



Rewarding Learning

General Certificate of Secondary Education
2022

Centre Number

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Candidate Number

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Mathematics

Unit M7 Paper 2
(With calculator)
Higher Tier



[GMC72]

GMC72

MONDAY 13 JUNE, 10.45am–12 NOON

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 fourteen** questions.

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

You **may** 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 calculator, ruler, compasses and a protractor.

The Formula Sheet is on page 2.

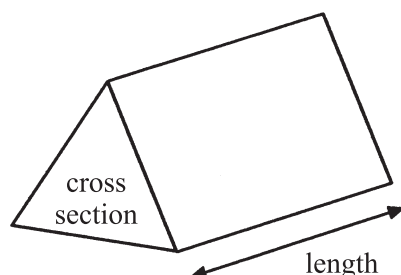
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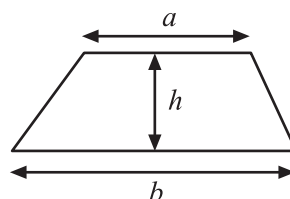
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Formula Sheet

Volume of prism = area of cross section \times length

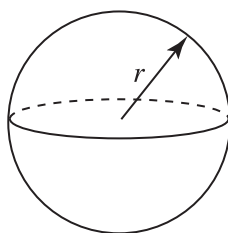


Area of trapezium = $\frac{1}{2}(a + b)h$



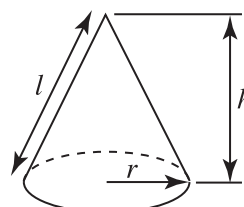
Volume of sphere = $\frac{4}{3}\pi r^3$

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

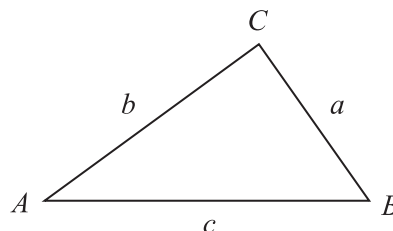


Volume of cone = $\frac{1}{3}\pi r^2 h$

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 Winter 2018–19 was the wettest on record in the United States.

The average rainfall was 9.01 inches.

How many centimetres was this to the nearest centimetre?

1 inch = 2.54 cm



Answer _____ cm [3]



2 Kendra flips a coin and rolls a dice.

(a) List all the possible outcomes in the table below.

Two have already been filled in for you.

		Dice					
Coin		1	2	3	4	5	6
	Heads (H)	H1					
	Tails (T)					T5	

[2]

Given that each outcome is equally likely, find the probability that

(b) Kendra gets a 5,

Answer _____ [1]

(c) Kendra gets a Tail and an odd number.

Answer _____ [1]

3 Write down the next two terms in the sequence below.

1, 8, 27, 64, _____, _____

[2]



4 A concrete mixture contains cement, sand and gravel in the ratio 1 : 2 : 3

(a) What weight of concrete contains 36 kg of gravel?

Answer _____ kg [2]

(b) Work out the weight of sand contained in 198 kg of concrete.

Answer _____ kg [2]

5 Phil changed 230 euro into £ and Gerry changed 168 euro into £.

The exchange rate is £1 = 1.09 euro.

How much more did Phil receive in £?

Answer £ _____ [3]

[Turn over]

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- 6 A supermarket sells coffee in jars of two different sizes, as illustrated below.



Which jar is better value?

You must show working to justify your answer.

Answer _____ [3]



- 7 Marie has a recipe for Spaghetti Carbonara which requires the following ingredients.

Spaghetti	500 g
Bacon	200 g
Eggs	8
Cream	76 ml
Parmesan	48 g

Marie only has 150 g of bacon.

Work out how much of the other ingredients she should use.

Answer

Spaghetti	g
Eggs	
Cream	ml
Parmesan	g

[3]

[Turn over



8 Calculate the size of the angle a.

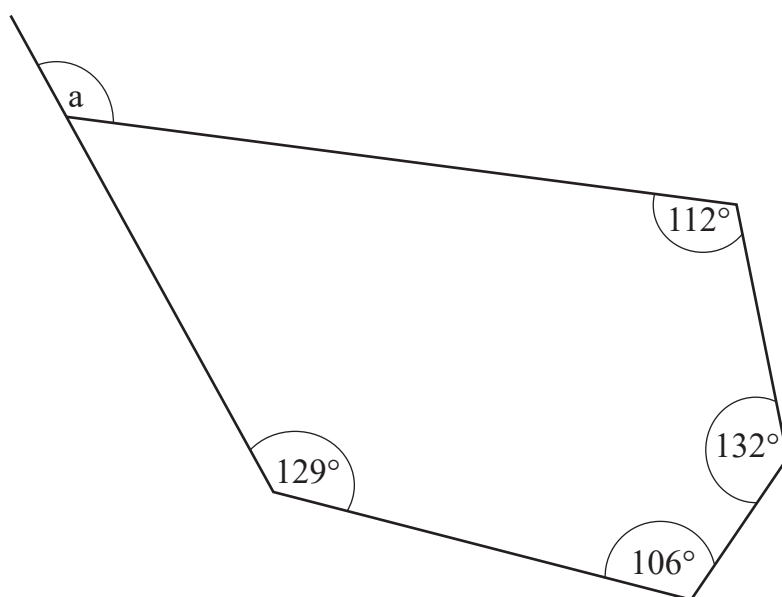


diagram
not drawn
accurately

Answer Angle a = _____ $^\circ$ [3]



9 The equation $x^3 - 3x = 34$ has a solution between 1 and 5

Use a trial and improvement method to find this solution.

Give your answer correct to one decimal place.

You must show ALL your working.

x	$x^3 - 3x$	

Answer $x =$ _____ [4]

[Turn over

12996.06 R



16GMC7209

- 10 (a)** When a spinner was spun 50 times, it landed on red 12 times.
When spun another 50 times, it landed on red another 9 times.

Calculate the relative frequency for red

- (i)** after the first 50 spins,

Answer _____ [1]

- (ii)** after the 100 spins.

Answer _____ [1]

- (b)** When spun another 50 times the spinner landed on red another 9 times.

What value of the relative frequency gives the best estimate of the probability of this spinner landing on red?

Explain your answer.

Answer _____ because _____
_____ [2]

- (c)** The spinner landed on yellow 40 times in the first 100 spins.

- (i)** Estimate the probability for this spinner landing on yellow.

Answer _____ [1]

- (ii)** Estimate how many times the spinner will land on yellow in 300 spins.

Answer _____ [1]



- 11 A **solid** cone has a vertical height of 12 cm, a slant height of 13 cm and a base radius of 5 cm.

Work out the **total** surface area of the cone, leaving your answer in terms of π

Answer _____ cm^2 [2]



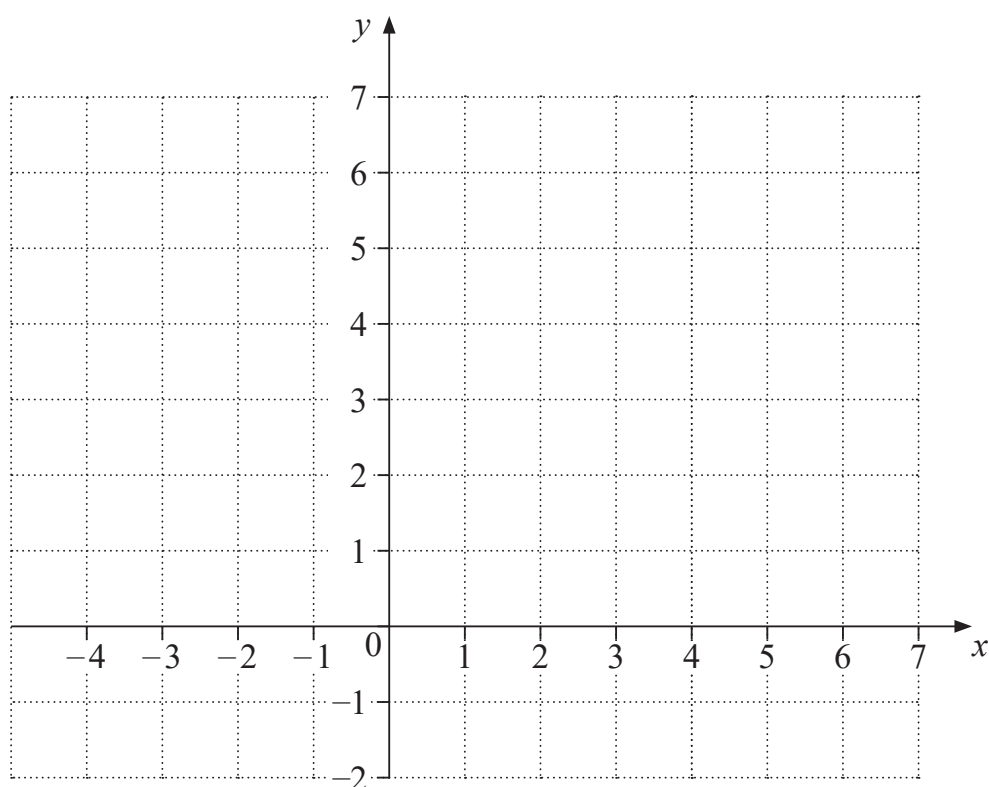
12 The following linear inequalities represent a closed region.

$$x + y \geq 3$$

$$2y - x \geq 4$$

$$y \leq 5$$

- (a) By drawing straight lines and shading, show this region on the grid below. Label the region R.



[3]

- (b) Hence work out the maximum value of $3x + 2y$ in this region.

Answer _____ [2]



13 A book club offers 26 **different** books for sale.

Five of the books cost £3 each

Six of the books cost £4 each

Seven of the books cost £6 each

Eight of the books cost £7 each.

Abi wants to buy two books for exactly £10

How many combinations of books can she choose from?

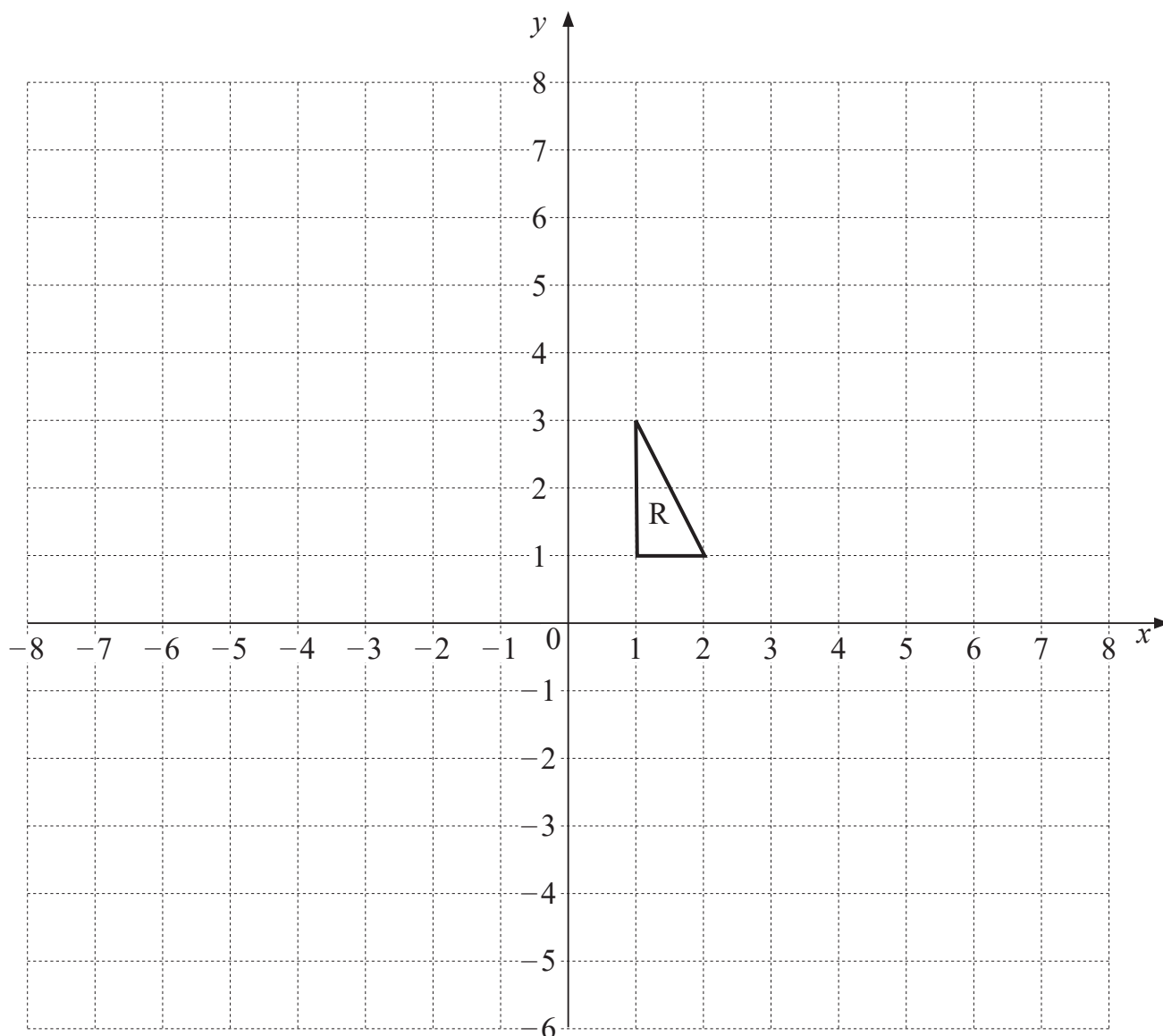
Answer _____ [2]

[Turn over

12996.06 R



16GMC7213



- (a) Triangle R is reflected in the line $y = -1$ and its image rotated 90° clockwise about the point $(1, -1)$

Draw the final image after these two transformations and label it S. [4]

- (b) Describe fully the single transformation which maps R to S.

Answer _____ [2]



THIS IS THE END OF THE QUESTION PAPER

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12996.06 R



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

Total Marks	
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Examiner Number

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Rewarding Learning

**General Certificate of Secondary Education
Summer 2022**

GCSE Mathematics

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

HIGHER TIER ADDITIONAL SUPPORT MATERIALS (Summer 2022)

Numbers

Lowest common multiple (LCM): The lowest common multiple is the lowest multiple shared by 2 or more numbers.

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).

Metric units

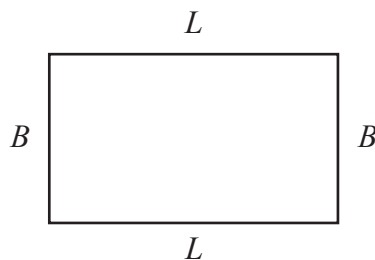
$$1 \text{ ml} = 1 \text{ cm}^3$$

Compound Measures

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

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

Perimeter, Area and Volume



The perimeter of a rectangle is the distance around the outside of the rectangle. It is found by adding the lengths of the 4 sides of the rectangle.

$P = 2L + 2B$ where P is perimeter, L is length and B is breadth.

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

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

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.

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

The circumference (perimeter) of a circle is $C = 2\pi r$ where r is the radius of the circle. An alternative formula is $C = \pi d$ where d is the diameter of the circle.

Mid point 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 $-\frac{1}{m}$

Geometry and Angles

There are 180° on a straight line.

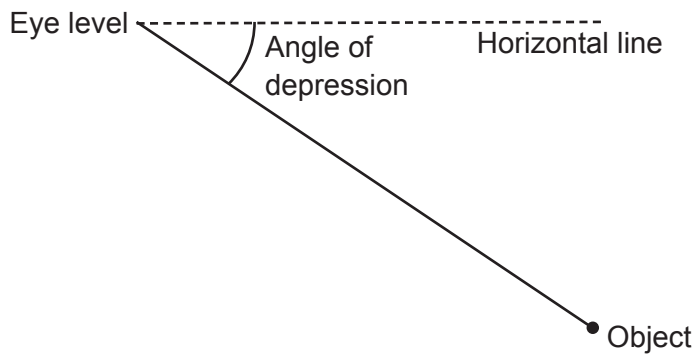
There are 180° inside a triangle.

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.

Angle of depression

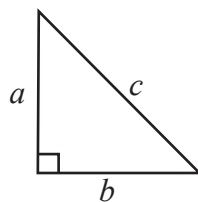
If a person stands and looks down at an object, the **angle of depression** is the angle between the horizontal line of sight and the object.



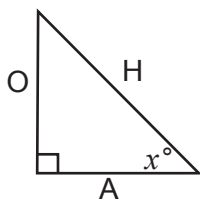
Pythagoras' Theorem

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

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



Trigonometric ratios in right angled triangles



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

Tangent/Radius property

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

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.

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.

Estimate for the mean of a grouped frequency distribution

Estimated mean = sum of (mid interval values multiplied by their frequency) divided by the sum of all the frequencies.

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

Frequency density in histograms

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