[2]



3 7, 10, 13, 16, ...

Using the n th term, find the smallest term in the sequence above which is bigger than 1000

Show your working.

Answer _____ [5]





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September 1st is on a Sunday.

Nina has applied to do her driving test in September.

No test dates are given on a Sunday.

Nina is unable to do her test on Mondays or Fridays due to work.

What is the probability that Nina is given a test date that **she cannot** do?

Answer _____ [3]



5 $A = 2.5 \times 10^8$

$$B = 8 \times 10^{-2}$$

$$C = 5 \times 10^4$$

Work out the value of $\frac{AB}{C}$

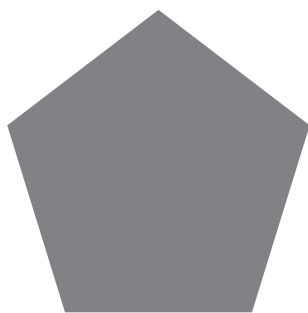
Give your answer in standard form.

Answer _____ [3]

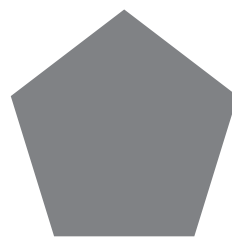
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6



A



B

diagram
not drawn
accurately

A and B are similar pentagons.

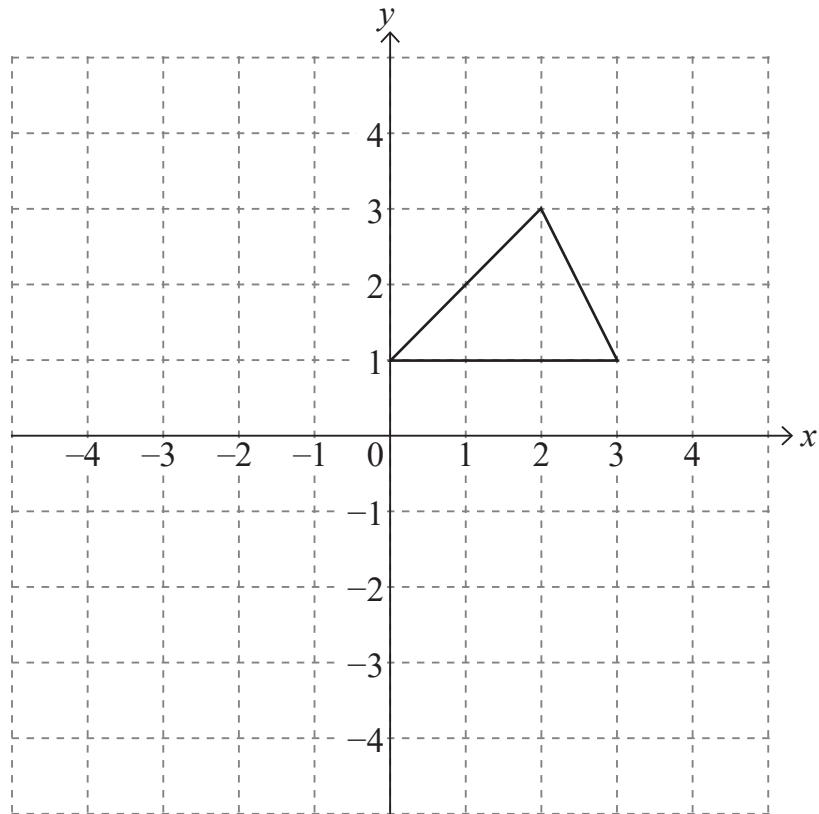
The length of each side of pentagon B is $\frac{3}{4}$ of the length of the corresponding side of pentagon A.

What fraction of the area of A is the area of B?

Answer _____ [1]



7



Draw the reflection of the triangle in the line $y = -x$.

[3]

[Turn over



8 M is directly proportional to d^2

$$M = 36 \text{ when } d = 3$$

d is directly proportional to x

$$d = 4 \text{ when } x = 2$$

Work out the value of M when $x = 4$

Answer _____ [4]



9 (a) The point $(5, a)$ lies on the circle $x^2 + y^2 = 50$

Find the possible values of a .

Answer _____ [2]

(b) Find the equation of the tangent to the circle $x^2 + y^2 = 50$ at $(-1, 7)$.

Answer _____ [3]

[Turn over



10 (a) Change $0.527527527\dots$ into a fraction.

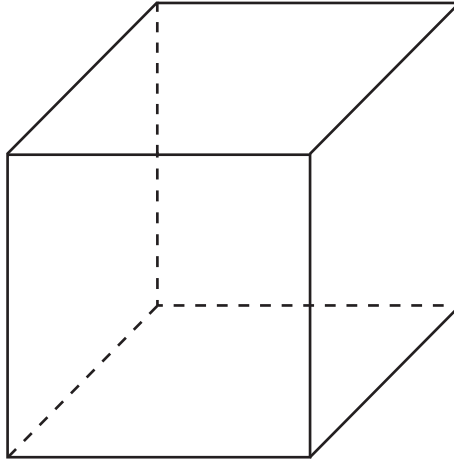
Answer _____ [2]

(b) Write down the value of $4^{\frac{3}{2}}$

Answer _____ [1]



11



The length of the space diagonal of a cube is 9 cm.

Find the length of a side of the cube, giving your answer in the form $a\sqrt{b}$

Answer _____ cm [3]

[Turn over



12 A box contains 2 bronze medals, 6 silver medals and 3 gold medals.

Two medals are taken at random from the box.

What is the probability that they are

(a) both silver,

Answer _____ [3]

(b) different types of medal?

Answer _____ [4]



13

$$A = (7 - \sqrt{5})(7 + \sqrt{5}) \quad B = [(7 - \sqrt{5}) - (7 + \sqrt{5})]^2 \quad C = \frac{14\sqrt{10}}{7\sqrt{2}}$$

Prove that only one of A, B, C is irrational.

[5]

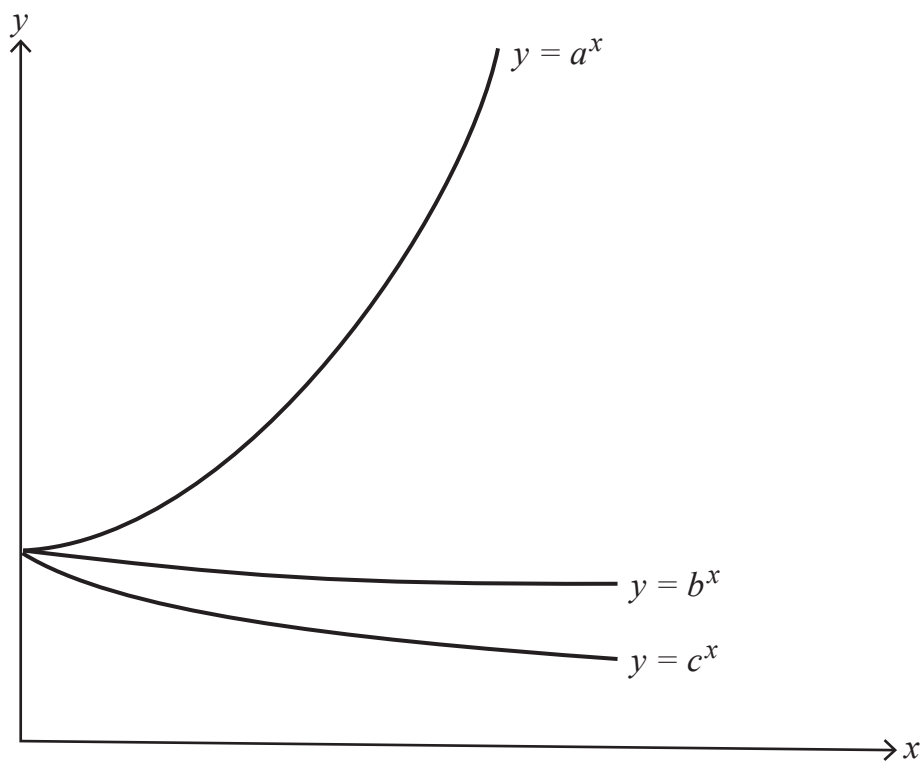
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14



a , b and c are three decimal numbers.

The graphs of $y = a^x$, $y = b^x$, $y = c^x$ are sketched above.

One of a , b , c lies between 0.2 and 0.6,
 one of a , b , c lies between 0.8 and 1.2,
 and one of a , b , c lies between 1.4 and 1.8

(a) Which of a , b , c lies between 0.2 and 0.6?

Answer _____ [1]

(b) Which of a , b , c lies between 0.8 and 1.2?

Answer _____ [1]

(c) d is a decimal which lies between 2.0 and 2.4

Draw one possible sketch of the graph $y = d^x$ on the grid above. [1]

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Question Number	Marks
1	
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Total Marks	
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Examiner Number

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