

## Vectors and transformation geometry – supported focus

4MA1 supported native-lesson focus only; qualification gaps remain

# 1. Supported teaching and tier boundary

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4MA1: Vectors and transformation geometry. Version: Issue 2, November 2017; first assessment June 2018; linear Mathematics A.

## 2. Supported teaching and tier boundary

### Supported teaching and tier boundary

Foundation teaching and Higher additions are labelled below. This reference packages the existing native-lesson crosswalk. It does not certify unreviewed specification rows or a whole qualification. Original diagnostics are separate and are not reproduced.

### 3. Vectors and transformation geometry · Foundation

#### Vectors and transformation geometry · Foundation

Add corresponding vector components and subtract position vectors to find a displacement. A translation moves every point by the same vector; a scalar multiple changes length and possibly direction.

## 4. Vectors and transformation geometry · Foundation

Vectors and transformation geometry · Foundation

$$\overrightarrow{AB} = \mathbf{b} - \mathbf{a}, \quad |\mathbf{v}| = \sqrt{v_x^2 + v_y^2}$$

## 5. Vectors and transformation geometry · Foundation

### Vectors and transformation geometry · Foundation

With  $a=(4,1)$  and  $b=(1,3)$ ,  $a+b=(5,4)$ . From  $A=(1,2)$  to  $B=(5,5)$ , displacement  $AB=(4,3)$ . Its magnitude is  $\sqrt{4^2+3^2}=5$ .

## 6. Vectors and transformation geometry · Foundation

### Vectors and transformation geometry · Foundation

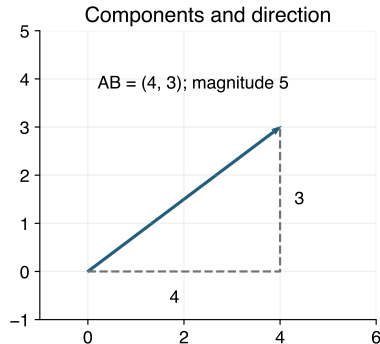
The order of subtraction matters:  $\overrightarrow{BA} = -\overrightarrow{AB}$ . Proving parallelism needs a scalar-multiple relation; a sketch alone is insufficient. Negative enlargement reverses position about its centre.

## 7. Vectors and transformation geometry · Foundation

### Vectors and transformation geometry · Foundation

Draw arrows with direction and identify the starting and ending points. Scalar products, spatial line equations and advanced angle calculations are excluded from this Foundation/Core lesson.

## Figure 8: Vectors and transformation



Check the labelled values and conditions.

## 9. Reflections, rotations and enlargements · Foundation

### 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  $P=C+k(P-C)$ .

## 10. Reflections, rotations and enlargements · Foundation

Reflections, rotations and enlargements · Foundation

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

## 11. Reflections, rotations and enlargements · Foundation

### Reflections, rotations and enlargements · Foundation

For  $C=(1,1)$ ,  $P=(3,2)$ ,  $k=2$ ,  $P-C=(2,1)$ , so new  $P=(1,1)+2(2,1)=(5,3)$ . Reflection of  $(3,2)$  in the  $y$ -axis gives  $(-3,2)$ . A  $90^\circ$  anticlockwise rotation about the origin gives  $(-2,3)$ .

## 12. Reflections, rotations and enlargements · Foundation

### Reflections, rotations and enlargements · Foundation

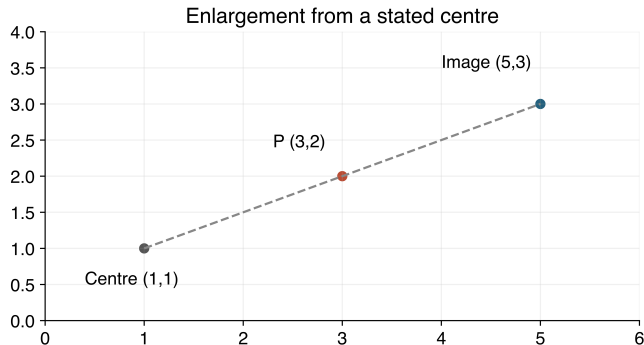
A rotation needs its centre and direction, not just an angle. A negative enlargement factor places the image on the opposite side of the centre. A translation does not change orientation or size.

## 13. Reflections, rotations and enlargements · Foundation

### Reflections, rotations and enlargements · Foundation

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.

Figure 14: Reflections, rotations



Check the labelled values and conditions.

## 15. Remaining qualification limits

### Remaining qualification limits

Official question-bank boundaries, scheme alignment and all objective-level teaching coverage require the recorded review; no practice registry promotion.

## 16. Remaining qualification limits

### Remaining qualification limits

The authored diagnostic assessments are not full-length qualification mocks.

## 17. Remaining qualification limits

### Remaining qualification limits

Only the mapped native skills are supplied here. Objective rows marked formula-review-required are not promoted to complete coverage by these print companions.

## 18. Terms

| Terms     |   |
|-----------|---|
| resultant | . |

## 19. Terms

### Terms

centre of enlargement .

## Check yourself

Reconstruct the method without looking back

Decide whether this claim is true. Give a concrete calculation or counterexample:  $\overrightarrow{AB}$  and  $\overrightarrow{BA}$  always have the same components.