

Year 8 Term 3

Linear Graphs

What do I need to be able to do?

By the end of this unit you should be able to:

- Compare gradients
- Compare intercepts
- Understand and use $y = mx + c$
- Find the equation of a line from a graph
- Interpret gradient and intercepts of real-life graphs

Keywords

Gradient: the steepness of a line

Intercept: where two lines cross. The y-intercept: where the line meets the y-axis

Parallel: two lines that never meet with the same gradient

Co-ordinate: a set of values that show an exact position on a graph

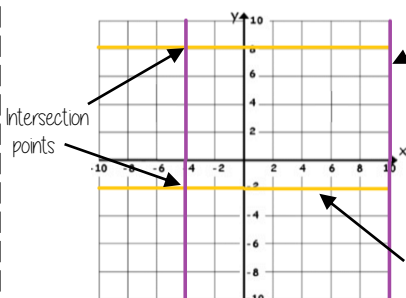
Linear: linear graphs (straight line) – linear common difference by addition/ subtraction

Asymptote: a straight line that a graph will never meet

Reciprocal: a pair of numbers that multiply together to give 1

Perpendicular: two lines that meet at a right angle

Lines parallel to the axes



All the points on this line have a x coordinate of 10

Lines parallel to the y axis take the form $x = a$ and are vertical

Lines parallel to the x axis take the form $y = a$ and are horizontal

All the points on this line have a y coordinate of -2

eg (3, -2) (7, -2) (-2, -2) all lay on this line because the y coordinate is -2

'a' can be ANY positive or negative value including 0

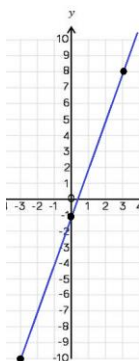
Plotting $y = mx + c$ graphs

$y = 3x - 1$ → 3 x the x coordinate then - 1

x	-3	0	3
y	-10	-1	8

Draw a table to display this information

This represents a coordinate pair (-3, -10)



You only need two points to form a straight line

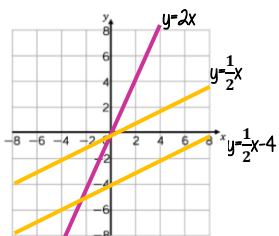
Plotting more points helps you decide if your calculations are correct (if they do make a straight line)

Remember to join the points to make a line

Compare Gradients

$$y = mx + c$$

The coefficient of x (the number in front of x) tells us the gradient of the line



The greater the gradient – the steeper the line

Positive gradients

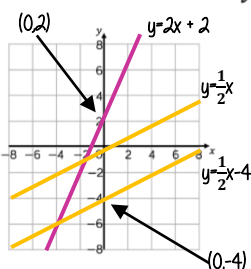
Negative gradients

Parallel lines have the same gradient

Compare Intercepts

$$y = mx + c$$

The value of c is the point at which the line crosses the y-axis Y intercept



The coordinate of a y intercept will always be (0,c)

Lines with the same y-intercept cross in the same place

$$y = mx + c$$

The coefficient of x (the number in front of x) tells us the gradient of the line

$$y = mx + c$$

The value of c is the point at which the line crosses the y-axis Y intercept

y and x are coordinates

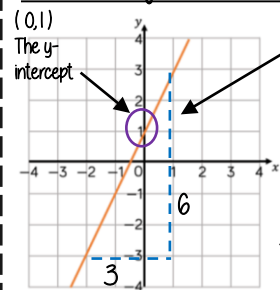
The equation of a line can be rearranged. Eg

$$y = c + mx$$

$$c = y - mx$$

Identify which coefficient you are identifying or comparing

Find the equation from a graph



The Gradient $\frac{6}{3} = 2$

$$y = 2x + 1$$

The direction of the line indicates a positive gradient

Positive gradients

Negative gradients

Real life graphs

A plumber charges a £25 callout fee, and then £12.50 for every hour. Complete the table of values to show the cost of hiring the plumber.

Time (h)	0	1	2	3	8
Cost (£)	£25				£125

In real life graphs like this values will always be positive because they measure distances or objects which cannot be negative.

Direct Proportion graphs

To represent direct proportion the graph must start at the origin

A box of pens costs £2.30

Complete the table of values to show the cost of buying boxes of pens.

Boxes	0	1	2	3	8
Cost (£)		£2.30			

When you have 0 pens this has 0 cost. The gradient shows the price per pen.

The y-intercept shows the minimum charge. The gradient represents the price per mile

Year 8 Term 3

Transforming Shapes

What do I need to be able to do?

By the end of this unit you should be able to:

- Recognise line symmetry
- Reflect in a horizontal line
- Reflect in a vertical line
- Reflect in a diagonal line

Keywords

Mirror line: a line that passes through the center of a shape with a mirror image on either side of the line

Line of symmetry: same definition as the mirror line

Reflect: mapping of one object from one position to another of equal distance from a given line.

Vertex: a point where two or more line segments meet

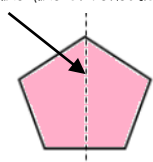
Perpendicular: lines that cross at 90°

Horizontal: a straight line from left to right (parallel to the x axis)

Vertical: a straight line from top to bottom (parallel to the y axis)

Lines of symmetry

Mirror line (line of reflection)



Shapes can have more than one line of symmetry...
This regular polygon (a regular pentagon has 5 lines of symmetry)



Rhombus

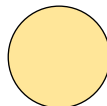
two lines of symmetry

Parallelogram

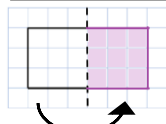
No lines of symmetry



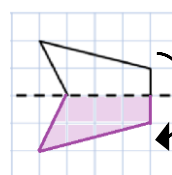
A circle has an infinite amount of lines of symmetry



Reflect horizontally/ vertically (1)



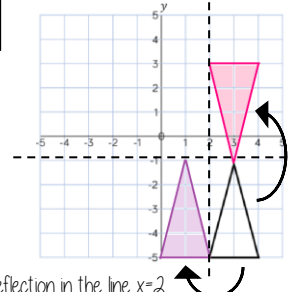
Reflection in a vertical line



Reflection in a horizontal line

Note: a reflection doubles the area of the original shape

Reflection on an axis grid

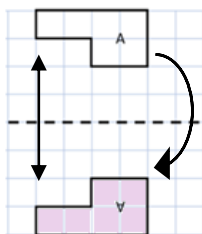


Reflection in the line $y=2$

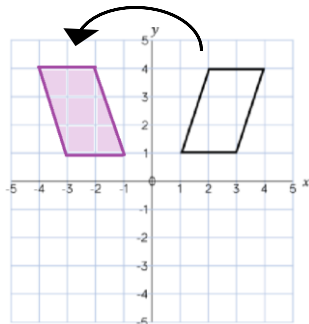
Reflection in the line $x=2$

Reflect horizontally/ vertically (2)

All points need to be the same distance away from the line of reflection



Reflection in the line y axis — this is also a reflection in the line $x=0$

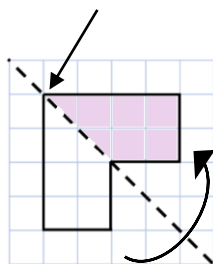


Lines parallel to the x and y axis
REMEMBER

Lines parallel to the x-axis are $y = \text{---}$
Lines parallel to the y-axis are $x = \text{---}$

Reflect Diagonally (1)

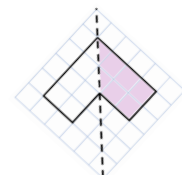
Points on the mirror line don't change position



Fold along the line of symmetry to check the direction of the reflection

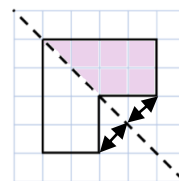
Turn your image

If you turn your image it becomes a vertical/ horizontal reflection (also good to check your answer this way)



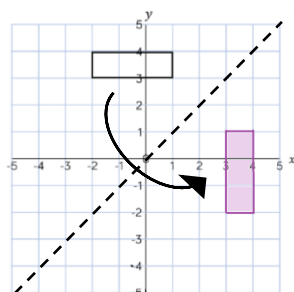
Drawing perpendicular lines

Perpendicular lines to and from the mirror line can help you to plot diagonal reflections

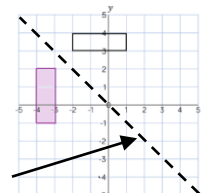


Reflect Diagonally (2)

This is the line $y = x$ (every y coordinate is the same as the x coordinate along this line)

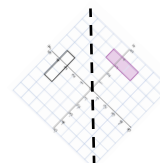


This is the line $y = -x$
The x and y coordinate have the same value but opposite sign



Turn your image

If you turn your image it becomes a vertical/ horizontal reflection (also good to check your answer this way)



Year 8 Term 3

Angles

What do I need to be able to do?

By the end of this unit you should be able to:

- Identify alternate angles
- Identify corresponding angles
- Identify co-interior angles
- Find the sum of interior angles in polygons
- Find the sum of exterior angles in polygons
- Find interior angles in regular polygons

Keywords

Parallel: Straight lines that never meet

Angle: The figure formed by two straight lines meeting (measured in degrees)

Transversal: A line that cuts across two or more other (normally parallel) lines

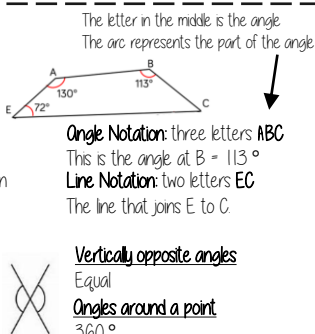
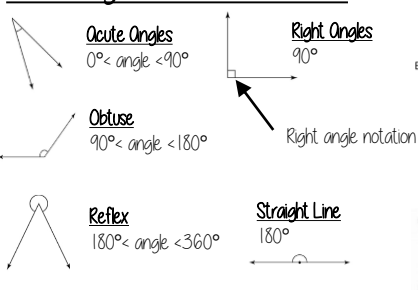
Isosceles: Two equal size lines and equal size angles (in a triangle or trapezium)

Polygon: A 2D shape made with straight lines

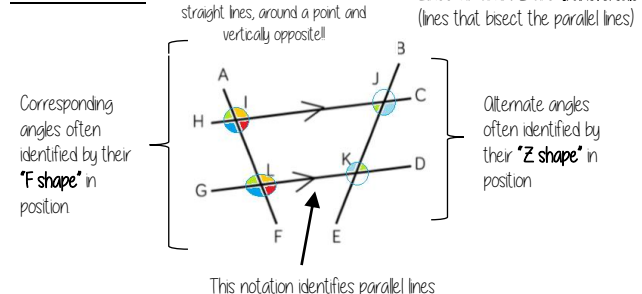
Sum: Addition (total of all the interior angles added together)

Regular polygon: All the sides have equal length; all the interior angles have equal size

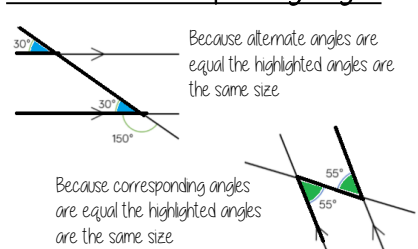
Basic angle rules and notation



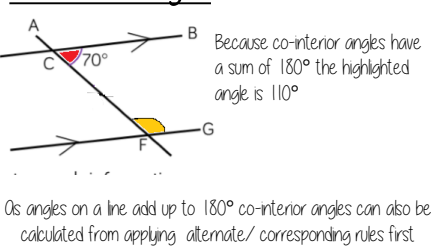
Parallel lines



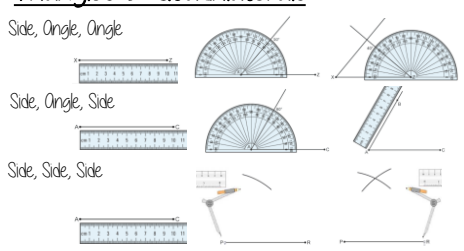
Alternate/Corresponding angles



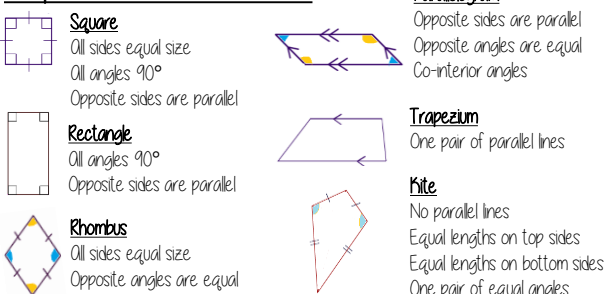
Co-interior angles



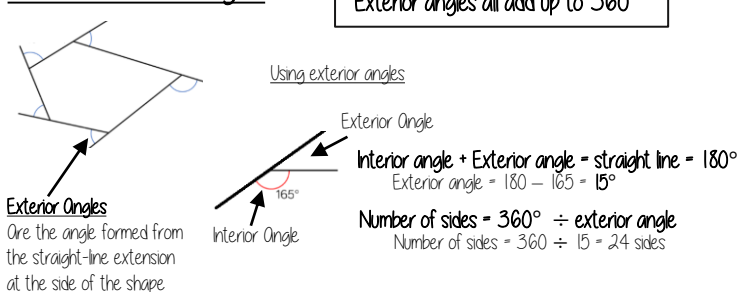
Triangles & Quadrilaterals



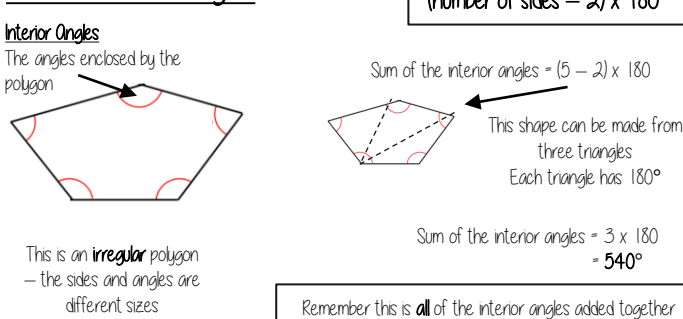
Properties of Quadrilaterals



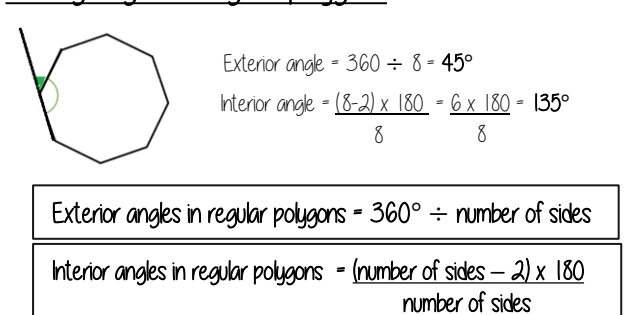
Sum of exterior angles



Sum of interior angles



Missing angles in regular polygons



Year 8 Term 3

Inequalities and Brackets

What do I need to be able to do?

By the end of this unit you should be able to:

- Form Expressions
- Expand and factorise single brackets
- Form and solve equations
- Solve equations with brackets
- Represent inequalities
- Form and solve inequalities

Keywords

Simplify: grouping and combining similar terms

Substitute: replace a variable with a numerical value

Equivalent: something of equal value

Coefficient: a number used to multiply a variable

Product: multiply terms

Highest Common Factor (HCF): the biggest factor (or number that multiplies to give a term)

Inequality: an inequality compares two values showing if one is greater than, less than or equal to another

Form expressions

For unknown variables, a letter is normally used in its place

More than – ADD

Less than/ difference – SUBTRACT

e.g. 4 more than $t \longrightarrow t + 4$

8 less than $k \longrightarrow k - 8$

Only similar terms can be grouped together

e.g. Find the perimeter of this shape

(Perimeter = length around outside of shape)

t  $t + 2t + 1 + t + 2t + 1 \longrightarrow 6t + 2$

Directed numbers

$++ \longrightarrow +$

$-- \longrightarrow +$

$+ - \longrightarrow -$

$- + \longrightarrow -$

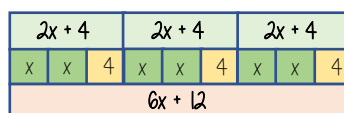
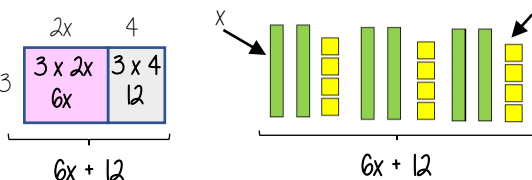
e.g. $a = -5$ and $b = 2$

$a^2 = a \times a = -5 \times -5 = 25$

$b + a = 2 + -5 = -3$

Multiply single brackets

$3(2x + 4)$



Different representations of $3(2x + 4) = 6x + 12$

Factorise into a single bracket

$8x + 4$



The two values multiply together (also the area) of the rectangle

$$8x + 4 \equiv 4(2x + 1)$$

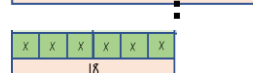
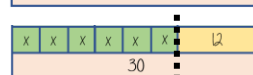
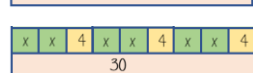
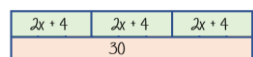
Note:

$$8x + 4 \equiv 2(4x + 2)$$

This is factorised but the HCF has not been used

Solve equations with brackets

$3(2x + 4) = 30$



$$3(2x + 4) = 30$$

Expand the brackets

$$6x + 12 = 30$$

-12

-12

$$6x = 18$$

-6

-6

Substitute to check your answer. This could be negative or a fraction or decimal

$$\begin{matrix} x \\ 3 \end{matrix} \quad x = 3$$

Simple Inequalities

< less than

≤ Less than or equal to

> More than

≥ More than or equal to

$$x < 10$$

Say this out loud
"x is a value less than 10"

Note:
 $x < 10$ and $10 > x$
represent the same values

$$x + 2 \leq 20$$

"my value + 2 is less than or equal to 20"

$$x \leq 18$$

The biggest the value can be is 18

$$10 > x$$

Say this out loud
"10 is more than the value"

Form and solve inequalities



Two more than treble my number is greater than 11

Find the possible range of values

Form

$$x \longrightarrow x3 \longrightarrow +2 \longrightarrow 11$$

$$3x + 2 > 11$$

Solve

$$x \longleftarrow -3 \longleftarrow -2 \longleftarrow 11$$

$$x > 3$$

Check

This would suggest any value bigger than 3 satisfies the statement

$$3 \times 3 + 2 = 11 \checkmark$$

$$10 \times 3 + 2 = 32 \checkmark$$

Algebraic constructs

Expression

A sentence with a minimum of two numbers and one maths operation

Equation

A statement that two things are equal

Term

A single number or variable

Identity

An equation where both sides have variables that cause the same answer includes $\equiv$

Formula

A rule written with all mathematical symbols e.g. area of a rectangle $A = b \times h$