Maths – Transformations

Year 9

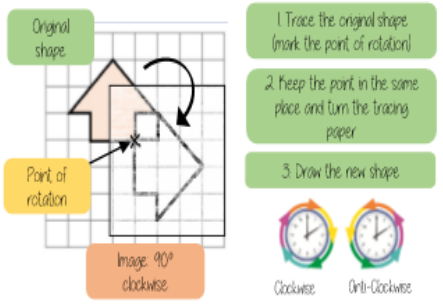
What do I need to be able to do?

- Recognise line symmetry
- Recognise and understand rotational symmetry
- Reflect shapes in horizontal and vertical lines
- Reflect shapes in diagonal lines
- Translate shapes in two directions
- Translate shapes given a vector
- Rotate shapes from a given centre
- Enlarge shapes using a given scale factor (including fractional SF)
- Enlarge shapes from a centre of enlargement
- Perform a combination of transformations
- Describe the transformation that has taken place given the original and new shape
- Use scale factors to find lengths of missing sides
- Use scale factors to find lengths of missing sides in similar shapes

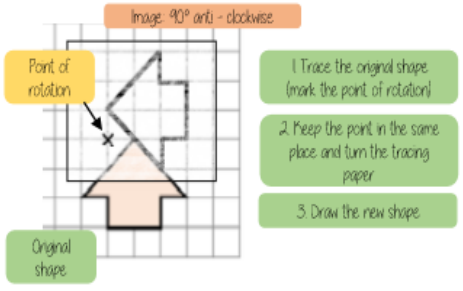
Keywords:

Rotate: a rotation is a circular movement.
Symmetry: when two or more parts are identical after a transformation. **Regular**: a regular shape has angles and sides of equal lengths.
Invariant: a point that does not move after a transformation.
Vertex: a point two edges meet.
Horizontal: from side to side
Vertical: from up to down
Similar Shapes: shapes of different sizes that have corresponding sides in equal proportion and identical corresponding angles.
Scale Factor: the multiple describing how much a shape has been enlarged
Enlarge: to change the size of a shape (enlargement is not always making a shape bigger)
Corresponding: objects (or sides) that appear in the same place in two similar situations. Image: the picture or visual representation of the shape

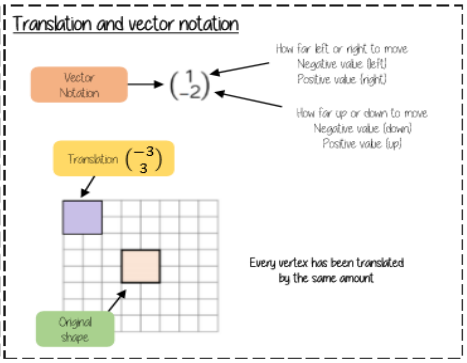
Rotate from a point (in a shape)



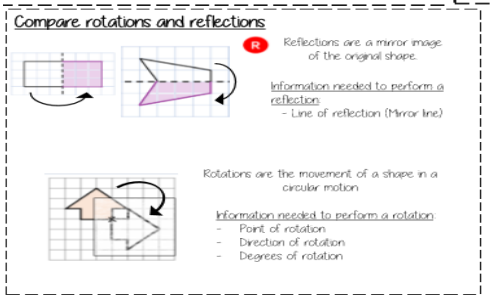
Rotate from a point (outside a shape)



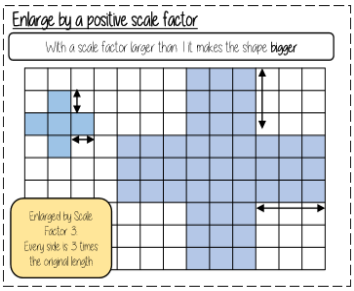
Translation and vector notation



Compare rotations and reflections



Enlarge by a positive scale factor

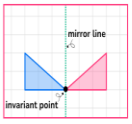


What are invariant points?

Invariant points are points which have stayed in the same place after a transformation.

E.g.

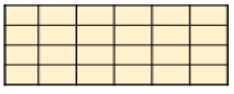
Here is a reflection. The invariant point is labelled.



Recognise enlargement & similarity

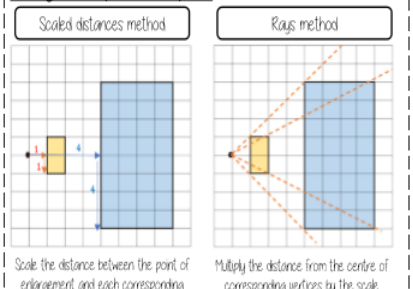
Shapes are similar if all pairs of corresponding sides are in the same ratio

These shapes are similar because all sides are increased by the same ratio



Enlargements are similar shapes with a ratio other than 1

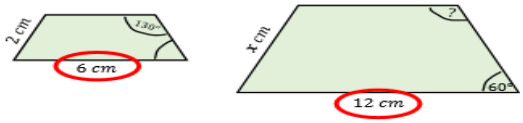
Enlarge a shape from a point



Calculations in similar shapes

Don't forget that properties of shapes don't change with enlargements or in similar shapes

The two trapezium are similar find the missing side and angle



Corresponding sides identify the scale factor $\frac{12}{6} = 2$ Scale Factor = 2

Calculate the missing side Length (corresponding side) x scale factor

$2cm \times 2$

$x = 4cm$

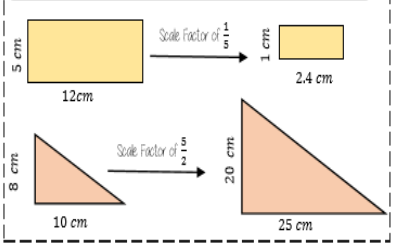
Enlargement does not change angle size

Calculate the missing angle Corresponding angles remain the same

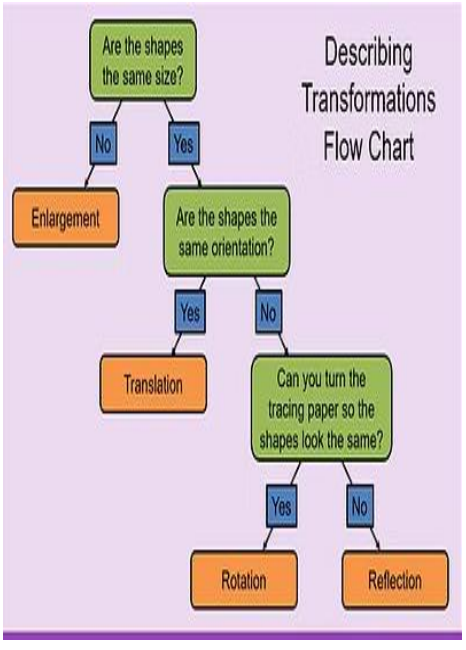
$130°$

Positive fractional scale factor

With a scale factor between 0 and 1 it makes the shape smaller



Describing Transformations Flow Chart



What do I need to be able to do?

- Solve one and two step equations, including with fractions.
- Solve equations with brackets
- Solve equations with unknowns on both sides
- Solve equations involving powers of the unknown
- Form and solve equations in a variety of contexts
- Rearrange one step formulae
- Rearrange two step formulae

Keywords:

Equation – a mathematical statement that two things are equal.
Expand brackets - multiply everything in the brackets by the number outside.
Solve - To find the value of the letter
Inverse - The opposite operation
Evaluate - Work out
Simultaneous equations – solve more than one equation at the same time.

Solve equations with brackets

$3(x + 5) = 27$

Expand Brackets

$3x + 15 = 27$

$-15 \quad -15$

$3x = 12$

$\div 3 \quad \div 3$

$x = 4$

Simultaneous equations

2 chocolate bars & 1 apple costs £2.50
1 chocolate bar & 1 apple costs £1.50

How much is a chocolate bar?

= £2.50
= £1.50
= £1

How do we find the value of an apple?

Equations with unknown on both sides

$5a + 8 = 3a + 18$

$-3a \quad -3a$

$2a + 8 = 18$

$-8 \quad -8$

$2a = 10$

$\div 2 \quad \div 2$

$a = 5$

Forming equations

a + 5 + 3a + 15 = 180

4a + 20 = 180

4a = 160

a = 40^0

Substitute the cost of a chocolate bar to find the cost of an apple.

= £1.50

£1 + = £1.50

= 50p

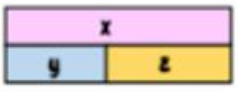
Formulae and Equations

Formulae – all expressed in symbols

Substitute in values

Equations – include numbers and can be solved

Rearranging Formulae (one step)



$x = y + z$

Rearrange to make y the subject

$y = x - z$

$y \rightarrow +z \rightarrow x$

$y \leftarrow -z \leftarrow x$

Using inverse operations or fact families will guide you through rearranging formulae

Rearranging can also be checked by substitution

Language of rearranging...

Change the subject

Make XXX the subject

Rearrange

Rearranging Formulae (two step)

In an equation (find x)

$4x - 3 = 9$

$+3 \quad +3$

$4x = 12$

$\div 4 \quad \div 4$

$x = 3$

In a formula (make x the subject)

$xy - s = a$

$+s \quad +s$

$xy = a + s$

$\div y \quad \div y$

$x = \frac{a + s}{y}$

The steps are the same for solving and rearranging

Rearranging is often needed when using $y = mx + c$

e.g. Find the gradient of the line $2y - 4x = 9$

Make y the subject first $y = \frac{4x + 9}{2}$ Gradient $= \frac{4}{2} = 2$