

Enlargements

Solutions

For Pearson Edexcel GCSE Mathematics (1MA1) • Foundation tier

Each question is shown in grey, followed by the working, one step per line. The final answer is in a box. *Marks* shows how the marks are usually given in the exam, and **Tip** points out a common mistake.

1 (2 marks)

A rectangle is 4 cm long and 3 cm wide.
The rectangle is enlarged by scale factor 2.5
Work out the length and the width of the enlarged rectangle.

In an enlargement every length is multiplied by the scale factor.

Length: $4 \times 2.5 = 10$

Width: $3 \times 2.5 = 7.5$

Answer: 10 cm by 7.5 cm

Marks: 1 mark for 10. 1 mark for 7.5.

2 (2 marks)

On the grid, enlarge the shaded shape by scale factor 3

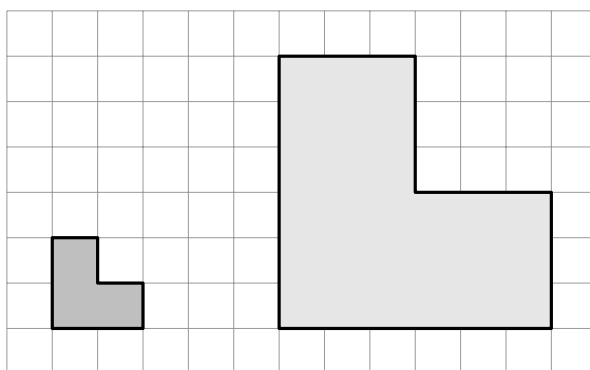
Multiply every length by 3.

The bottom side and the left side: 2 squares $\rightarrow$ 6 squares

Each of the short sides: 1 square $\rightarrow$ 3 squares

Go round the shape side by side, drawing each side 3 times as long.

No centre is given, so it can go anywhere on the grid.



Answer: L-shape with long sides 6 squares and short sides 3 squares

Tip: Check every side, not just the first two. A common mistake is to add 3 squares to each side instead of multiplying by 3.

Marks: 2 marks for a correct shape. 1 mark for at least three sides multiplied by 3.

3 (2 marks)

On the grid, enlarge triangle *A* by scale factor 2, centre (2, 1)

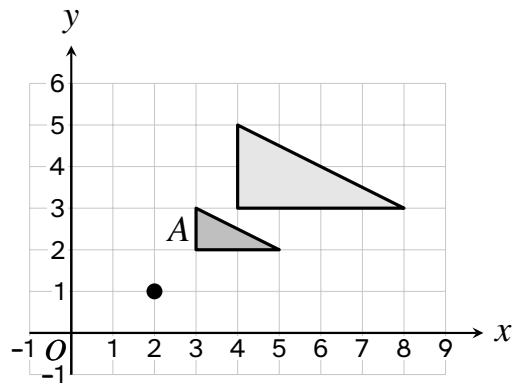
Measure how far each vertex is from the centre (2, 1), then double it.

(5, 2) is 3 right and 1 up from the centre.

Doubled: 6 right and 2 up from the centre, which is (8, 3)

(3, 2) is 1 right and 1 up, so it goes to 2 right and 2 up: (4, 3)

The image has vertices (4, 3), (8, 3), (4, 5)



Answer: (4, 3), (8, 3), (4, 5)

Tip: Always measure from the centre of enlargement, not from the shape. The right size in the wrong place only gets 1 mark.

Marks: 2 marks for the correct image. 1 mark for the correct size and way round in the wrong position.

4 (2 marks)

On the grid, enlarge triangle *B* by scale factor $\frac{1}{3}$, centre $(-5, 1)$

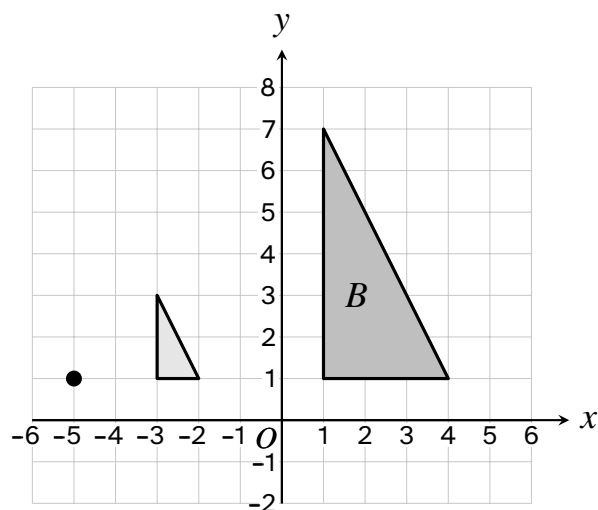
Scale factor $\frac{1}{3}$ means divide the distances from the centre by 3.

(4, 1) is 9 right of the centre $(-5, 1)$.

Divided by 3: 3 right of the centre, which is $(-2, 1)$

(1, 7) is 6 right and 6 up, so it goes to 2 right and 2 up: $(-3, 3)$

The image has vertices $(-3, 1)$, $(-2, 1)$, $(-3, 3)$



Answer: $(-3, 1)$, $(-2, 1)$, $(-3, 3)$

Marks: 2 marks for the correct image. 1 mark for the correct size.

5 (2 marks)

On the grid, enlarge shape R by scale factor $\frac{1}{2}$, centre $(1, 1)$

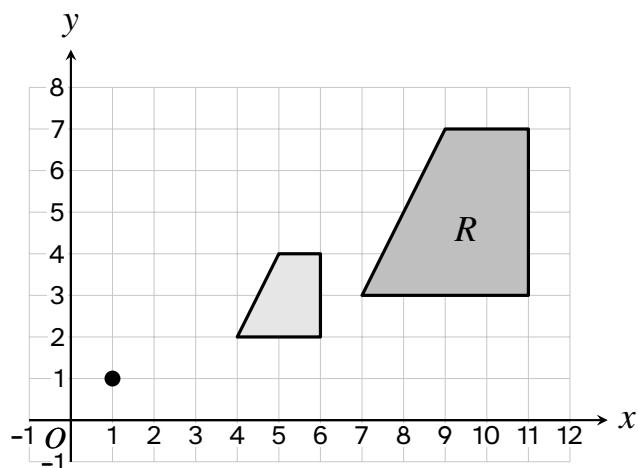
Halve the distances from the centre $(1, 1)$.

$(7, 3)$ is 6 right and 2 up from the centre.

Halved: 3 right and 1 up, which is $(4, 2)$

$(11, 7)$ is 10 right and 6 up, so it goes to 5 right and 3 up: $(6, 4)$

The image has vertices $(4, 2)$, $(6, 2)$, $(6, 4)$, $(5, 4)$

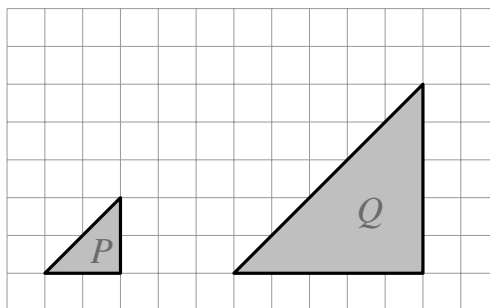


Answer: (4, 2), (6, 2), (6, 4), (5, 4)

Marks: 2 marks for the correct image. 1 mark for the correct size and way round, or two vertices correct.

6 (2 marks)

Triangle Q is an enlargement of triangle P .



- (a) Write down the scale factor of the enlargement.

The base of P is 2 squares and the base of Q is 5 squares.

Scale factor = new length $\div$ old length = $5 \div 2 = 2.5$

Check with the heights: $5 \div 2 = 2.5$ ✓

Answer: 2.5 (or $\frac{5}{2}$)

(b) Lucy says,

‘The scale factor is 3, because the base of Q is 3 squares longer than the base of P .’

Explain why Lucy is wrong.

In an enlargement the lengths are **multiplied** by the scale factor, not added to.

$2 \times 3 = 6$, but the base of Q is 5 squares.

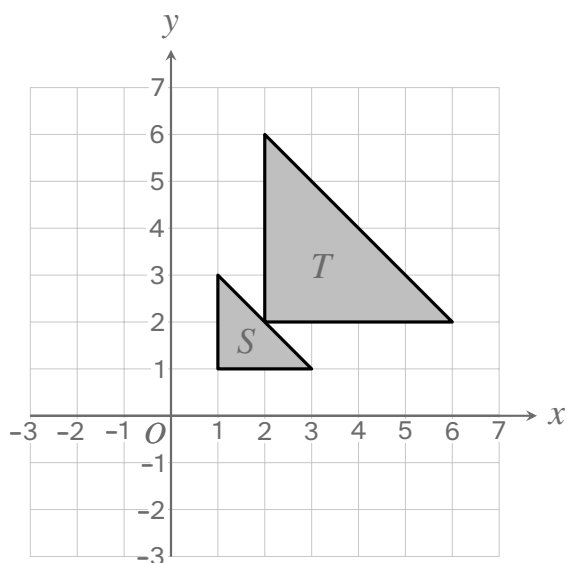
So the scale factor is $5 \div 2 = 2.5$, not 3.

Answer: Lengths are multiplied, not added: $2 \times 3 = 6 \neq 5$, so the scale factor is $5 \div 2 = 2.5$

Tip: Scale factor means “how many times as long”. Find it by dividing, never by subtracting.

7 (2 marks)

Describe fully the single transformation that maps triangle S onto triangle T .



T is the same shape as S but bigger, so it is an enlargement.

The base of S is 2 squares and the base of T is 4 squares.

Scale factor = $4 \div 2 = 2$

Lines through matching vertices, e.g. (3, 1) and (6, 2), all pass through the origin.

So the centre is (0, 0).

Answer: Enlargement, scale factor 2, centre (0, 0)

Tip: “Doubled in size” is not enough. Write “enlargement”, give the scale factor as a number, and give the centre as a coordinate.

Marks: 2 marks for enlargement, scale factor 2 and centre (0, 0). 1 mark for two of these. No marks if you give more than one transformation.

8 (2 marks)

A shape has a perimeter of 14 cm.
The shape is enlarged by scale factor 3
Work out the perimeter of the enlarged shape.

Every side is multiplied by 3.

So the perimeter (the total of the sides) is also multiplied by 3.

$$14 \times 3 = 42$$

Answer: 42 cm

Marks: 1 mark for 14×3 . 1 mark for 42.

9 (1 mark)

Triangle K has angles of 35° , 60° and 85° .
Triangle K is enlarged by scale factor 4 to give triangle L .
Write down the size of the largest angle in triangle L .

An enlargement changes the lengths but **not** the angles.

Triangle L has the same angles as triangle K : 35° , 60° and 85° .

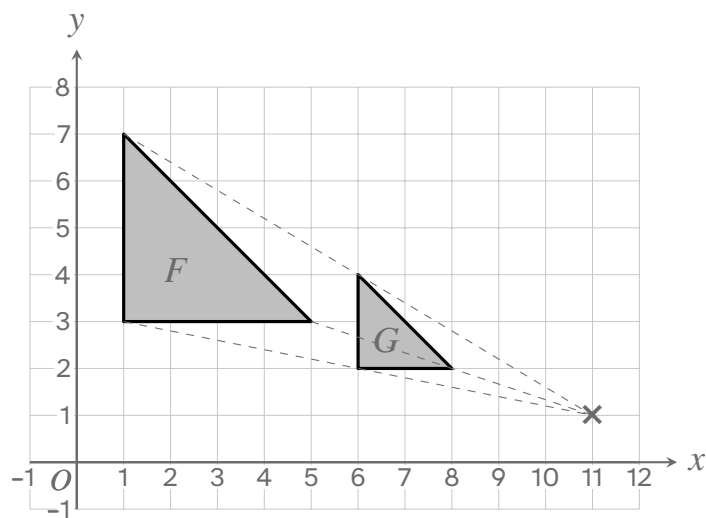
The largest angle is 85° .

Answer: 85°

Tip: Do not multiply the angle by the scale factor: $85 \times 4 = 340^\circ$ is impossible in a triangle, because the angles must add up to 180° .

10 (2 marks)

Triangle F and triangle G are drawn on the grid. (Construction lines are shown dashed.)



Describe fully the single transformation that maps triangle F onto triangle G .

G is the same shape as F but smaller, so it is an enlargement.

The base of F is 4 squares and the base of G is 2 squares.

$$\text{Scale factor} = 2 \div 4 = \frac{1}{2}$$

To find the centre, draw straight lines through matching vertices and extend them.

For example, (1, 3) to (6, 2) and (1, 7) to (6, 4).

The lines meet at (11, 1).

Answer: Enlargement, scale factor $\frac{1}{2}$, centre (11, 1)

Tip: Give all three parts: the word “enlargement”, the scale factor and the centre. The shape gets smaller, so the scale factor is a fraction, not 2.

Marks: 2 marks for enlargement, scale factor $\frac{1}{2}$, centre (11, 1). 1 mark for enlargement with the correct scale factor or the correct centre.

11 (2 marks)

A photograph is 6 cm wide and 4 cm high.
The photograph is enlarged so that it is 15 cm wide.
Work out the height of the enlarged photograph.

Find the scale factor from the widths:

$$15 \div 6 = 2.5$$

Multiply the height by the same scale factor:

$$4 \times 2.5 = 10$$

Answer: 10 cm

Tip: Do not add: the width went up by 9, but the height does not go up by 9. Use the scale factor.

Marks: 1 mark for $15 \div 6 (= 2.5)$. 1 mark for 10.
