



General Certificate of Secondary Education
2023

Centre Number

--	--	--	--	--

Candidate Number

--	--	--	--	--

Mathematics

Unit M7 Paper 2
(With calculator)

Higher Tier



[GMC72]

GMC72

WEDNESDAY 7 JUNE, 10.45 am–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 sixteen** 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.

13347.08 R



20GMC7201

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 = $4\pi r^2$

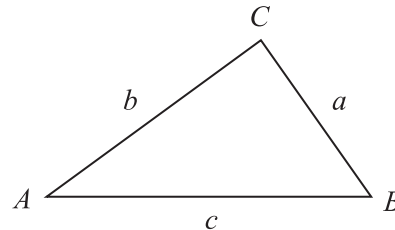


Volume of cone = $\frac{1}{3}\pi r^2 h$

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 game cost €22.99

The exchange rate was £1 = €1.10

What was the cost in £?

Answer £ _____ [2]

2 Albert wants to buy a gold chain.

Gold chains are priced by the length of the chain.

An 18-inch chain costs £264

What will Albert have to pay for a 21-inch chain?



© Getty Images

Answer £ _____ [2]

[Turn over

13347.08 R

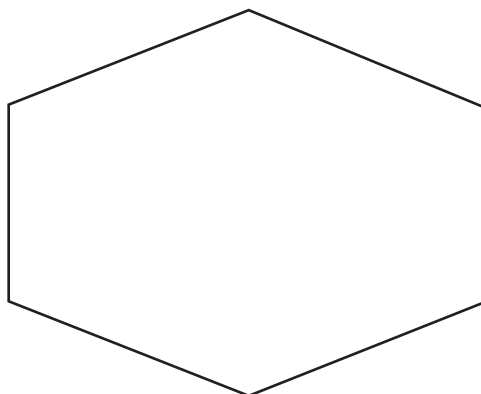


20GMC7203

3 Ellie and Tanisha are working out the sum of the angles in polygons.

Ellie decides to split the hexagon below into triangles.

(a) Show how this can be done.



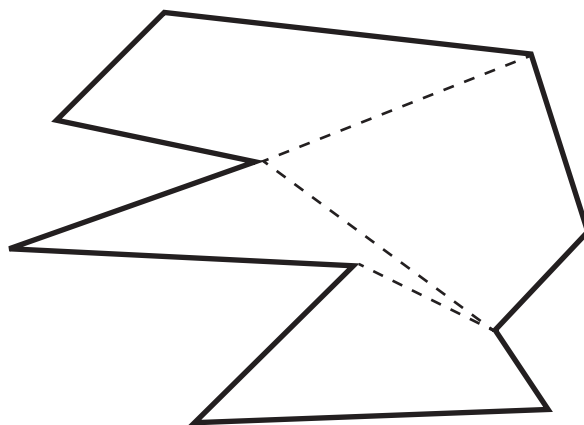
[1]

(b) What is the sum of the angles in the hexagon?

Answer _____° [1]

Tanisha splits the decagon below into quadrilaterals as shown.

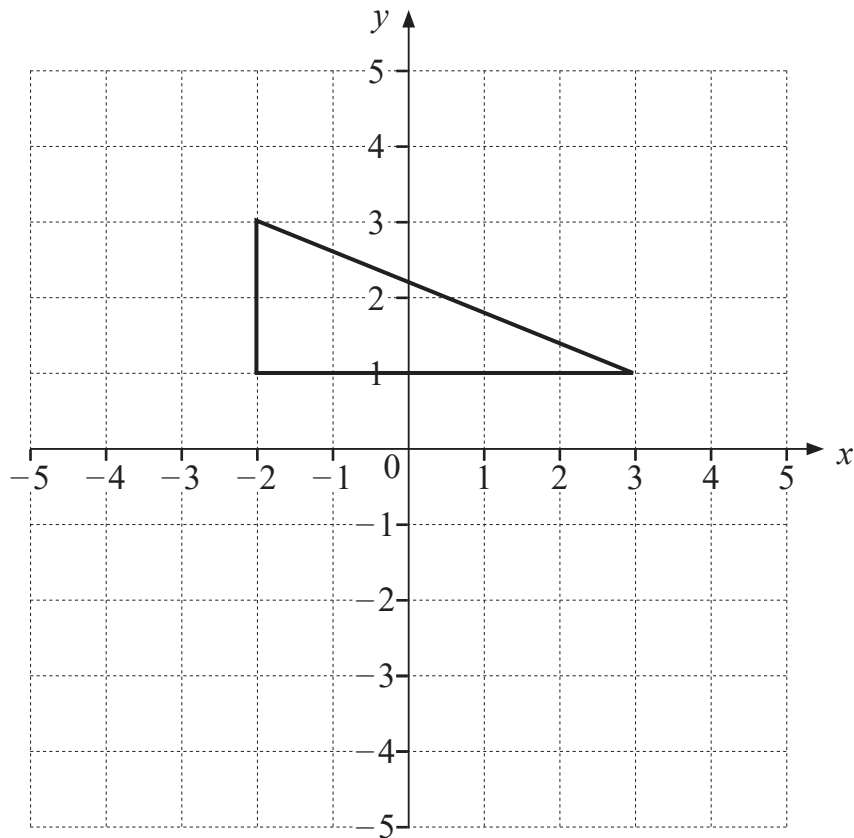
(c) What is the sum of the angles in the decagon?



Answer _____° [1]



4 (a) Reflect the triangle in the x -axis.



[1]

(b) A rectangle of length 5 cm and width 8 cm is enlarged by a scale factor of 4

What are the dimensions of the enlarged rectangle?

Answer length _____ cm, width _____ cm [2]

[Turn over



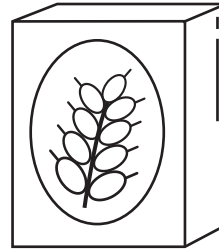
5 A breakfast cereal is sold in three different sized boxes.



500 g



750 g



1 kg

A new size of box will be made.

It will have 20% more cereal than the 500 g box.

It will cost £1.56, which is 20p more than the 500 g box.

Will the customer who normally buys the 500 g box get a better or worse deal in buying this new size of box?

Show all working clearly.

They will get a _____ deal. [4]



6 Visitors to Northern Ireland were asked to name their favourite tourist attraction.

The table of probabilities is based on their responses.

Tourist attraction	Giant's Causeway	Ulster Museum	Titanic Belfast	Mussenden Temple	Derry City Walls	Other
Probability	0.3	0.1	0.14			0.2

The probability of Mussenden Temple is the same as the probability of Derry City Walls.

(a) Complete the table. [3]

(b) What is the probability a visitor named Ulster Museum or Titanic Belfast?

Answer _____ [1]

(c) Last week 1800 visitors were asked to name their favourite tourist attraction.

Estimate how many named Giant's Causeway.

Answer _____ [2]

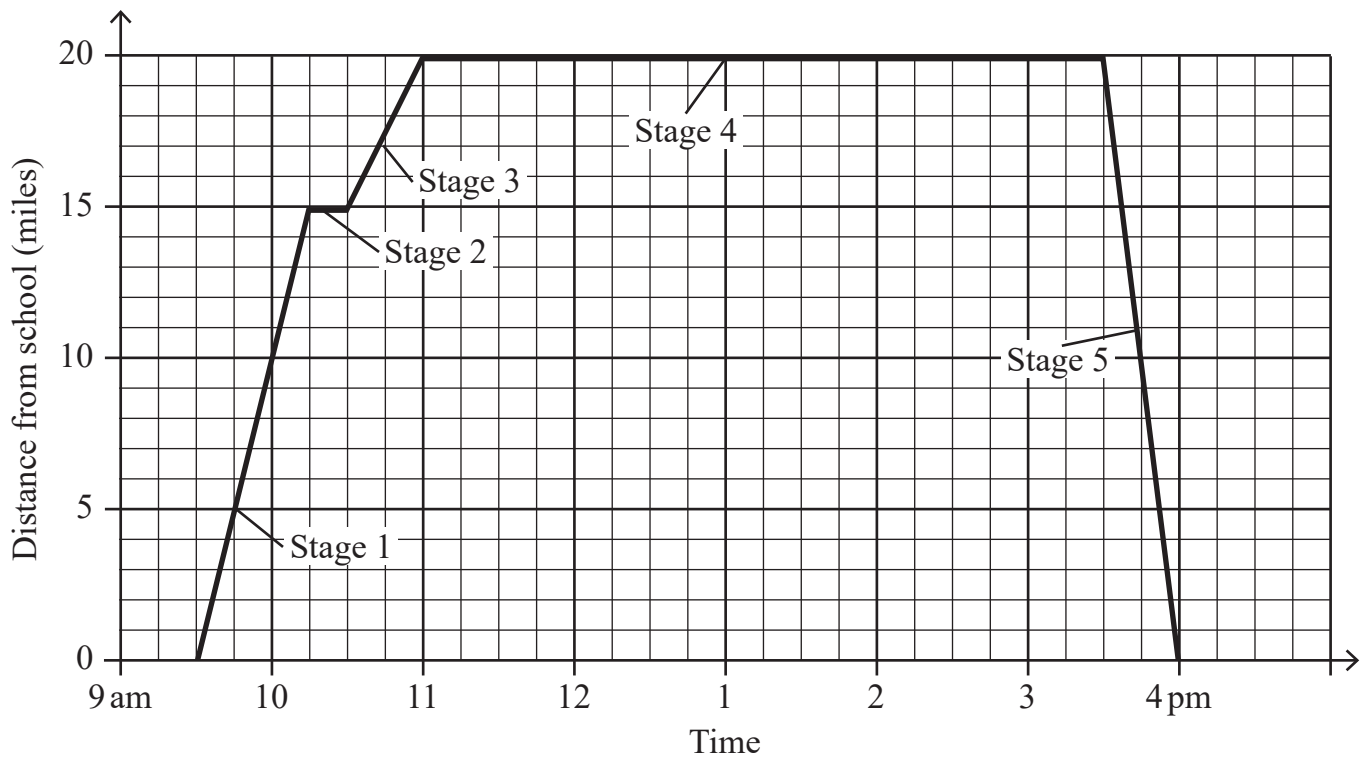
[Turn over



7 A group of students visit a theme park on a school trip.

The graph below shows their journey.

They leave school at 9.30 am and arrive back at 4 pm.



(a) Which was the fastest stage on the journey to the theme park?

Answer _____ [1]

(b) How long did the students stay in the theme park?

Answer _____ [1]

(c) Calculate the average speed of the journey back to school.

Answer _____ mph [2]



8 (a) Simplify $y^8 \div y^2$

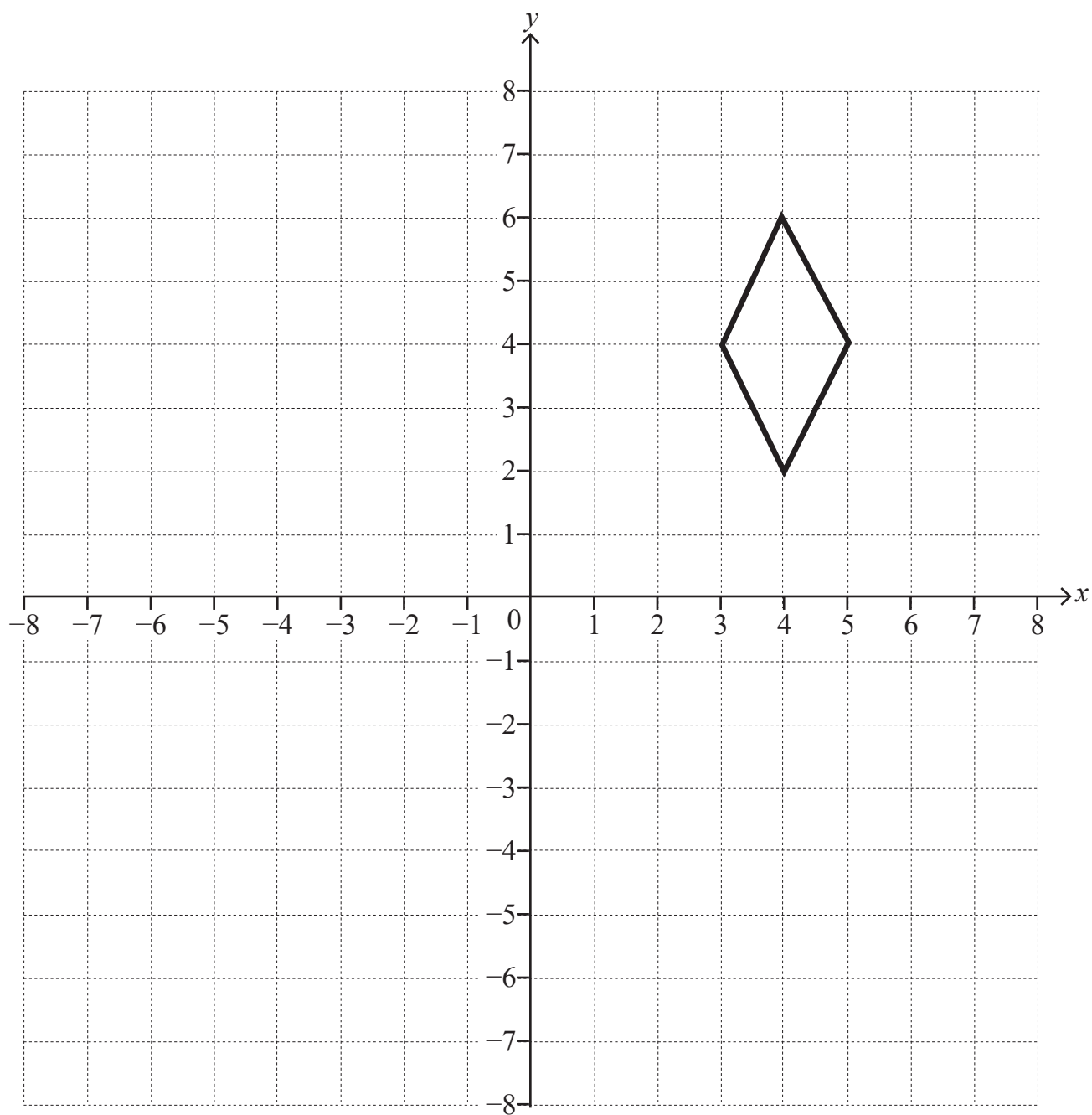
Answer _____ [1]

(b) Solve the inequality $7x > 3x - 12$

Answer _____ [2]



9 Rotate the shape 90° anticlockwise about $(0, -2)$



[2]



10 (a) Write the decimal number 19 as a binary number.

Answer _____ [1]

(b) Rearrange $h - 3m = y$ to make m the subject.

Answer _____ [2]

11 A regular polygon has exterior angles of size 15°

(a) How many sides has the polygon?

Answer _____ [2]

(b) Bailey thinks all regular pentagons are congruent.

Is he correct?

Circle your answer.

yes no more information needed [1]

[Turn over

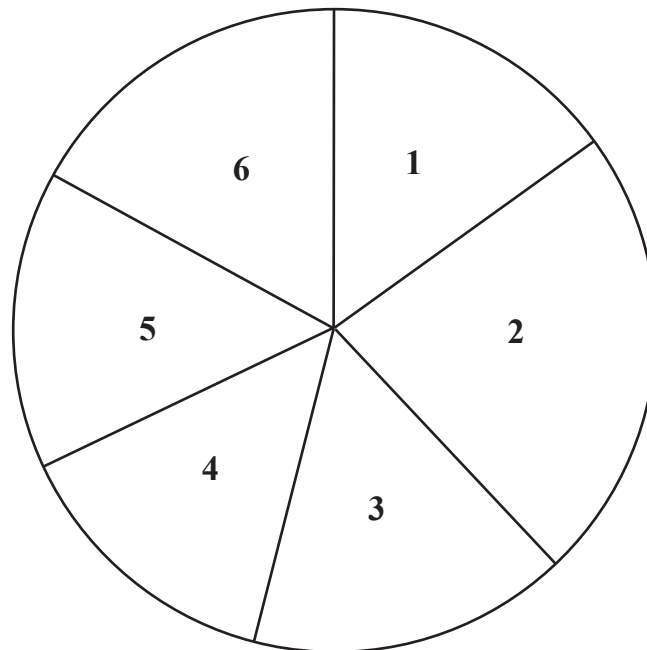
13347.08 R



20GMC7211

12 Georgia rolls a dice a number of times and records the outcome each time.

She displays her results in this pie chart.



Alice thinks Georgia's dice is biased.

Bob disagrees.

What information is needed to decide who is correct?

Answer _____ [1]



13 Draw the locus of all points which are the same distance from A and B.

A
×

×

B

[2]

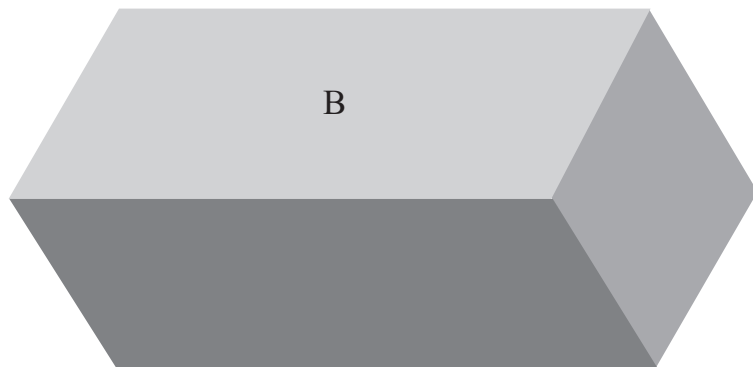
[Turn over

13347.08 R



20GMC7213

14 Cuboid B is an enlargement, scale factor 3, of cuboid A.



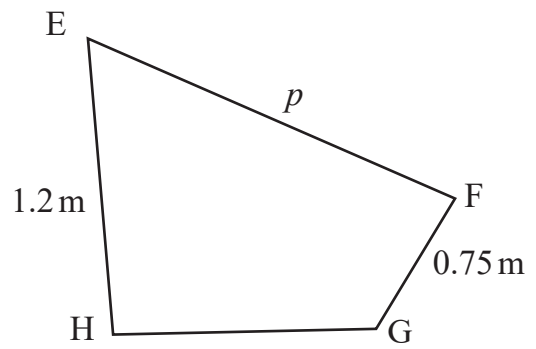
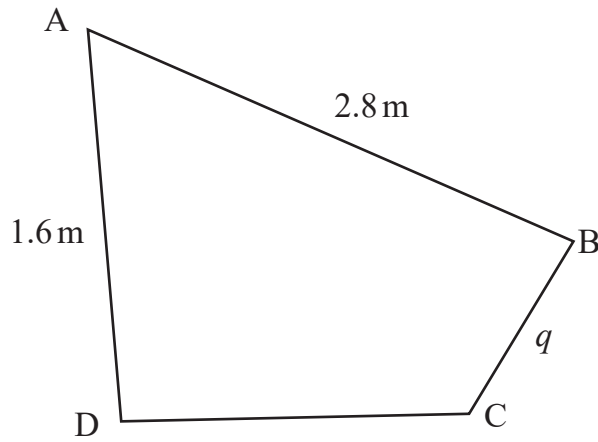
The volume of B is $x \text{ cm}^3$

(a) What is the volume of A?

Answer _____ cm^3 [2]



(b) Two similar shapes are shown.



Diagrams are not drawn to scale.

(i) Find the value of p .

Answer _____ m [2]

(ii) Find the value of q .

Answer _____ m [1]

[Turn over



15 When a body is moving through the air, the air resistance R newtons (N) is proportional to the square of the velocity v m/s.

At a velocity of 100 m/s, the air resistance is 50 N.

(a) Find R in terms of v .

Answer _____ [2]

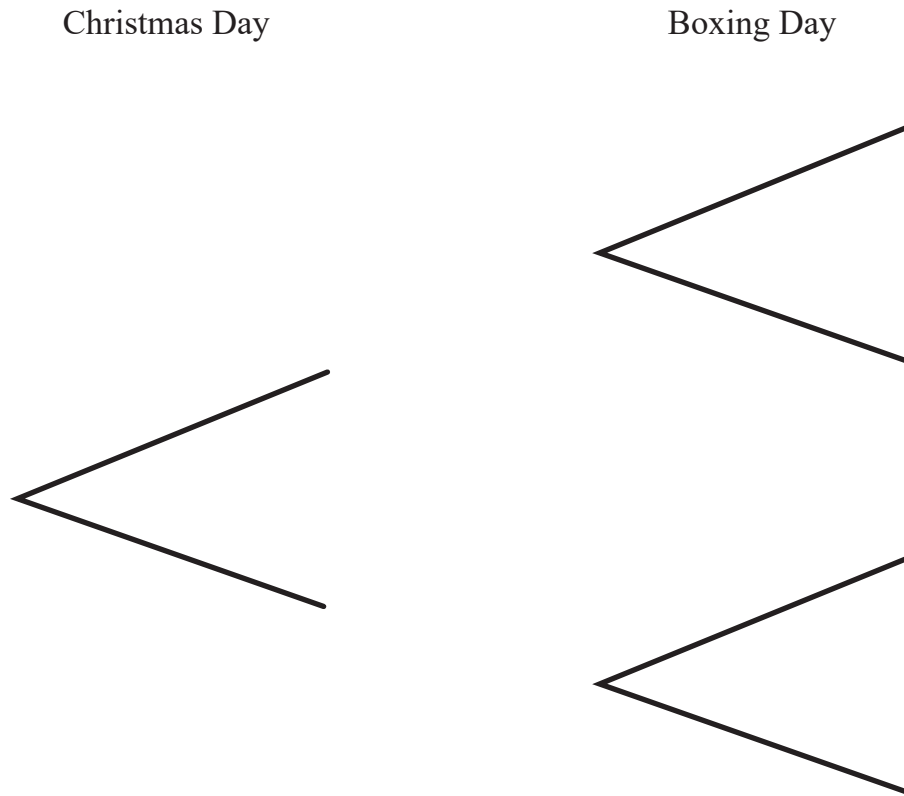
(b) Find R when $v = 120$ m/s.

Answer _____ N [1]



16 The probability that it rains in Ireland on any given day in December is 0.62

- (a) Complete the tree diagram to show this information for Christmas Day and Boxing Day.



[2]

- (b) What is the probability that it rains on exactly one of these days?

Answer _____ [2]

13347.08 R



20GMC7217

THIS IS THE END OF THE QUESTION PAPER

BLANK PAGE

DO NOT WRITE ON THIS PAGE

13347.08 R



20GMC7218



BLANK PAGE
DO NOT WRITE ON THIS PAGE

13347.08 R



20GMC7219

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	
12	
13	
14	
15	
16	

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.





Rewarding Learning

**General Certificate of Secondary Education
Summer 2023**

GCSE Mathematics

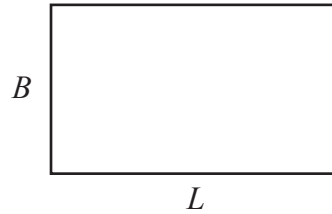
HIGHER TIER ADDITIONAL SUPPORT MATERIALS (For use in Summer 2023)

HIGHER TIER ADDITIONAL SUPPORT MATERIALS (Summer 2023)

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

Perimeter, Area and Volume

The perimeter of a polygon is the distance around the outside of the polygon.



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.

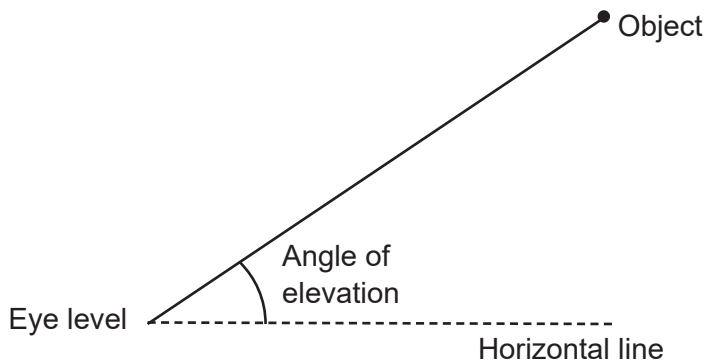
There are 180° inside a triangle.

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 elevation

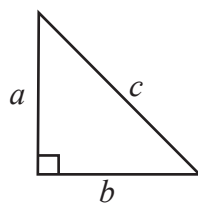
If a person stands and looks up at an object, the **angle of elevation** is the angle between the horizontal line of sight and the object.



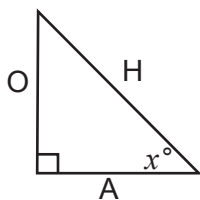
Pythagoras' Theorem

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.

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

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

