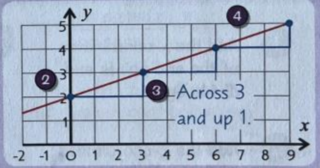
Using y = mx + c

1. Rearrange into the form $y = mx + c$.
2. Put a dot on the y-axis at the value of c.
3. Use m to go across and up/down an appropriate number of units. Make a dot and repeat.
4. Draw a straight line through the dots.
5. Check gradient looks correct.

EXAMPLE

Draw the graph of $3y = x + 6$.

① $3y = x + 6 \Rightarrow y = \frac{1}{3}x + 2$



⑤ A gradient of $\frac{1}{3}$ is gentle and increases from left to right. ✓

Three Steps for Drawing

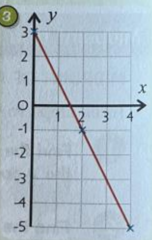
1. Draw a table with three values of x.
2. Put the x-values into the equation and work out the y-values.
3. Plot the points and draw a straight line through them.

EXAMPLE

Draw the graph $y = -2x + 3$ for values of x from 0 to 4.

x	0	2	4
y	3	–1	–5

E.g. when $x = 2$,
$y = -2(2) + 3$
$= -4 + 3 = -1$



Quadratic Graphs

A quadratic graph ($y = ax^2 + bx + c$) has a symmetrical bucket shape.

Three steps to plot a quadratic graph:

1. Substitute the x-values into the equation to find y-values.
2. Plot the points.
3. Join the points with a smooth curve.

The coefficient of x^2 is positive, so the curve is u-shaped.

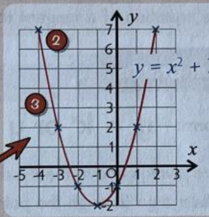
EXAMPLE

Plot the graph of $y = x^2 + 2x - 1$.

①

x	–4	–3	–2	–1	0	1	2
y	7	2	–1	–2	–1	2	7

E.g. $y = (-4)^2 + 2(-4) - 1$
$= 16 - 8 - 1 = 7$



Two Steps to Find the Midpoint of a Line Segment

1. Add the x-coordinates of the end points and divide by 2.
2. Add the y-coordinates of the end points and divide by 2.

EXAMPLE

Point A has coordinates (–8, 2) and Point B has coordinates (6, 10). Find the coordinates of the midpoint of AB.

$$\left(\frac{-8+6}{2}, \frac{2+10}{2}\right) = \left(\frac{-2}{2}, \frac{12}{2}\right) = (-1, 6)$$

Finding the Gradient

GRADIENT — steepness of a line.

Uphill slope = positive gradient
Downhill slope = negative gradient

$$\text{Gradient} = \frac{\text{change in y}}{\text{change in x}}$$

Three steps to find the gradient:

1. Find the coordinates of two points on the line.
2. Find the change in y and the change in x.
3. Substitute into the formula.

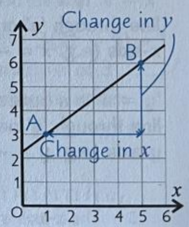
Subtract the y- and x-coordinates in the same order.

EXAMPLE

① A: (1, 3) B: (5, 6)

② Change in y: $6 - 3 = 3$
Change in x: $5 - 1 = 4$

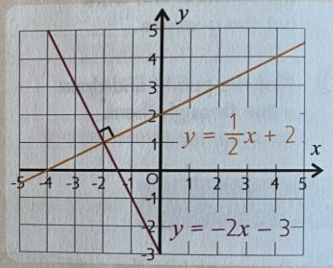
③ Gradient $= \frac{3}{4} = 0.75$



Perpendicular Line Gradients

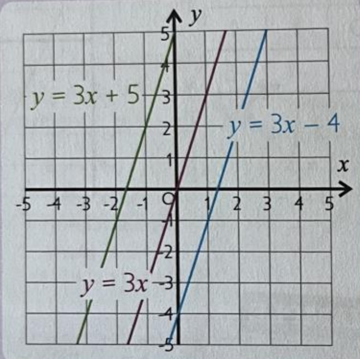
Perpendicular lines cross at right angles. Their gradients multiply together to give –1.

If gradient of first line = m, then gradient of second line $= -\frac{1}{m}$.



Parallel Line Gradients

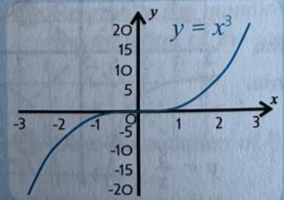
Parallel lines have the SAME gradient — i.e. they have the SAME m value.

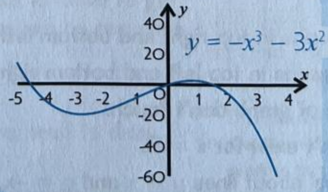


Cubic Graphs

A cubic graph ($y = ax^3 + bx^2 + cx + d$) has a wiggle in the middle.

$+x^3$ graphs go up from bottom left: $-x^3$ graphs go down from top left:





Plot cubic graphs using the steps for quadratic graphs above.

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Equation of a Line Through Two Points

1. Use both points to find gradient.
2. Substitute one point into $y = mx + c$.
3. Rearrange to find 'c'.
4. Write equation as $y = mx + c$.

EXAMPLE

Find the equation of the straight line that passes through $(-2, 12)$ and $(4, -6)$.

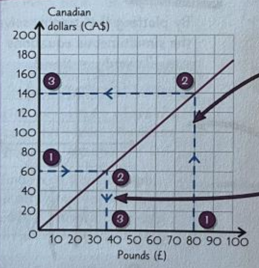
1. $m = \frac{-6-12}{4-(-2)} = \frac{-18}{6} = -3$
2. Sub in $(4, -6)$: $-6 = -3(4) + c \Rightarrow -6 = -12 + c$
3. $c = -6 + 12 = 6$
4. $y = -3x + 6$

CONVERSION GRAPHS — show how to convert between units.

Three steps to use conversion graphs:

1. Draw a line from a value on one axis.
2. When you reach the conversion line, go to the other axis.
3. Read off the value from this axis.

EXAMPLE



a) How many Canadian dollars is £80?

Go up from £80: £80 = CA$140

b) How many pounds is CA$600?

CA$600 isn't on the graph, so pick an easy number to use instead:

CA$60 = £35

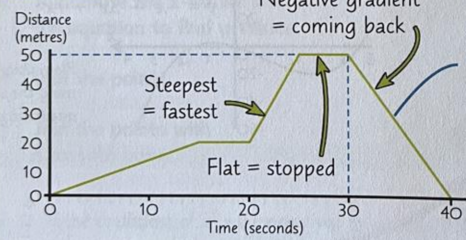
Multiply to work out CA$600:

CA$600 = £35 × 10 = £350

DISTANCE-TIME GRAPHS — show distance travelled against time.

Distance from the starting point goes on the vertical axis and time goes on the horizontal axis. The gradient gives the speed.

EXAMPLE



Final section starts 50 m from starting point at 30 s and ends back at starting point at 40 s.

Speed of this section $= \frac{0-50}{40-30} = \frac{-50}{10} = -5$ m/s, so coming back at 5 m/s.

Equation of a Straight Line

General equation for a straight-line graph:

$$y = mx + c$$

c = y-intercept (where the graph crosses the y-axis)

m = gradient

Rearrange other straight-line equations into this form:

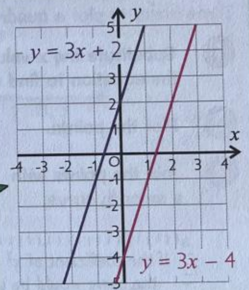
$3x - y = 5 \rightarrow y = 3x - 5$

$7x + y - 2 = 0 \rightarrow y = -7x + 2$

Parallel lines have the same gradient, so they have the same value of m:

$y = 3x + 2$ has gradient 3 and y-intercept 2

$y = 3x - 4$ has gradient 3 and y-intercept -4



Equations of Straight-Line Graphs

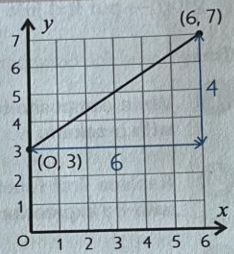
GRADIENT — steepness of a line.

$$\text{Gradient} = \frac{\text{change in } y}{\text{change in } x}$$

1. Use any two points on the line to find the gradient, 'm'.
2. Find the y-intercept, 'c'.
3. Write equation as $y = mx + c$.

EXAMPLE

1. $m = \frac{4}{6} = \frac{2}{3}$
2. $c = 3$
3. $y = \frac{2}{3}x + 3$



Spotting Straight-Line Equations

Straight-line equations only have an x-term, a y-term and a number term.

If there are any other terms, it's not a straight line.

Straight lines:		NOT straight lines:	
$y = 5x - 2$	$x + 2y = 1$	$y = 3x^2 + 1$	$xy = 1$
$3 + 4x - 2y = 0$	$8y = 1$	$x^2 + y^2 = 3$	$5 = 3y - \frac{2}{x}$

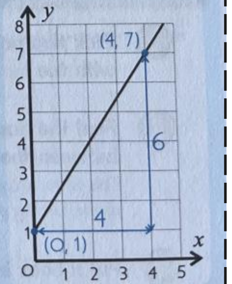
Three Steps to Find the Equation

1. Use any two points on the line to find the gradient, 'm'.
2. Read off the y-intercept, 'c'.
3. Write equation as $y = mx + c$.

EXAMPLE

Find the equation of this line in the form $y = mx + c$.

1. $m = \frac{6}{4} = \frac{3}{2}$
2. $c = 1$
3. $y = \frac{3}{2}x + 1$



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