Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
November 2022

Mathematics

StemUp Model Solution

Unit M5 Paper 1
(Non-Calculator)
Foundation Tier



[GMC51]

GMC51

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 seventeen** 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.

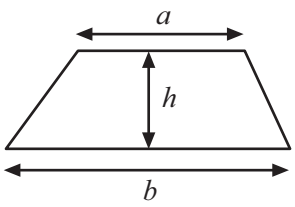
INFORMATION FOR CANDIDATES

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.

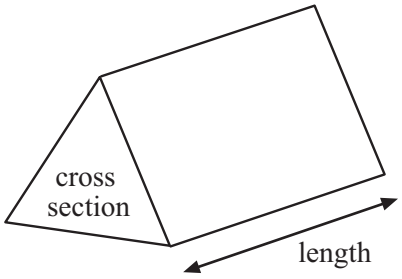
13329

Formula Sheet

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



Volume of prism = area of cross section × length



13329

1 **(a)** A theatre has 37 rows.

Each row has 22 seats.

Estimate how many seats there are in the theatre.

Show your method.

$37 \approx 40, \quad 22 \approx 20$

$40 \times 20 = 800$

Answer 800 [2]

(b) Tickets for a pantomime cost £5.75 each.

Year 12 students raise £307 washing cars.

Estimate how many pantomime tickets they can buy from washing cars.

Show your method.

£5.75 ≈ £6, £307 ≈ £300

300 ÷ 6 = 50

Answer 50 [2]

[Turn over

2 Three girls receive pocket money every week.

Each girl saves a proportion of it as shown below.

Name	Pocket money	Proportion saved	Amount saved
Tammy	£10	$\frac{1}{4}$	£ 2.50
Una	£7	30%	£ 2.10
Vicky	£12	0.2	£ 2.40

Work out how much each girl saves and complete the table. [3]

Tammy: $\frac{1}{4}$ of £10 = 10 ÷ 4 = £2.50

Una: 10% of £7 = 70p, 30% = 3 × 70p = £2.10

Vicky: 0.2 × £12 = 2 × £1.20 = £2.40

3 Use the diagram to answer the following.



(a) What temperature is shown?

Answer 25 °C [1]

(b) What speed in mph is shown?

Answer 54 mph [1]

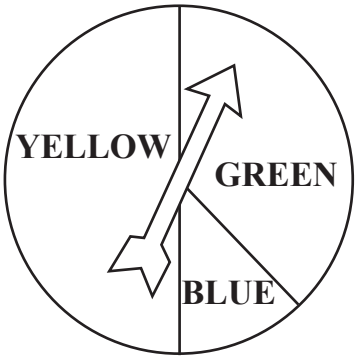
(c) The car has travelled 123 456 miles.

Write this to the nearest thousand.

Answer 123 000 miles [1]

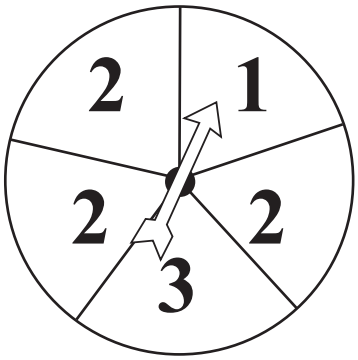
[Turn over

4 **(a)** When the spinner below is spun, which colour is it **least likely** to land on?



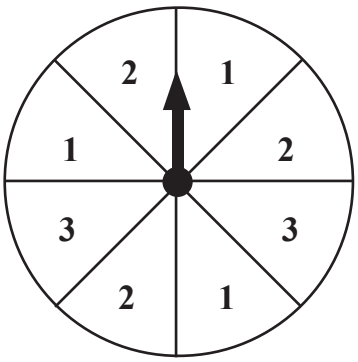
Answer Blue [1]

(b) When the spinner below is spun, which number is it **most likely** to land on?



Answer 2 [1]

(c) When the spinner below is spun, which two numbers is it **equally likely** to land on?



Answer 1 and 2 [1]

5 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: 16 kg is heavier than 10 kg

£13.95 + £4.75 = £18.70

Postage Direct: 16 − 7 = 9 kg over 7 kg

9 × 60p = 540p = £5.40

£12.50 + £5.40 = £17.90

Difference: £18.70 − £17.90 = £0.80

Answer _____*Postage Direct*_____ is cheaper by _____*80p*_____ [4]

[Turn over

6 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 4 hundred thousand (400 000) [1]

7 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.

Cards: 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20 (11 cards)

Odd: 11, 13, 15, 17, 19 → 5 cards

Even: 10, 12, 14, 16, 18, 20 → 6 cards

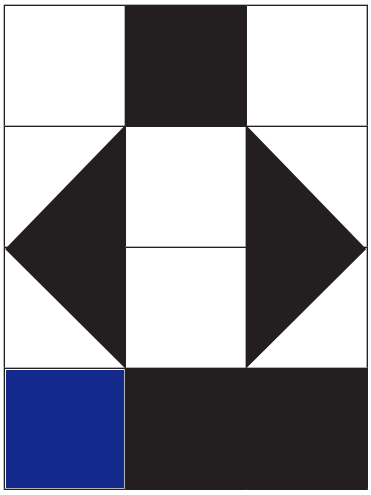
Prime: 11, 13, 17, 19 → 4 cards

Prime has the fewest cards, so it is least likely

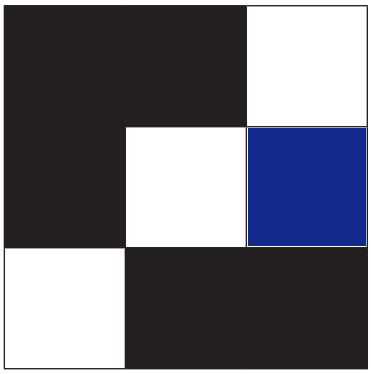
Answer prime [2]

[Turn over

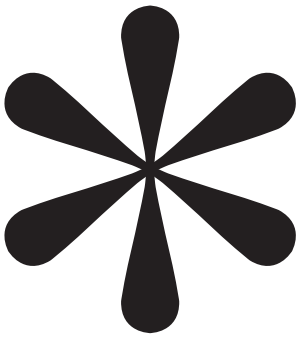
8 **(a)** Shade **one square** so that this shape has only one line of symmetry. [1]



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



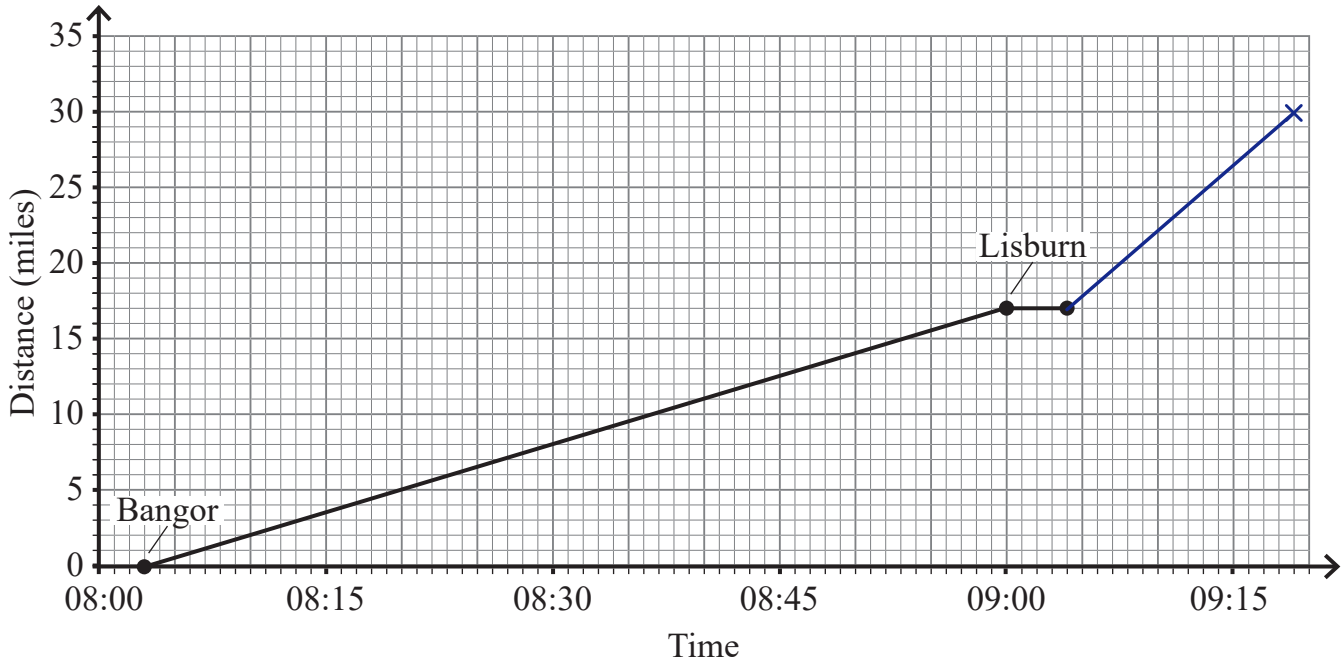
(c) State the order of rotational symmetry of this shape.



Answer 6 [1]

[Turn over

9 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 is stopped 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 minutes = 13 miles in ¼ hour
speed = 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 lines are straight, so they do not show the train speeding up or slowing down [1]

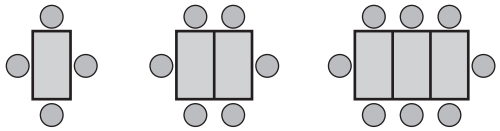
10 Ross works out $200 \times 90 = 18\,000$

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

Answer 18 000 ÷ 200 = 90 [1]

[Turn over

11 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?

Totals: 5, 8, 11, 14, ... go up by 3 each time

Total = 3n + 2

3n + 2 = 38

3n = 36, n = 12

Answer Pattern number *12* [1]

12 Calculate 5% of 45

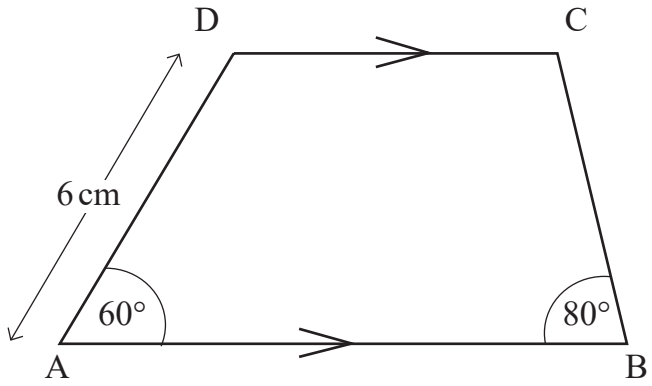
10% of 45 = 45 ÷ 10 = 4.5

5% of 45 = 4.5 ÷ 2 = 2.25

Answer 2.25 [2]

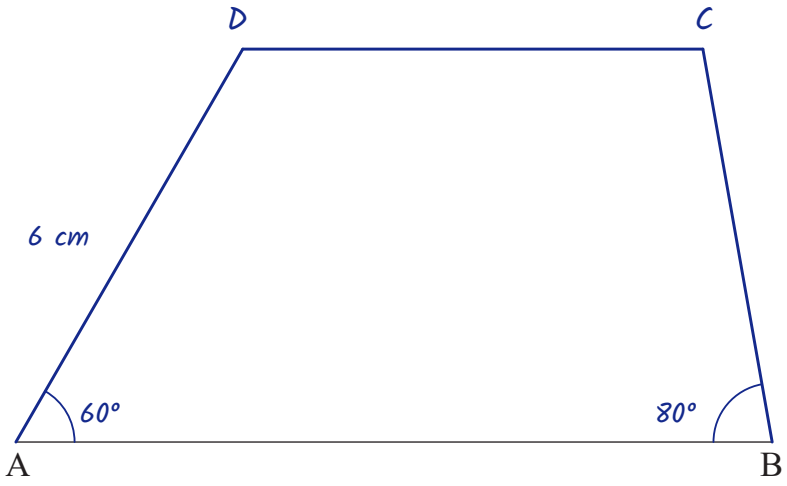
[Turn over

13 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]

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

What is the ratio of

number who pass : number who fail?

Give your answer in simplest form.

60% pass, 100% − 60% = 40% fail

60 : 40 = 6 : 4 = 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]

15 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.

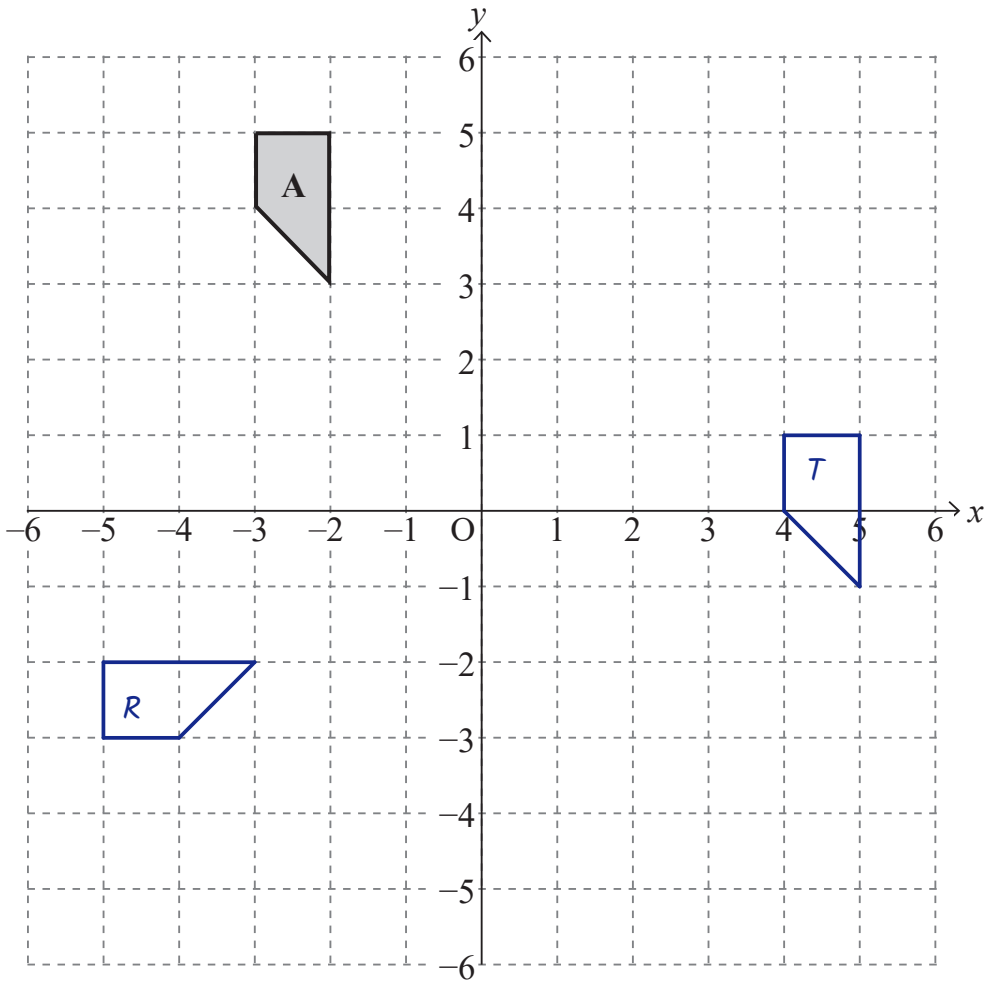
Common denominator 12

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

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

[Turn over

16



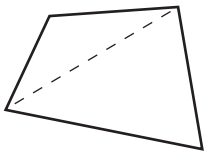
(a) Draw the image of shape A after a translation, 7 right and 4 down.

Label it T. [1]

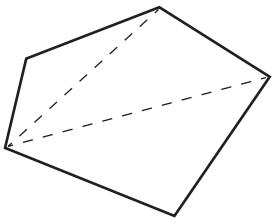
(b) Draw the image of shape A after a rotation, 90° anticlockwise, about the origin.

Label it R. [2]

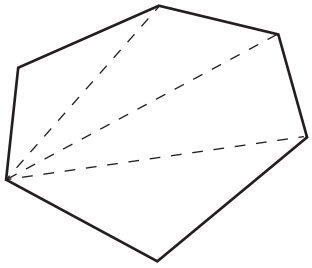
17



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?

Quadrilateral = 2 triangles = 2 × 180° = 360°

Sum of angles in P = 3 × 360° = 1080°

1080 ÷ 180 = 6 triangles

Number of triangles = sides − 2 (quad 2, pentagon 3, hexagon 4)

so sides = 6 + 2 = 8 (octagon)

Answer *8* [2]

THIS IS THE END OF THE QUESTION PAPER

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Question Number	**Marks**
1	
2	
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Total Marks	

Examiner Number

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GCSE Mathematics

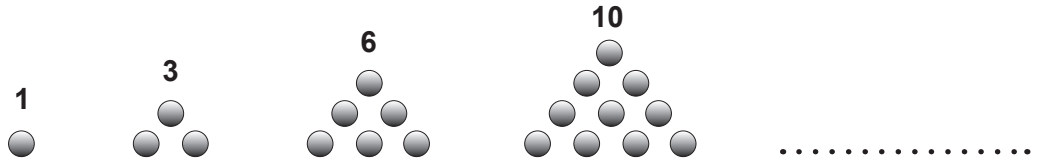
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(For use in November 2022)

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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).

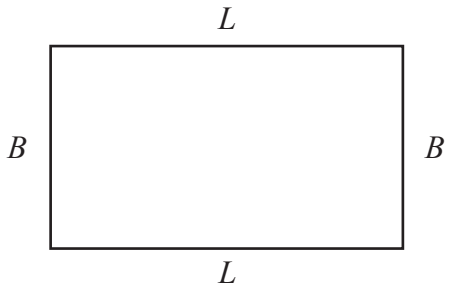
Range

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

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

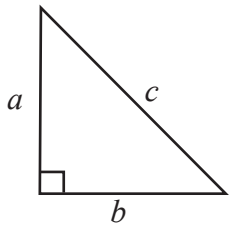
$$\text{Density} = \frac{\text{Mass}}{\text{Volume}}$$

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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

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