Graphs – Y11 Higher – Unit 1

What do I need to be able to do?

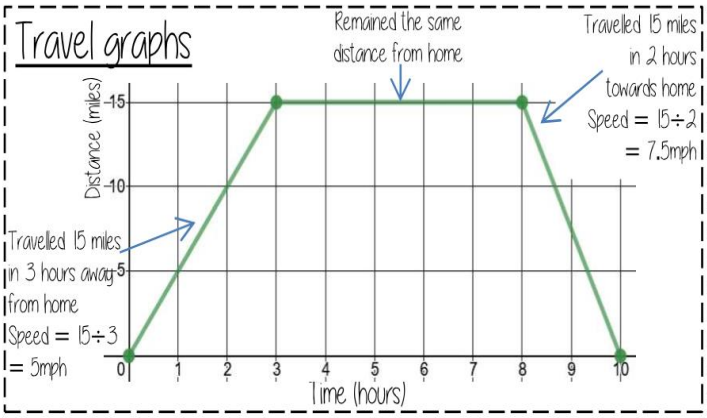
By the end of this unit you should be able to:

- Label and identify lines parallel to the axes
- Recognise and use basic straight lines
- Identify positive and negative gradients
- Plot y = mx+c graphs
- Find the equation of line
- Find the midpoint between coordinates
- Plot quadrics, cubic and reciprocal graphs
- Plot and use graphs from real life situations

Vocabulary

Quadrant: four quarters of the coordinate plane.
Coordinate: a set of values that show an exact position.
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)
Origin: (0,0) on a graph. The point the two axes cross
Parallel: Lines that never meet
Gradient: The steepness of a line
Intercept: Where lines cross
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.

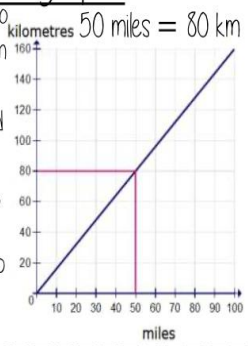
Travel graphs

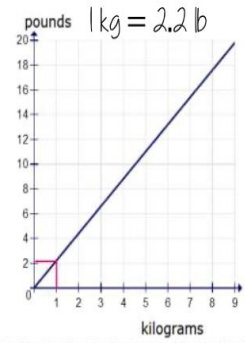


Conversion graphs

Used to change from one unit to another

Use your ruler to draw a line from the value you want converted to the conversion line, then down/across to the unit you want





Plot linear graphs

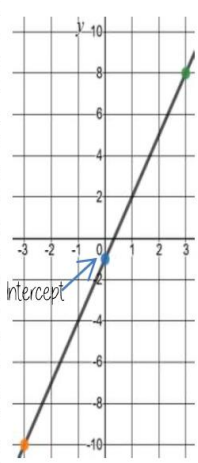
Use substitution to find values to plot. This is the same as when you are finding terms in a linear sequence from the nth term

$y = 3x - 1$ → 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

Plot quadratic graphs

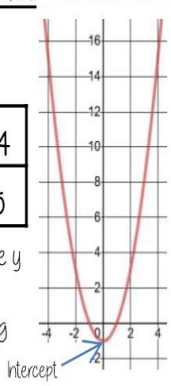
We substitute to find the x values

x^2 gives a happy face ☺ $-x^2$ gives a sad face ☹

$y = x^2 - 1$

x	−4	−2	0	2	4
y	15	3	-1	3	15

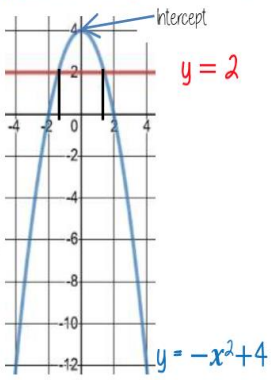
You will often see symmetry in the y values in the table as well as the graph (unless you are only working with part of the curve)



$y = -x^2 + 4$

x	−4	−2	0	2	4
y	−12	0	4	0	−12

You may be asked to find the coordinates when y is equal to something e.g. when $y = 2$ From the graph we can read that the lines intersect at approximately $(-1.4, 2)$ and $(1.4, 2)$



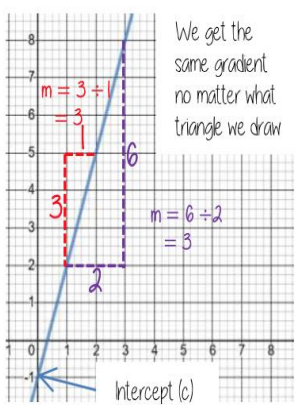
y = mx + c

To find the gradient (m) we use right angled triangles to calculate $\frac{\text{difference in y}}{\text{difference in x}}$

You can use any points on the line – pick exact coordinates to make it easier

So $y = 3x - 1$

A downward slope will have a negative gradient



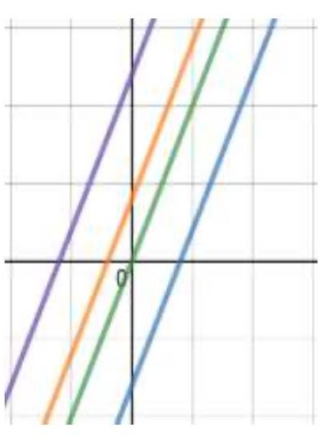
We get the same gradient no matter what triangle we draw

Parallel lines

$y = 2x + 6$
$y = 2x$
$y = 2x + 2$
$y = 2x - 4$

Notice that all the lines are parallel. Lines with the same gradient will always be parallel.

The only thing that changes is the intercept



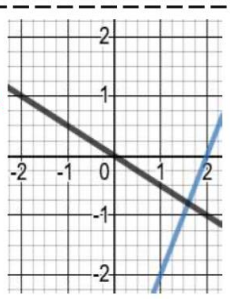
Remember!!!

Always draw graphs using a ruler and pencil

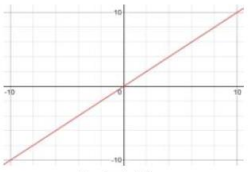
Perpendicular lines

$y = -0.5x$ −0.5 is the negative reciprocal of 2
$y = 2x - 4$

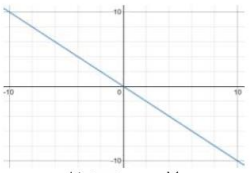
The gradients of perpendicular lines have a product of −1 e.g. $-0.5 \times 2 = -1$



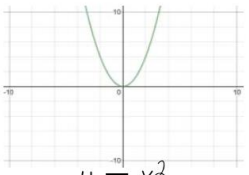
Recognising types of graphs



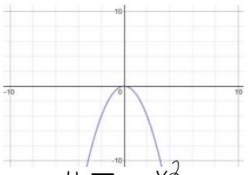
$y = x$



$y = -x$



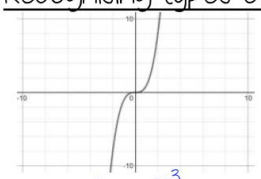
$y = x^2$



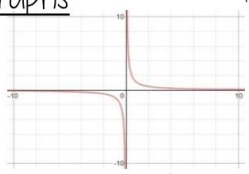
$y = -x^2$

Recognising types of graphs

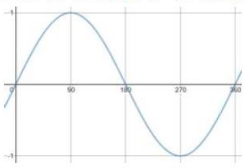
Hint to remember: sin to the sky



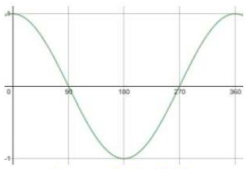
$y = x^3$



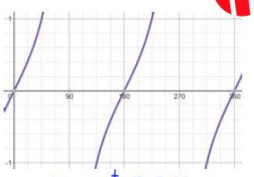
$y = x^{-1}$



$y = \sin x$



$y = \cos x$



$y = \tan x$

Is (x, y) a solution?

x and y represent values that can be substituted into an equation

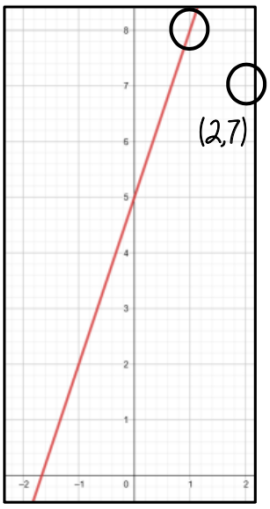
Does the coordinate (1,8) lie on the line y=3x+5?

This coordinate represents x=1 and y=8

$y = 3x + 5$

$8 = 3(1) + 5$

As the substitution makes the equation correct the coordinate (1,8) IS on the line y=3x+5

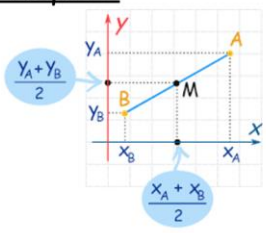


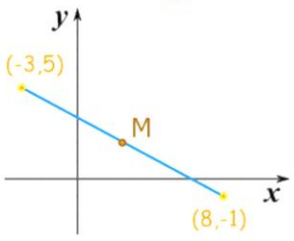
Is (2,7) on the same line?

$7 \neq 3(2) + 5$

No 7 does NOT equal 6+5

Mid point





Use the formula:

$M = \left(\frac{x_A+x_B}{2}, \frac{y_A+y_B}{2} \right)$

$M = \left(\frac{(-3)+8}{2}, \frac{5+(-1)}{2} \right)$

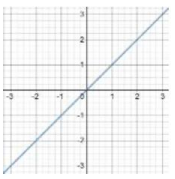
$M = (5/2, 4/2)$

$M = (2.5, 2)$

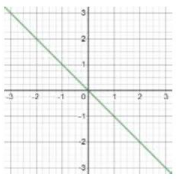
Regions of inequalities

Reminder of types of graphs

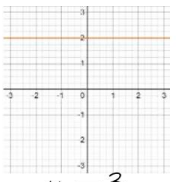
We need to remember the different types of linear graphs to work with regions.



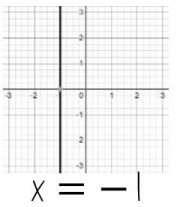
$y = x$



$y = -x$



$y = 3$



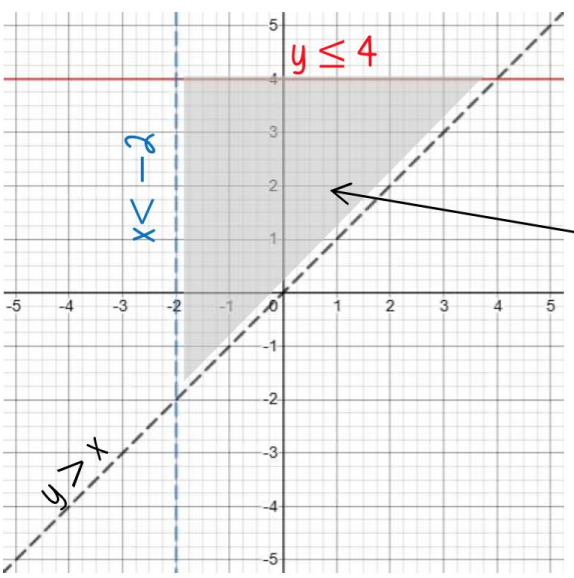
$x = -1$

Show the region that is satisfied by the following inequalities

$y > x$:

$y \leq 4$

$x > -2$: :



The shaded region represents all the values that satisfy all 3 inequalities

Notice how > and < statements are represented by a broken line and ≥ and ≤ statements are represented by a solid line.