Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
November 2022

Mathematics

StemUp Model Solution

Unit M6 Paper 1
(Non-Calculator)
Foundation Tier



[GMC61]

GMC61

THURSDAY 1 DECEMBER, 9.15am–10.15am

TIME

1 hour.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page. **You are provided with Foundation 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 eighteen** 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.

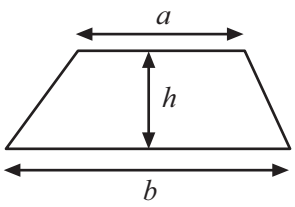
INFORMATION FOR CANDIDATES

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.

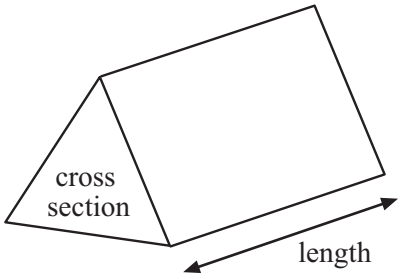
13332

Formula Sheet

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



Volume of prism = area of cross section × length



13332

1 Sean wants to send a parcel weighing 16 kg from Belfast to Dublin.

He has two options.

Parcels 'r' Us
£13.95 with £4.75 extra charge for items heavier than 10 kg

Postage Direct
£12.50 plus 60p for each kg over 7 kg

Which is the cheaper option and by how much?

Parcels 'r' Us: £13.95 + £4.75 = £18.70

Postage Direct: 16 − 7 = 9 kg over

9 × 60p = 540p = £5.40

£12.50 + £5.40 = £17.90

£18.70 − £17.90 = £0.80 = 80p

Answer Postage Direct is cheaper by 80p [4]

[Turn over

2 The United Kingdom (UK) is made up of England, Northern Ireland, Scotland and Wales.

In 2019 the population of the UK was 65.8 million.

The table shows the population in 2019 in 3 of the countries.

Country	Population
England	55.4 million
Northern Ireland	1.9 million
Scotland	5.4 million
Wales	

(a) What was the population of Wales in 2019?

55.4 + 1.9 + 5.4 = 62.7 million

65.8 − 62.7 = 3.1 million

Answer 3.1 million [2]

(b) What is the place value of the 4 in 55.4 million?

Answer 400 000 (4 hundred thousands) [1]

3 A bag contains cards numbered 10 to 20

A card is taken at random from the bag.

Which type of number from odd, even or prime is least likely to be taken?

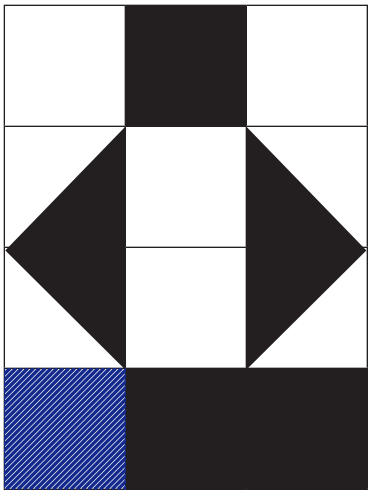
You must show your working to support your answer.

Odd: 11, 13, 15, 17, 19 → 5 cards
Even: 10, 12, 14, 16, 18, 20 → 6 cards
Prime: 11, 13, 17, 19 → 4 cards
Prime has the fewest cards (4 out of 11)

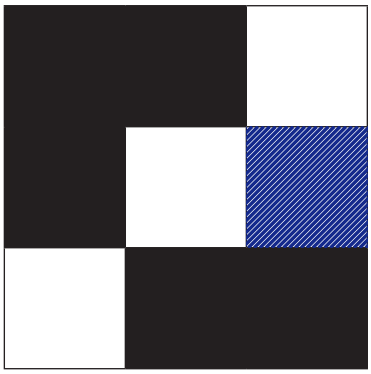
Answer _____prime_____ [2]

[Turn over

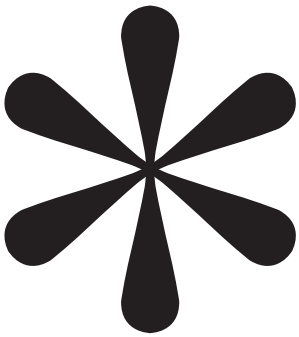
4 **(a)** Shade **one square** so that this shape has only one line of symmetry. [1]



(b) Shade **one square** so that this shape has rotational symmetry of order 2 [1]



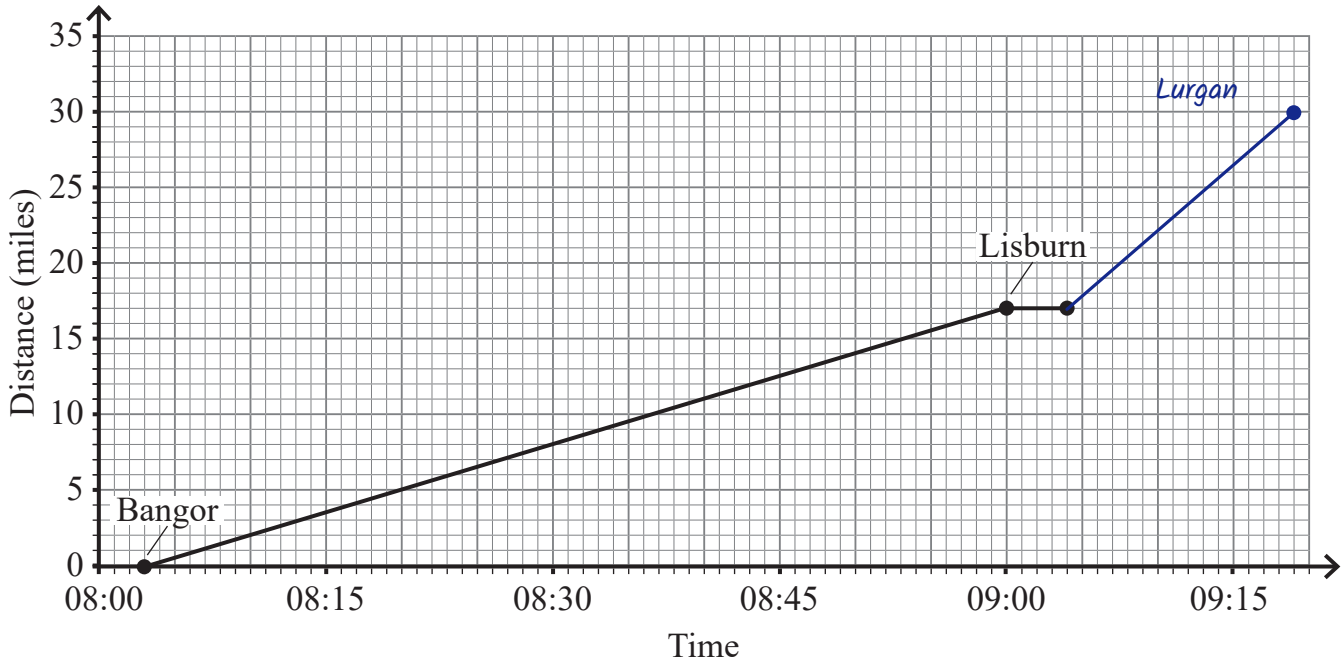
(c) State the order of rotational symmetry of this shape.



Answer 6 [1]

[Turn over

5 The distance–time graph shows a train journey.



(a) What is the distance between Bangor and Lisburn?

Answer 17 miles [1]

(b) Give a reason for the horizontal line which starts when the train reaches Lisburn.

Answer The train stops at Lisburn station to let passengers get off and on. [1]

(c) The train leaves Lisburn and travels on to Lurgan.

The distance between Lisburn and Lurgan is 13 miles and the journey takes 15 minutes.

Show this information on the graph. [1]

(d) What is the average speed of the train from Lisburn to Lurgan?

13 miles in 15 min = 13 miles in ¼ hour

13 × 4 = 52 mph

Answer 52 mph [1]

(e) Give one reason for knowing that the graph shows average speed rather than actual speed.

Answer The line is straight so it does not show the train speeding up or slowing down. [1]

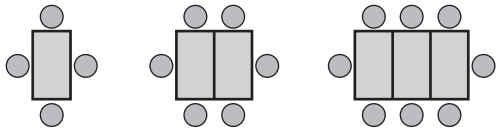
6 Ross works out $200 \times 90 = 18\,000$

Write down a calculation Ross could use to check his answer.

Answer 18 000 ÷ 90 = 200 [1]

[Turn over

7 A sequence consists of rectangles and circles as shown.



Pattern 1 Pattern 2 Pattern 3

(a) Complete the table for patterns 2, 3, 4 and 7

	Pattern 1	**Pattern 2**	**Pattern 3**	**Pattern 4**	**Pattern 7**
Number of rectangles	1	2	*3*	*4*	*7*
Number of circles	4	*6*	8	*10*	*16*
Total number of rectangles and circles	5	*8*	*11*	*14*	*23*

[2]

(b) Which pattern number has a total number of 38 rectangles and circles?

Total goes up by 3 each time: 5, 8, 11, 14, ...

Total = 3n + 2

3n + 2 = 38

3n = 36

n = 12

Answer Pattern number *12* [1]

8 Calculate 5% of 45

10% of 45 = 4.5

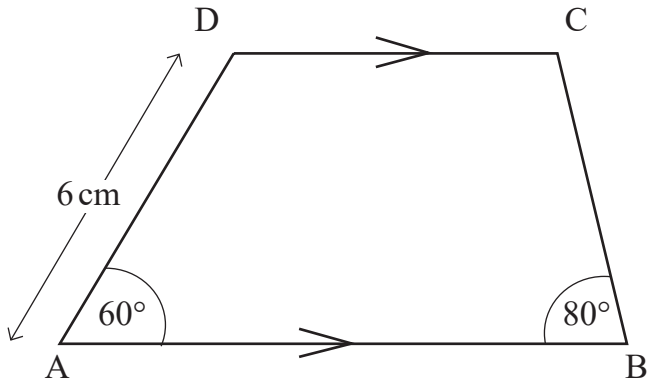
5% of 45 = 4.5 ÷ 2 = 2.25

Answer 2.25 [2]

[Turn over

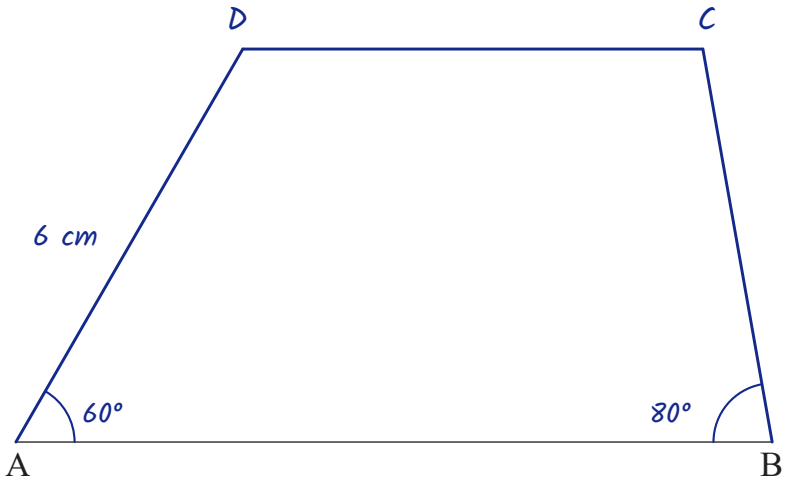


9 Charlie has drawn a **sketch** of a trapezium with lengths and angles as shown.



AB is already drawn.

Using a ruler and protractor, complete Charlie's trapezium **accurately**.



[4]

13332

10 **(a)** 60% of entrants pass a test.

What is the ratio of

number who pass : number who fail?

Give your answer in simplest form.

pass 60%, fail 100% − 60% = 40%

60 : 40 = 3 : 2

Answer 3 : 2 [2]

(b) The ratio of boys : girls born in a hospital one week was 3 : 5

What fraction were girls?

3 + 5 = 8 parts, girls = 5 parts

Answer $\frac{5}{8}$ [1]

11 At the beginning of January an oil tank was $\frac{3}{4}$ full.

At the end of March it was $\frac{1}{6}$ full.

What fraction of the tank was used?

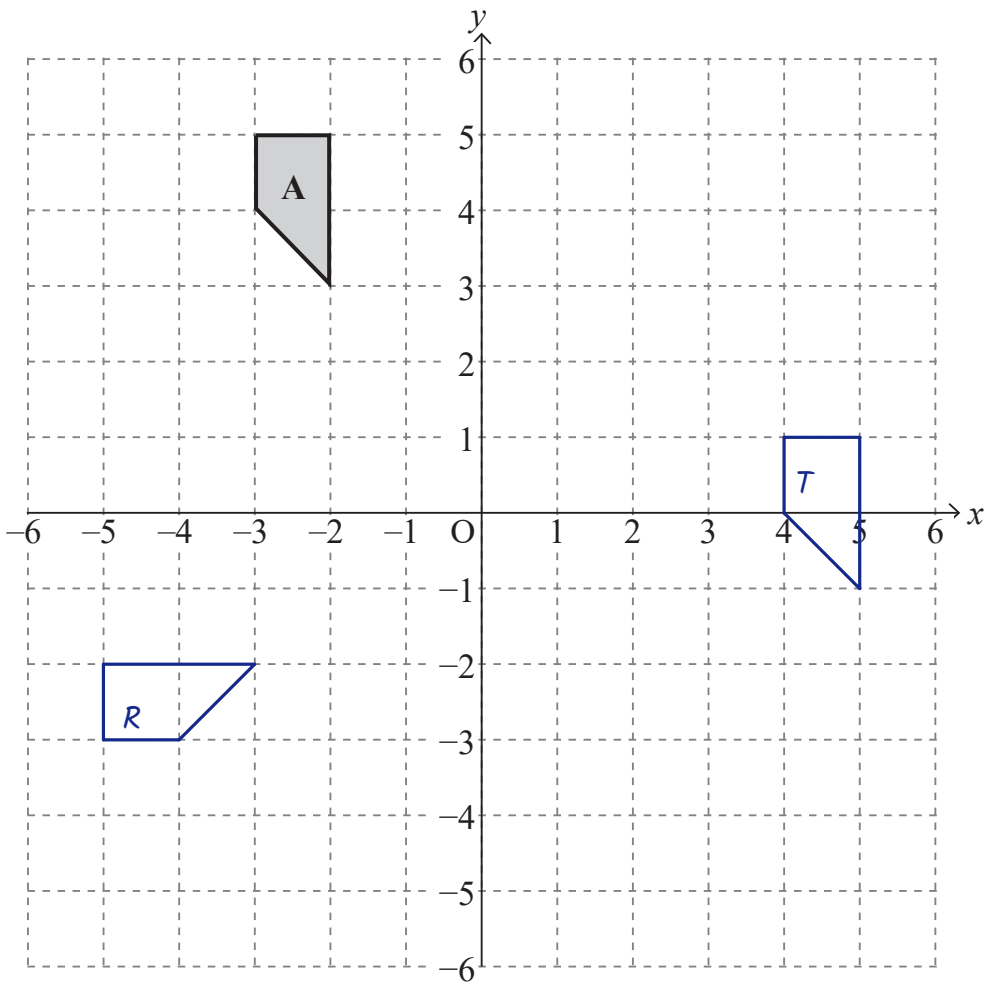
Show your working.

$\frac{3}{4} - \frac{1}{6} = \frac{9}{12} - \frac{2}{12} = \frac{7}{12}$

Answer $\frac{7}{12}$ [2]

[Turn over

12



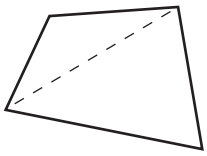
(a) Draw the image of shape A after a translation, 7 right and 4 down.

Label it T. [1]

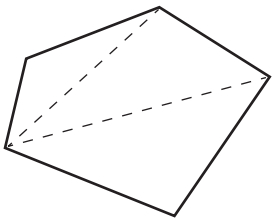
(b) Draw the image of shape A after a rotation, 90° anticlockwise, about the origin.

Label it R. [2]

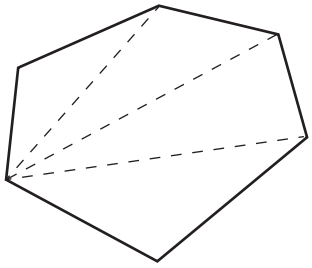
13



Quadrilateral



Pentagon



Hexagon

P is a polygon.

The sum of all the angles in P is three times the sum of the angles in a quadrilateral.

How many sides has P?

Angles in a quadrilateral = 360°

3 × 360° = 1080°

180(n − 2) = 1080

n − 2 = 1080 ÷ 180 = 6

n = 8

Answer *8* [2]

[Turn over

14 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?

$16 \times 2 = 32$

Answer 32 cm [1]

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

$2^2 = 4$

Answer 4 [1]

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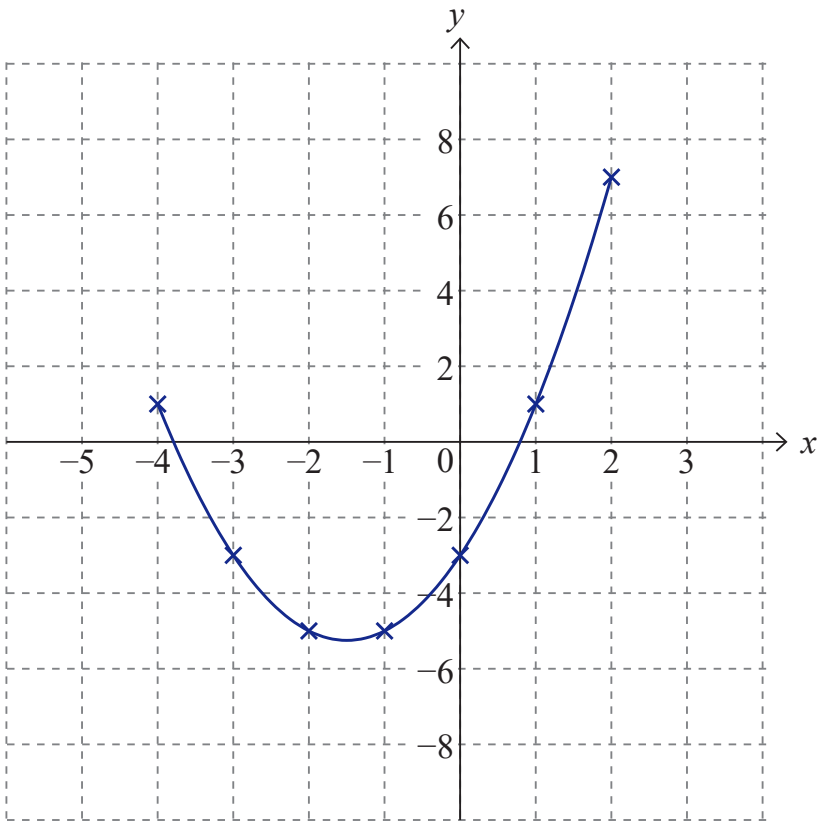
15 **(a)** Complete the table for $y = x^2 + 3x - 3$

x	−4	−3	−2	−1	0	1	2
y	1	−3	−5	−5	−3	1	7

$x = -3$: $9 - 9 - 3 = -3$ $x = 2$: $4 + 6 - 3 = 7$

[2]

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



[Turn over

16 **(a)** Write the decimal number 15 as a binary number.

8 4 2 1
1 1 1 1 8 + 4 + 2 + 1 = 15

Answer 1111 [1]

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

64 32 16 8 4 2 1
1 0 0 0 0 0 0 1 × 64 = 64

Answer 64 [1]

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

How many sides has the polygon?

Exterior angle = 180° − 140° = 40°

Number of sides = 360° ÷ 40° = 9

Answer 9 [2]

[Turn over

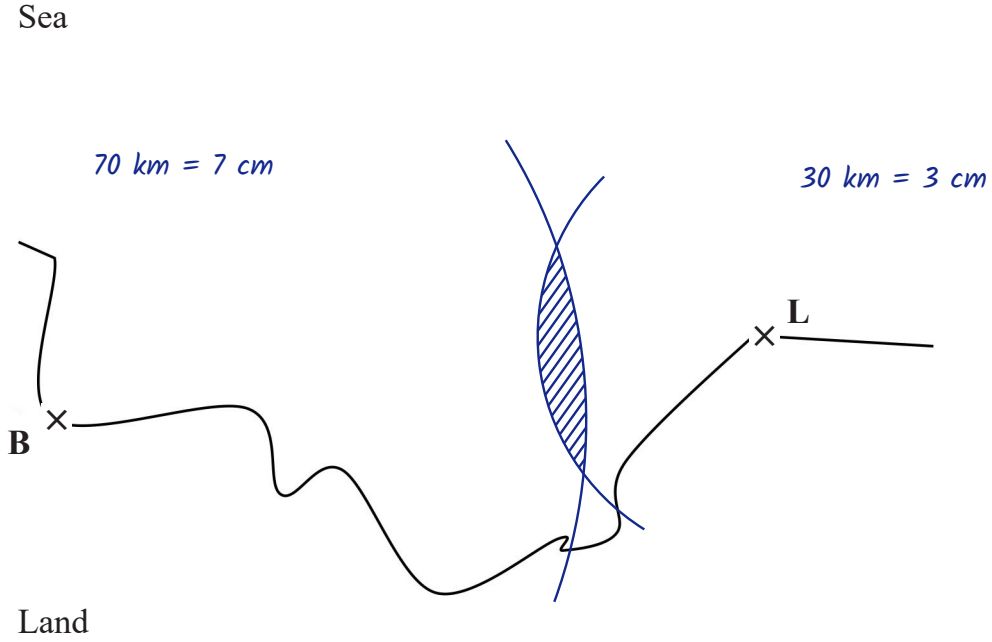


18 The diagram shows a section of coastline with a lifeboat station marked at B and a lighthouse marked at L.

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]

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November 2022

GCSE Mathematics

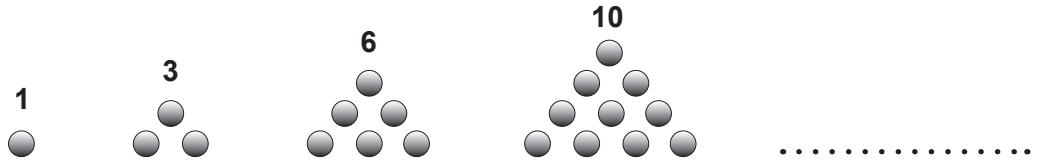
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ADDITIONAL SUPPORT MATERIALS
(For use in November 2022)

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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

Triangular numbers – are a pattern of numbers which form triangles. Each number in the sequence adds a new row of dots to the triangle.



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).

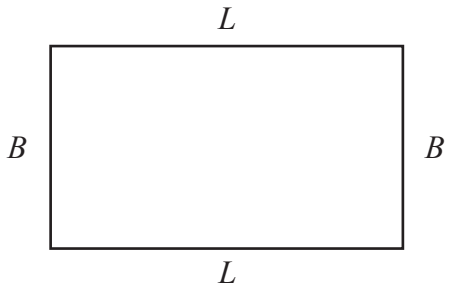
Range

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

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

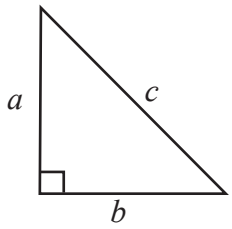
$$\text{Density} = \frac{\text{Mass}}{\text{Volume}}$$

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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

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