

4.4.2 Transformations

Name: _____ Class: _____ Date: _____

KEY WORDS centre of enlargement

<!-- Session 2 native-skill companion -->

Objective

Practise transformations within the labelled native lessons. Public original tasks; locally authored answer guidance.

1 Key knowledge and worked examples

■ Reflections, rotations and enlargements · Foundation

A translation adds a vector. A reflection reverses signed perpendicular distance from a mirror line. A rotation needs a centre, angle and direction. For enlargement from C, use new $P = C + k(P - C)$.

$$\mathbf{p}_{\text{image}} = \mathbf{c} + k(\mathbf{p} - \mathbf{c})$$

For centre $C=(1,1)$, point $P=(3,2)$ and factor 2, the image is $(5,3)$. At factor $1/2$ the image is $C + (1/2)(P - C) = (2, 1.5)$, halfway from C to P. Reflecting $(3,2)$ in the y-axis gives $(-3,2)$. Rotating it 90° anticlockwise about the origin gives $(-2,3)$. Translation by $(2,-1)$ gives $(5,1)$. State the centre, line or vector as appropriate.

Specify a reflection line, rotation centre/angle/direction or enlargement centre/factor. Fractional positive enlargement factors reduce a shape without reversing its position about the centre.

AQA G7 Foundation includes single reflections, rotations, translations and enlargements with positive integer/fractional factors. Negative factors and combinations of isometries belong to separate Higher teaching.

■ Reflections, rotations and enlargements · Higher

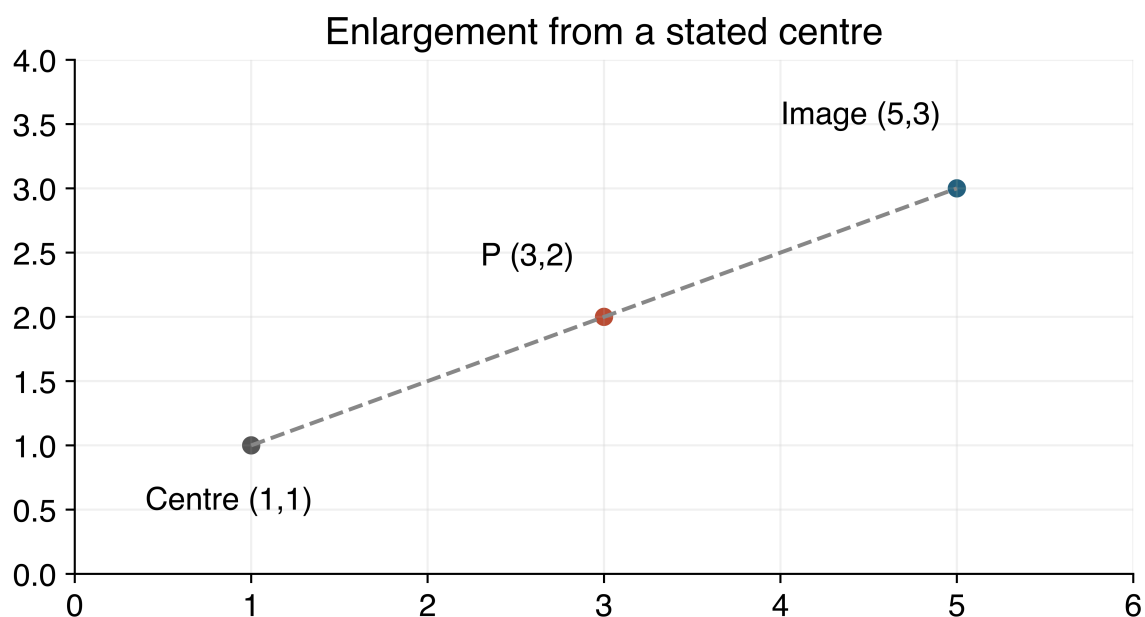
A translation adds a vector. A reflection reverses signed perpendicular distance from a mirror line. A rotation needs a centre, angle and direction. For enlargement from C, use new $P=C+k(P-C)$.

$$\mathbf{p}_{\text{image}} = \mathbf{c} + k(\mathbf{p} - \mathbf{c})$$

For $C=(1,1), P=(3,2), k=2$, the image is $C+2(P-C)=(5,3)$. With $k=1/2$ it is $(2,1.5)$; with $k=-2$ it is $(-3,-1)$, on the opposite side of the centre. Reflecting $(3,2)$ in the y-axis gives $(-3,2)$, and a 90° anticlockwise rotation about the origin gives $(-2,3)$. Identify centre, factor, line, angle and direction as applicable.

A rotation needs its centre and direction, not just an angle. A negative enlargement factor places the image on the opposite side of the centre. A translation does not change orientation or size.

Describe a transformation completely before constructing the image. Check corresponding distances and angles. For combined transformations, apply them in the stated order; they usually do not commute.



Original native-lesson illustration; labels belong to its worked example.

2 Practice

2.1 (Foundation) For $C=(1,1), P=(3,2), k=2$, find the image x-coordinate.

2.2 (Foundation) For that enlargement, find the image y-coordinate.

2.3 (Foundation) Reflect (3,2) in the y-axis. Find the new x-coordinate.

3 Exam-style questions

3.1 Decide whether this claim is true. Justify with a concrete calculation or counterexample: Every enlargement is centred at the origin unless its scale factor is negative.

Solutions

2.1 Image = $C + 2(P - C)$. Its x-coordinate is $1 + 2(3 - 1) = 5$.

2.2 Its y-coordinate is $1 + 2(2 - 1) = 3$.

2.3 Reflection in the vertical axis negates x: 3 becomes -3.

3.1 False. Centre (1,1), positive scale factor 2 maps (3,2) to (5,3). The origin is not the centre; the centre is specified independently of the factor's sign.

Local review guidance: show the chosen method; give the checked result; explain the condition or failed shortcut. This is authored classroom guidance.