

# SHAPE

## Topics

- Column vectors
- Transformations

Autumn term

Transformations

## What do I need to be able to do?

- Represent, add, and subtract vectors
- Translate shapes using vectors
- Reflect, rotate, and enlarge shapes
- Describe a transformation

## Career Links

- Being able to confidently work with shape and geometric rules is a skill with links to these careers
- Air travel
- Animation
- Architecture
- Physics

## Key Vocabulary

Vector	A vector has magnitude and direction
Reflect	An image or shape as it would be seen in a mirror
Rotate	A circular movement around a central point
Enlarge	To make bigger
Scale factor	The ratio between the scale of a given object and a new object
Translation	Moving a shape without rotating or flipping it

## Vectors

Vectors are often written as column vectors

Left or right → 3  
Up or down ↘ -4

Positive values are right and up. Negative values are left and down.  
This is 3 right and 4 down.

This is the vector  $\begin{pmatrix} 4 \\ 1 \end{pmatrix}$



It goes 4 units right and 1 unit up.

Add/subtract vectors:

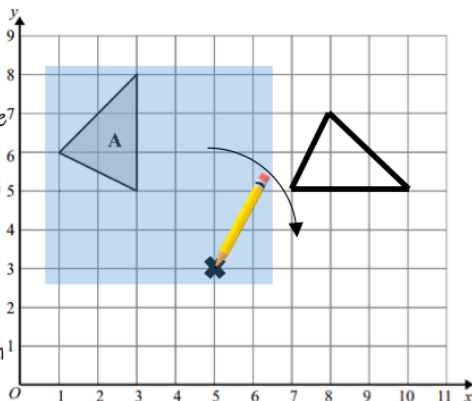
$$\begin{pmatrix} 8 \\ 4 \end{pmatrix} - \begin{pmatrix} 3 \\ 6 \end{pmatrix} = \begin{pmatrix} 5 \\ -2 \end{pmatrix}$$

Multiply vectors by a constant

$$3 \begin{pmatrix} 4 \\ 7 \end{pmatrix} = \begin{pmatrix} 12 \\ 21 \end{pmatrix}$$

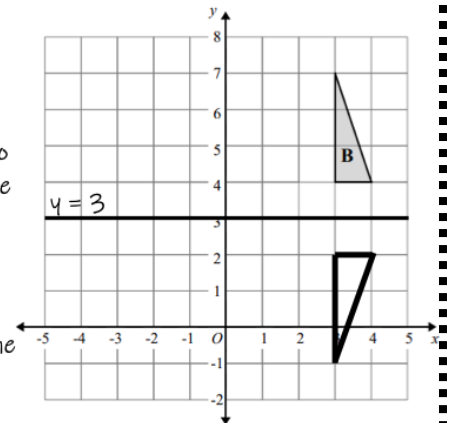
Rotation: e.g. rotate shape A 90° clockwise about (5,3)

Draw the object onto tracing paper and put the pencil on the centre of rotation (5,3). Then rotate the tracing paper as instructed and draw the image in its new position.



Reflection: e.g. reflect shape B in the line  $y = 3$

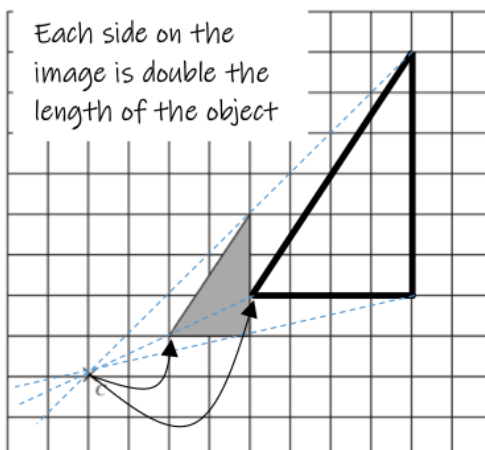
Draw on the line of reflection. Reflect each point to the other side of the line of reflection. Each point on the image is the same distance from the line of reflection as they are on the object.



Enlargement: e.g. Enlarge the shaded shape by scale factor of 2, centre C.

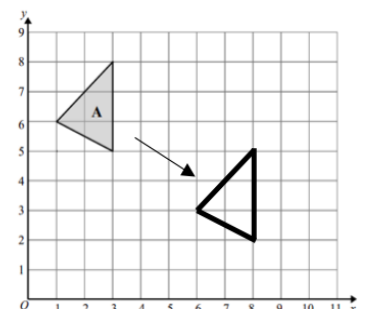
Counting from C to the first vertex, it was 2 squares right and 1 square up, so the image will be double that (s.f. of 2) so 4 right and 2 up from the centre, C.

Each side on the image is double the length of the object



Translation: e.g. translate triangle A by the vector  $\begin{pmatrix} 5 \\ -3 \end{pmatrix}$

A translation is a movement, so in this instance it moves 5 squares right and 3 squares down.



Rotation, reflection and translation all leave a congruent (identical) shape to the object.

## Topics

- Ratio
- Direct Proportion

Autumn term

RATIO

## What do I need to be able to do?

- Simplify Ratio and relate to fractions
- Share into a ratio or find a ratio given one part or the difference
- Combine ratios
- To be able to determine the best value
- To be able to adjust a recipe amount.

# RATIO

## Career Links

- Being able to confidently work with ratio and proportion is a skill with links to these careers
- Cosmetic industry
- Stock Analysts/finance/Banking
- Architecture / Cartography/ Construction
- Food industry

## Key Vocabulary

Scale	The relationship between the length in a model to the length on the real item
Simplify	Reducing the ratio into a simpler form by finding common factors
Proportion	The size of one thing compared to the size of another
Share	To split into equal parts or groups
Equivalent	Equal in amount or value
Fractions	The portion/ part of the whole thing.

To simplify a ratio, divide all numbers in the ratio by the same amount

$$\div 3 \quad \begin{array}{c} 9 : 3 \\ \curvearrowright \text{Divide both sides by 3} \\ 3 : 1 \end{array} \quad \div 3$$

3:4 in the form 1:n

$$\begin{array}{c} 3:4 \\ \div 3 \quad \downarrow \quad \div 3 \\ 1:4/3 \\ \hline \end{array}$$

Describe the first amount in this ratio as a fraction of the whole.

$$10 : 25$$

$$2 : 5$$

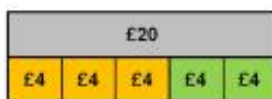
$$2 + 5 = 7 \text{ parts}$$

$$\frac{2}{7}$$

## Sharing in a ratio

You can divide a total in a ratio by considering the ratio as fractions

Eg Bob and Betty share £20 in the ratio 3:2



Bob's share

Betty's share

$$\frac{3}{5} \text{ of } £20 = £12$$

$$\frac{2}{5} \text{ of } £20 = £8$$

In a bag there are some sweets...

The ratio of cherry sweets to lime sweets is 5:1

The ratio of lime sweets to apple sweets is 3:4

What is the ratio of cherry sweets to apple sweets?

$$\begin{array}{ccc|ccc} \text{CHERRY} & \text{LIME} & & \text{LIME} & \text{APPLE} & \\ \times 3 & \downarrow & & \downarrow & & \\ 5 & : & 1 & 3 & : & 4 \\ 15 & : & 3 & & & \\ \text{CHERRY} & & \text{LIME} & & \text{APPLE} & \\ 15 & : & 3 & : & 4 & \end{array}$$

$$\text{CHERRY : APPLE} \\ 15 : 4$$

Which is the best buy?

### Eat Fresh



400 ml for £1.08

Quantity	Price
400	108
100	27

$$\div 4 \quad \leftarrow \quad \rightarrow \quad \div 4$$

### Max-Mar\*



1 L for £2.3

CHEAPEST

Quantity	Price
1000	230
100	23

$$\div 10 \quad \leftarrow \quad \rightarrow \quad \div 10$$

Year 9 H –  
Knowledge  
Organiser



## Topics

- Loci
- Maps
- Scales

Autumn term

Shape 1

## What do I need to be able to do?

- Be able to bisect a line
- Be able to bisect an angle
- Be able to draw plans and elevations of a shape
- Be able to draw an isometric drawing of a shape

# Shape

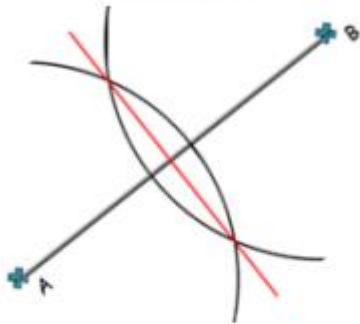
## Career Links

- Being able to confidently work with shape is a skill with links to these careers
- Architecture / Cartography/ Construction
- Building

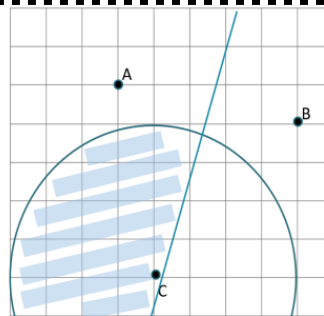
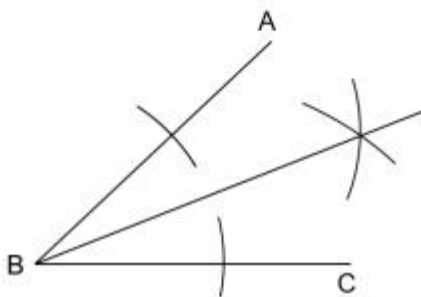
## Key Vocabulary

Locus	A set of points which obey a certain rule
Bisect	Divide in to 2 parts
Plan	The top view of a shape
Elevation	The view of a 3D shape when it is looked at from the side or from the front.
Map	A diagrammatic representation of an area of land or sea showing physical features, cities, roads, etc.
Scale	The ratio that defines the relation between the actual figure and its model.

## Line bisector



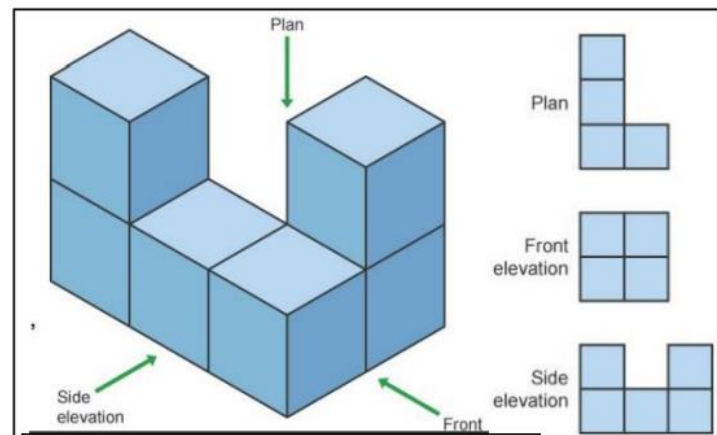
## Angle bisector



Shade the region that is:  
 - closer to A than B  
 - less than 4 cm from C

Line bisector of A and B

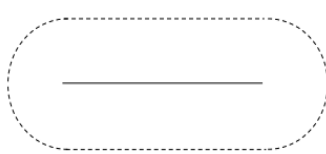
Circle with radius 4cm



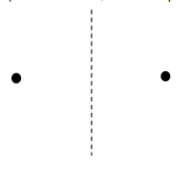
Equidistant from a point



Equidistant from a line

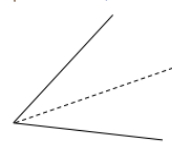


Equidistant from 2 points



The same as a perpendicular bisector

Equidistant from 2 lines



The same as an angle bisector

