



Rewarding Learning

General Certificate of Secondary Education
January 2020

Centre Number

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Candidate Number

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Mathematics

Unit M8 Paper 1
(Non-calculator)

Higher Tier



MV24

[GMC81]

WEDNESDAY 15 JANUARY, 9.15am–10.30am

Time

1 hour 15 minutes, plus your additional time allowance.

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 on blank pages or tracing paper.
Complete in black ink only.

Answer all sixteen 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 at the end of each question indicate the marks awarded to each question or part question.

You should have a ruler, compasses and a protractor.

The Formula Sheet is on pages 4–6.

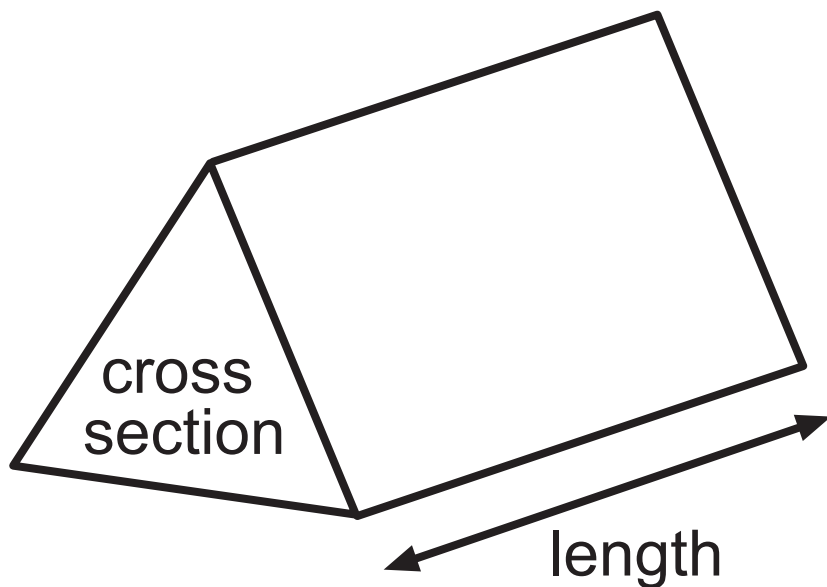
Blank Page

(Formula Sheet starts on page 4)

Formula Sheet

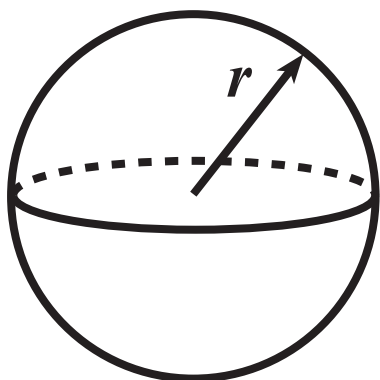
Volume of prism

= area of cross section \times length



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

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



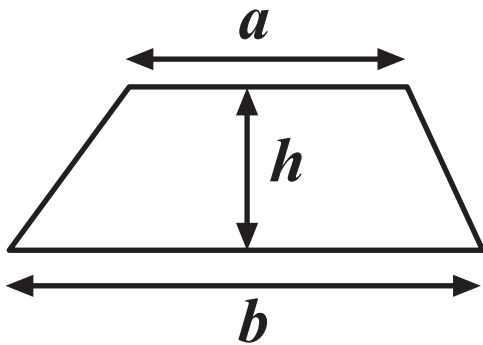
Quadratic Equation

The solutions of $ax^2 + bx + c = 0$

where $a \neq 0$, are given by

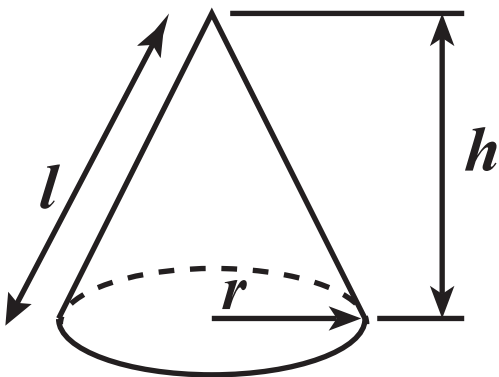
$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

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

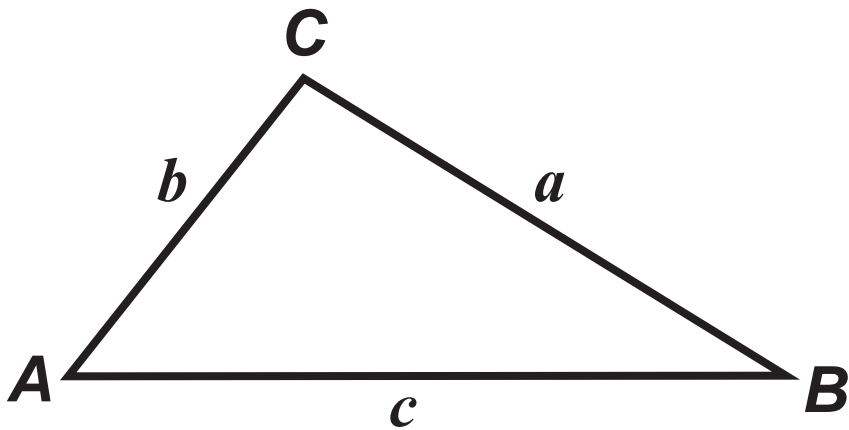


Volume of cone = $\frac{1}{3} \pi r^2 h$

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

1 Simplify the following. [1 mark for each]

(a) $4y^3 \times 3y^4$

Answer _____

(b) $(m^4)^5$

Answer _____

2 (a) Solve the inequality $6y + 5 \geq 2$
[2 marks]

Answer _____

(b) Write down the smallest **integer** value of y which satisfies the inequality
[1 mark]

$$6y + 5 \geq 2$$

Answer $y =$ _____

3 (a) Write 25 as a binary number. [1 mark]

Answer _____

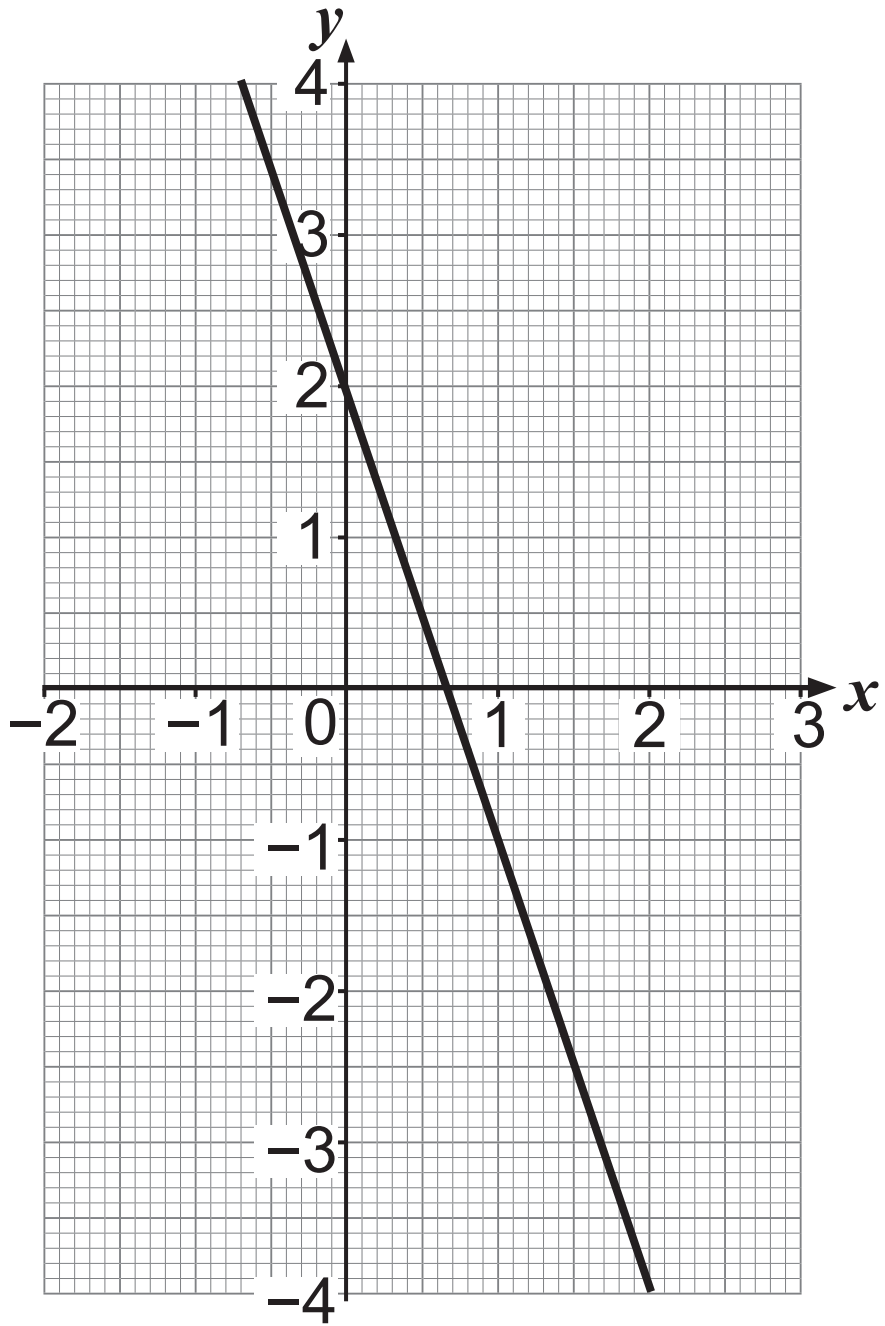
(b) Write the binary number 1101001 in decimal form. [1 mark]

Answer _____

4 Make m the subject of the formula
 $H = mr + s$ [2 marks]

Answer _____

5



By drawing a suitable line on the grid
opposite solve the simultaneous equations
[4 marks]

$$y = 2x - 2$$

$$y = -3x + 2$$

Answer $x =$ _____ $y =$ _____

6 Two fair dice are rolled.

Make a list of all the ways it is possible to get a total score of 7 on the two dice.

[2 marks]

Answer _____

7 Find the value of $(-2)^{-2}$ [2 marks]

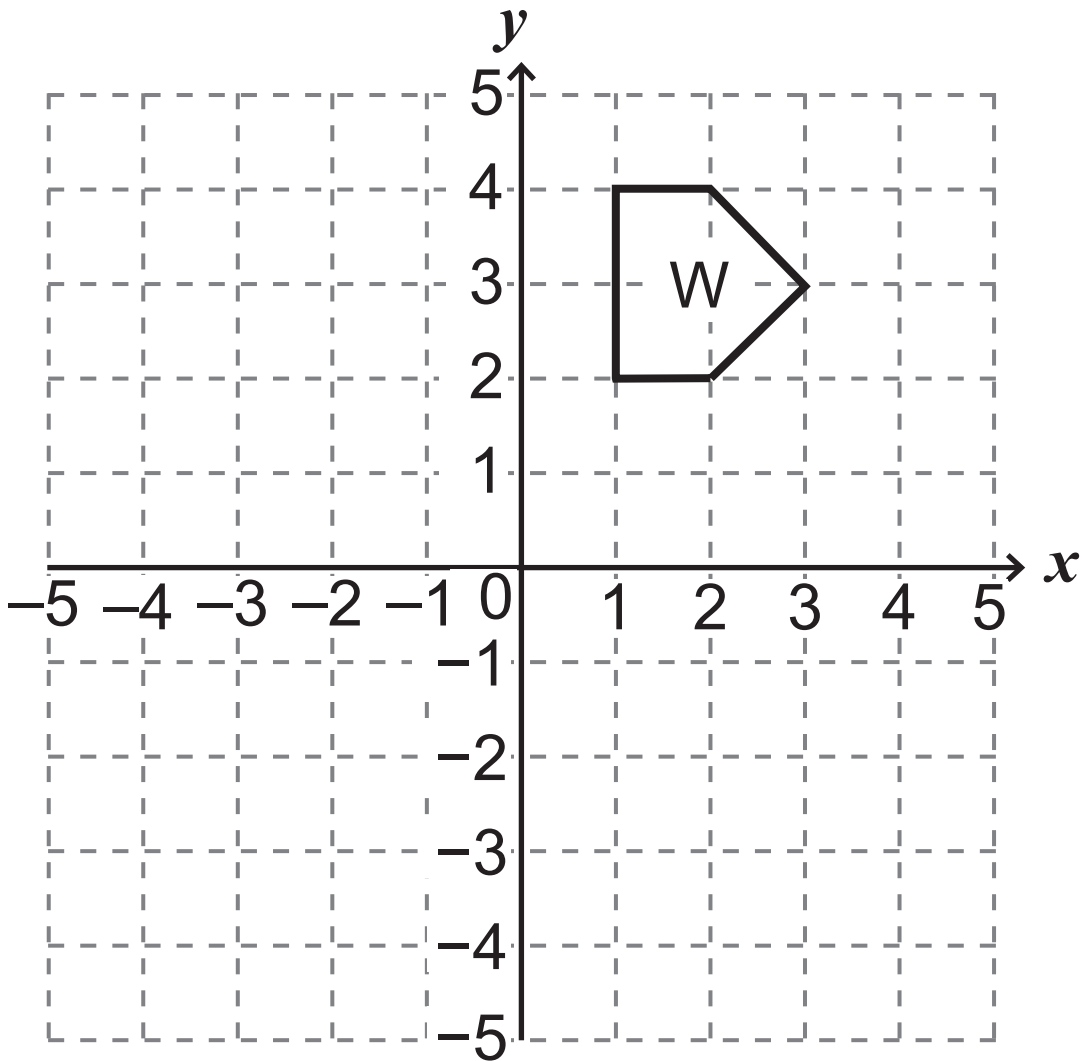
Answer _____

8 Make x the subject of the formula

$$y = \frac{b}{\sqrt{x}} \quad [2 \text{ marks}]$$

Answer $x =$ _____

9



On the grid, draw the reflection of the shape W in the line $y = -x$ [2 marks]

10 There are three main routes from Belleek to Enniskillen by car.

There are five main routes from Enniskillen to Fintona by car.

(a) How many different ways can James travel from Belleek to Enniskillen to Fintona by car using only main routes?
[1 mark]

Answer _____

(b) On a particular day, two of the main routes from Enniskillen to Fintona were closed.

By what percentage has the number of different ways for James to travel from Belleek to Enniskillen to Fintona by car using only main routes been reduced?
[2 marks]

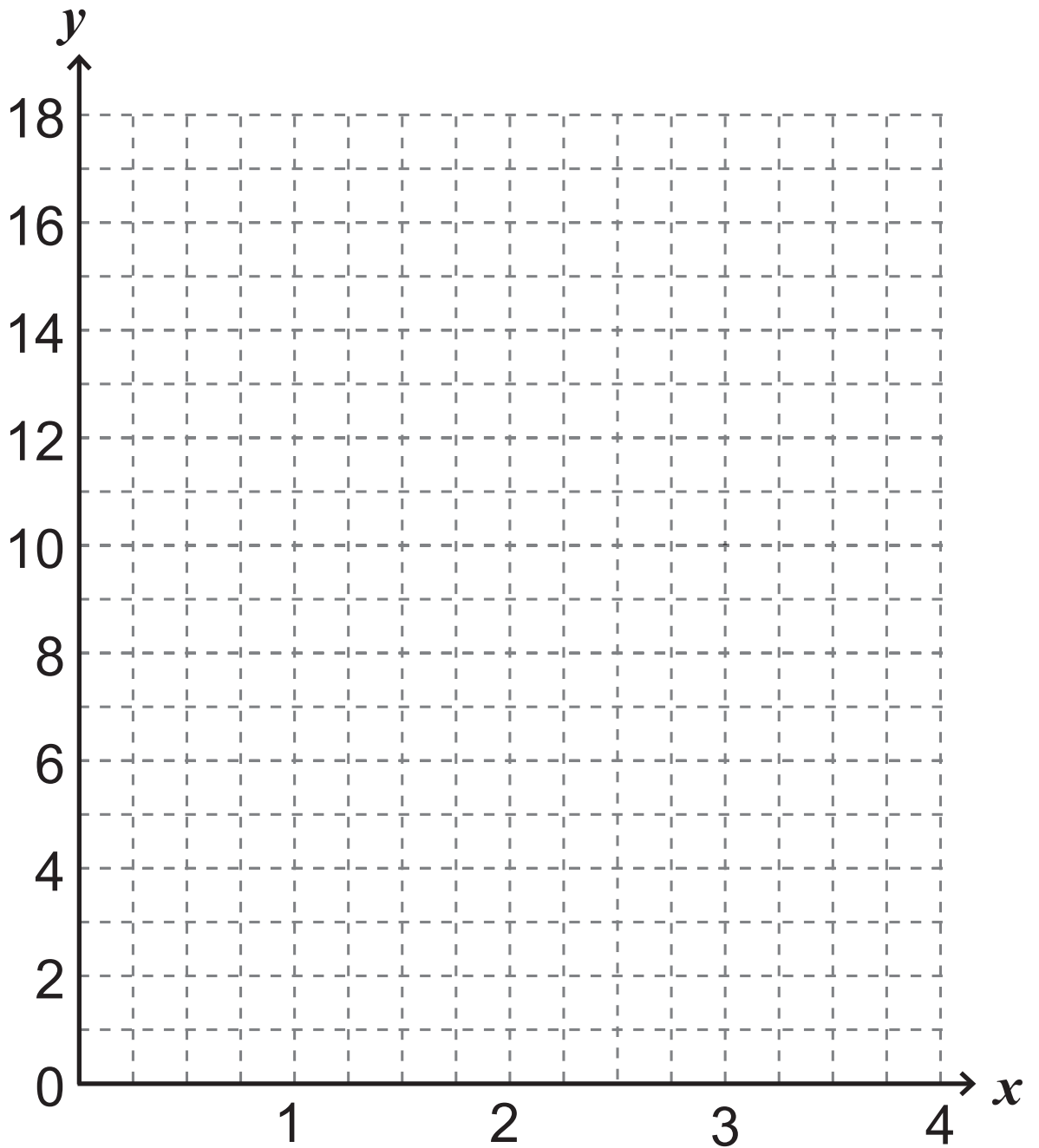
Answer _____ %

11 (a) Rationalise the denominator of $\frac{28}{\sqrt{7}}$
[2 marks]

Answer _____

(b) Show that $(\sqrt{45} - \sqrt{5})^2 = 20$
[2 marks]

12 (a) Sketch the curve $y = 2^x$ on the grid below for $0 \leq x \leq 4$ [3 marks]



(b) In **(a)**, if **£y** represents the value of one share in an investment company x years after purchase, explain in words what is happening to the value. [1 mark]

Answer _____

(c) Use your graph to predict after how many **months** the value of the share will be 10 times greater than the original purchase value. [2 marks]

Answer _____ months

13 Simplify $\sqrt[3]{(x^6y^9)^2}(xy)^{-2}$ [3 marks]

Answer _____

14 A bag contains five red badges and three yellow badges.

Two badges are taken at random from the bag.

What is the probability that they are the same colour? [4 marks]

Answer _____

15 Circle the irrational numbers in the list
[3 marks]

$$\frac{\pi^2}{4}$$

$$\frac{\sqrt{27}}{\sqrt{2}}$$

$$\frac{\sqrt{27}}{\sqrt{3}}$$

$$\frac{\sqrt{27}}{\sqrt{4}}$$

$$\sqrt[3]{27}$$

16 $y = \frac{3}{4}x + c$ is a tangent at the point P to the circle $x^2 + y^2 = 100$, centre O at (0,0).

(a) Write down the gradient of the radius OP.
[1 mark]

Answer _____

(b) Write down the equation of the line OP.
[1 mark]

Answer _____

(c) Hence find the possible coordinates of P. [4 marks]

Answer _____ or _____

This is the end of the question paper

For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
Total Marks	

Examiner Number

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