

# YEAR 8

# KNOWLEDGE

# ORGANISERS



## AUTUMN TERM 2

## GRAPHS

*Unit 4: The Cartesian Plane*

*Unit 5: Straight Line Graphs*

# GRAPHS...

## Unit 4: The Cartesian Plane

### 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
- Link linear graphs to sequences
- Plot  $y = mx + c$  graphs

### Keywords

**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)

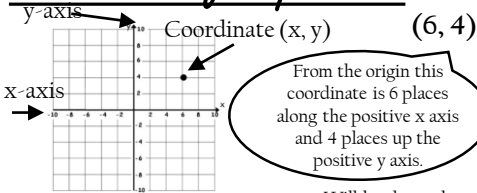
**Origin:** (0,0) on a graph. The point the two axes cross

**Parallel:** Lines that never meet

**Gradient:** The steepness of a line

**Intercept:** Where lines cross

### Coordinates in four quadrants



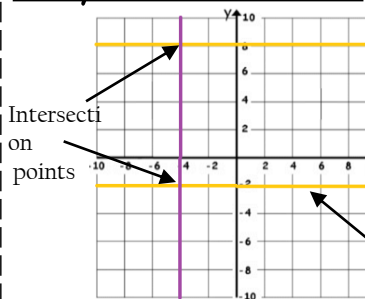
(0, a) Will be always be a point on the y axis. (a can be any number)

(a, 0) Will be always be a point on the x axis. (a can be any number)

Always the position on the x axis first

Always the position on the y axis second

### Lines parallel to the axes



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

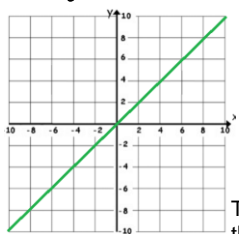
Lines parallel to the y axis take the form  $x = a$  and are vertical

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 e.g. (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

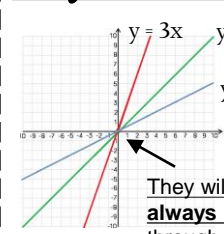
### Recognise and use the line $y=x$



Examples of coordinates on this line: (0, 0) (-3, -3) (8, 8)

The axes **scale is important** – if the scale is the same  $y = x$  will be a straight line at  $45^\circ$

### Recognise and use the lines $y=kx$



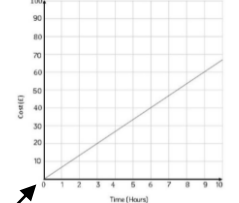
**Note:**  $y = x$  is the same as  $y=1x$

The value of  $k$  changes the steepness of the line

The bigger the value of  $k$  the **steeper** the line will be.

The closer to 0 the value of  $k$  the closer the line will be to the x axis.

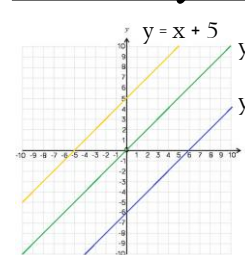
### Direct Proportion using $y=kx$



The line must be straight to be directly proportional – variables increase at the same rate  $k$

Direct proportion graphs always start at (0,0) as they are describing relationships between two variables

### Lines in the form $y = x + a$



All the lines are parallel because the gradients are the same

$y = x + a$

This is the line  $y=x$  when the y and x coordinate are the same

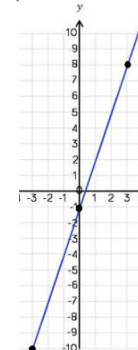
This shows the translation of that line. e.g.  $y = x + 5$  is the line  $y=x$  moved 5 places up the graph

5 has been added to each of the x coordinates

### Plotting $y = mx + c$ graphs

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

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

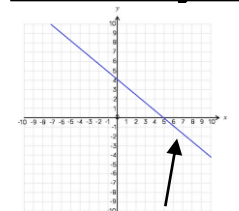


You only need two points to form a straight line

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

### Lines with negative gradients



Any straight-line graph with a negative x value has a negative gradient.

E.g.  $y = -2x$   
 $y = -x$   $y + x = 12$

Direction of all negative gradients

# GRAPHS...

## Unit 5: Straight Line 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.

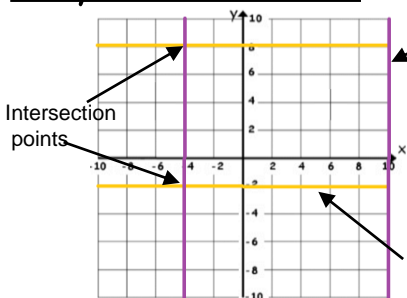
**Linear:** linear graphs are straight graphs.

**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

e.g. (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

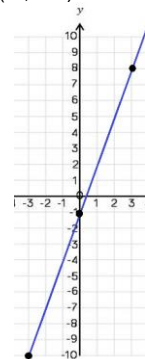
### Plotting $y = mx + c$ graphs

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

x	-3	0	3
y			

Draw a table to display this information

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



You only need two points to form a straight line

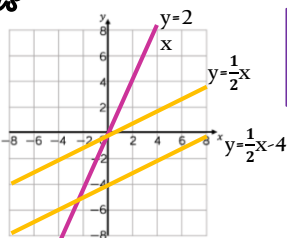
Plotting more points helps you decide if your calculations are correct (if they do make a straight line)

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



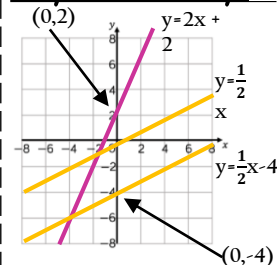
The greater the gradient - the steeper the line

Positive gradients

Negative gradients

Parallel lines have the same gradient

### Compare Intercep $y = mx + c$



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:

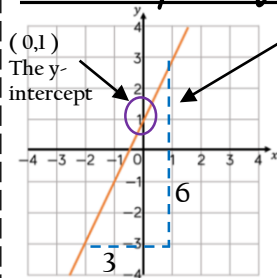
E.g:

$$y = c + mx$$

$$c = y - mx$$

Identify which coefficient you are identifying or comparing.

### Find the equation from a graph



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

The direction of the line indicates a positive gradient

$$y = 2x + 1$$

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

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

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.

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

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			