

Enlargement: Negative Scale Factors *extend*

ANSWERS

1



An enlargement maps (5, 4) to (-1, -5) and (3, 4) to (0, -5).
Find its scale factor and centre.

$$x: -1 = c - \frac{1}{2}(5 - c), c = 1$$

$$y: -5 = d - \frac{1}{2}(4 - d), d = -2$$

Answer $-\frac{1}{2}$, centre (1, -2)

2



Show that an enlargement by scale factor -2, centre (1, 3), maps (x, y) to (3 - 2x, 9 - 2y).
Hence find the one point that does not move.

$$\begin{aligned} 1 - 2(x - 1) &= 3 - 2x, \\ 3 - 2(y - 3) &= 9 - 2y \end{aligned}$$

$$3 - 2x = x \text{ gives } x = 1; y = 3$$

Answer (1, 3)

3



A shape is enlarged by scale factor -2, centre (0, 0), then by scale factor $\frac{1}{2}$, centre (2, 0).
Describe fully the single transformation.

$$(x, y) \rightarrow (-2x, -2y) \rightarrow (1 - x, -y)$$

$$\text{the same as } 180^\circ \text{ about } (0.5, 0)$$

Answer Enlargement, -1, centre (0.5, 0)

4



Shape A has an area of 3 cm².
An enlargement with a negative scale factor, centre (0, 0), makes an image with an area of 48 cm². One corner of A is (1, 2).
Where is this corner on the image?

$$\text{areas} \times 16, \text{ so lengths} \times 4: -4$$

$$(1, 2) \times -4 = (-4, -8)$$

Answer (-4, -8)

5



C is (-1, 3) and P is (3, 1). P' lies on the line CP, on the other side of C, with CP : CP' = 2 : 5.
Find the coordinates of P'.

$$\text{scale factor } -\frac{5}{2}, \text{ centre } C$$

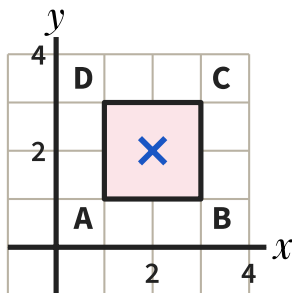
$$CP = \begin{pmatrix} 4 \\ -2 \end{pmatrix}, \times -\frac{5}{2} \rightarrow \begin{pmatrix} -10 \\ 5 \end{pmatrix}$$

Answer (-11, 8)

6



Square ABCD is enlarged by scale factor -1 so that the image lies exactly on the square.
Find the centre of the enlargement.
Which corner does A move to?



Answer (2, 2); A moves to C

7



A triangle has corners (1, 1), (3, 1) and (3, 2). It is enlarged by scale factor -2.5, centre (1, 1).
Find the exact length of the longest side of the image.

$$\text{longest side of A: } \sqrt{2^2 + 1^2} = \sqrt{5}$$

$$\times 2.5 \rightarrow \frac{5\sqrt{5}}{2}$$

Answer $\frac{5\sqrt{5}}{2}$ units

8



Prove that an enlargement by scale factor k , centre (0, 0), followed by an enlargement by scale factor $\frac{1}{k}$, centre (a, 0), is a translation.
Find its vector.

$$(x, y) \rightarrow (kx, ky)$$

$$\rightarrow (a + \frac{1}{k}(kx - a), y)$$

$$\begin{pmatrix} a - \frac{a}{k} \\ 0 \end{pmatrix}$$

Proof