PLOTTING AND INTERPRETTING GRAPHS

Key Concept

Substitution – This is where you replace a number with a letter

If a = 5 and b = 2

a + b =	5 + 2 = 7
a – b =	5 – 2 = 3
3a =	3 × 5 = 15
ab =	5 × 2 = 10
a^2 =	5^2 = 25

sparx

M932, M544,M888

Key Words

Intercept: Where two graphs cross.
Gradient: This describes the steepness of the line.
y-intercept: Where the graph crosses the y-axis.
Linear: A linear graph is a straight line.
Quadratic: A quadratic graph is curved, u or n shape.

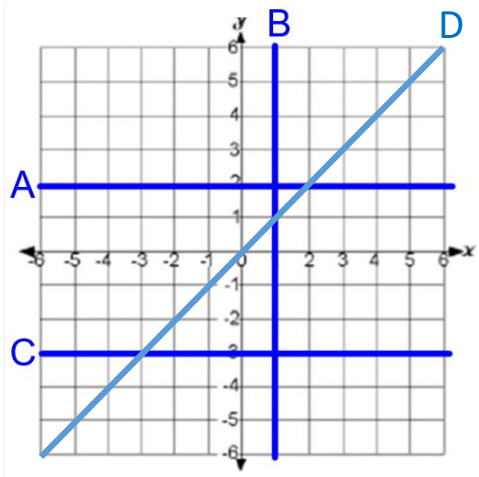
Tip

Parallel lines have the same gradient.

Formula

$$Gradient = \frac{difference\ in\ y's}{difference\ in\ x's}$$

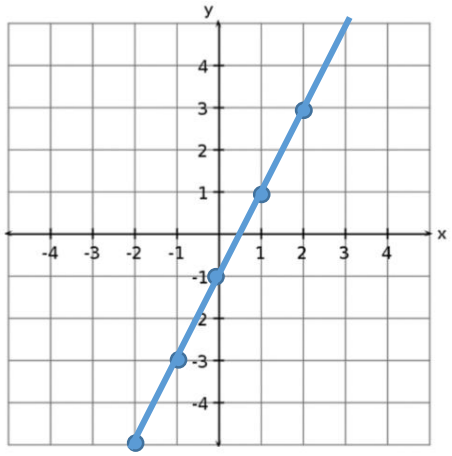
Examples



A: y = 2 B: x = 1
C: y = -3 D: y = x

Draw the graph of y = 2x - 1

X	-2	-1	0	1	2
Y	-5	-3	-1	1	3



Notice this graph has a gradient of 2 and a y-intercept of -1.

Questions

1) What are the gradient and y-intercept of:
a) y = 4x – 3 b) y = 4 + 6x c) y = - 5x – 3
2) Draw the graph of y = 3x – 2 for x values from -3 to 3 using a table.

ANSWERS: 1) a) m = 4, c = -3 b) m = 6, c = 4 c) m = -5, c = -3

STRAIGHT LINE GRAPHS AND EQUATION OF A LINE

Key Concepts

Coordinates in 2D are written as follows:

x is the value that is to the left/right

(x, y)

y is the value that is to up/down

Straight line graphs always have the equation:

$$y = mx + c$$

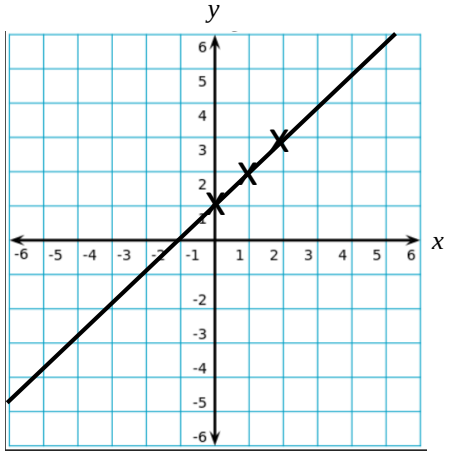
m is the **gradient** i.e. the steepness of the graph.

c is the **y intercept** i.e. where the graph cuts the y axis.

Parallel lines always have the same **gradient**.

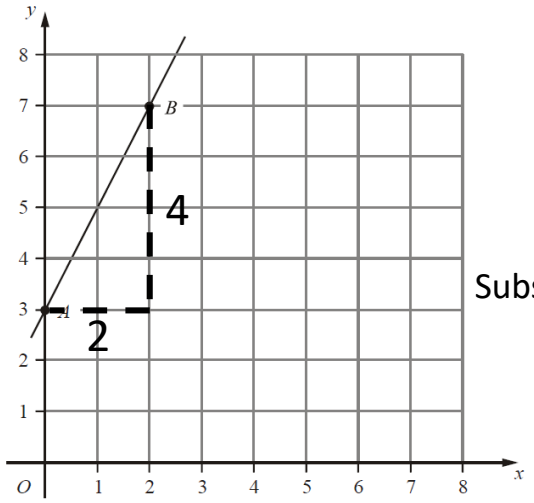
Plot the graph of $y = 2x + 1$

x	0	1	2
y	1	2	3



Examples of lines parallel to this graph are: $y = 2x - 3$ or $y = 2x + 7$

Examples



Calculate the equation of this line:

$$y = mx + c$$

$$m = \frac{4}{2}$$

$$= 2$$

$$y = 2x + c$$

Substitute in a coordinate: (2,7)

$$7 = (2 \times 2) + c$$

$$3 = c$$

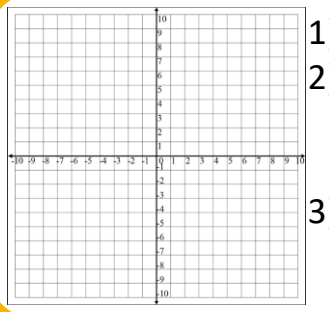
$$y = 2x + 3$$

sparx

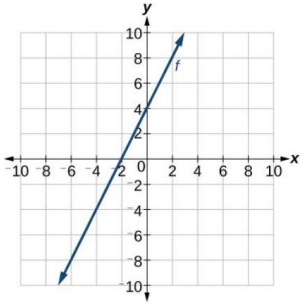
U789 U933
U741 U315

Key Words

Coordinate
Gradient
Parallel



1) Plot the line $y = 3x - 2$
2) Find the equation of the line for the attached graph.
3) State the equation of a line that would be parallel to this line.



ANSWERS: 2) $y = 2x + 4$ 3) Any line that has a gradient of 2

REARRANGE AND SOLVE EQUATIONS

Key Concepts

Solving equations:
Working with inverse operations to find the value of a variable.

Rearranging an equation:
Working with inverse operations to isolate a highlighted variable.

In solving and rearranging we **undo the operations** starting from the last one.

Examples

Solve:

$7p - 5 = 3p + 3$

$-3p \qquad -3p$

$4p - 5 = 3$

$+5 \qquad +5$

$4p = 8$

$\div 2 \qquad \div 2$

$p = 2$

Solve:

$5(x - 3) = 4(x + 2)$

expand $\qquad$ expand

$5x - 15 = 4x + 8$

$-4x \qquad -4x$

$x - 15 = 8$

$+15 \qquad +15$

$x = 23$

Rearrange to make r the subject of the formulae :

$$Q = \frac{2r - 7}{3}$$

$\times 3 \qquad \times 3$

$3Q = 2r - 7$

$+7 \qquad +7$

$3Q + 7 = 2r$

$\div 2 \qquad \div 2$

$$\frac{3Q + 7}{2} = r$$

Rearrange to make c the subject of the formulae :

$$2(3a - c) = 5c + 1$$

expand

$$6a - 2c = 5c + 1$$

$+2c \qquad +2c$

$6a = 7c + 1$

$-1 \qquad -1$

$6a - 1 = 7c$

$\div 7 \qquad \div 7$

$$\frac{6a - 1}{7} = c$$

sparx

M707, M387, M208, M979

Key Words
Solve
Rearrange
Term
Inverse

Links
Science

1) Solve $7(x + 2) = 5(x + 4)$
2) Solve $4(2 - x) = 5(x - 2)$
3) Rearrange to make m the subject $2(2p + m) = 3 - 5m$
4) Rearrange to make x the subject $5(x - 3) = y(4 - 3x)$

ANSWERS: 1) $x = 3$ 2) $x = 2$ 3) $m = \frac{3-4p}{7}$ 4) $x = \frac{4y+15}{5+3y}$

EQUATIONS IN CONTEXT

Key Concepts

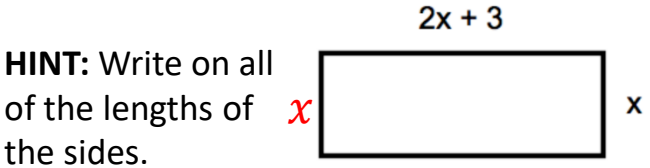
Algebra can be used to support us to find unknowns in a **contextual problem**.

We can always apply a letter to an unknown quantity, to then **set up an equation**.

It will often be used in area and perimeter problems and angle problems in geometry.

Solve to find the value of x when the perimeter is 42cm.

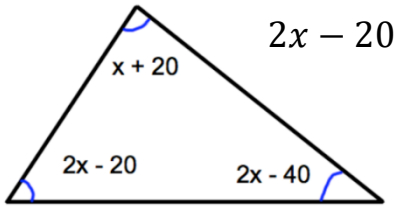
HINT: Write on all of the lengths of the sides.



We know the perimeter is 42cm

$$2x + 3 + 2x + 3 + x + x = 42$$
$$9x + 6 = 42$$
$$6x = 36$$
$$x = 6$$

Angles in a triangle sum to 180°



$$2x - 20 + x + 20 + 2x - 40 = 180$$
$$5x - 40 = 180$$
$$5x = 220$$
$$x = 45$$

Examples

Jane is 4 years older than Tom.
David is twice as old as Jane.
The sum of their ages is 60.
Using algebra, find the age of each person.

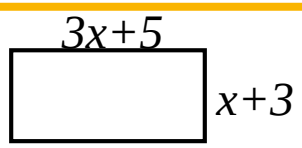
Tom = x → 12
Jane = $x + 4$ → $12 + 4 = 16$
David = $2x + 8$ → $(2 \times 12) + 8 = 32$

$$x + x + 4 + 2x + 8 = 60$$
$$4x + 12 = 60$$
$$4x = 48$$
$$x = 12$$

sparx

M208, M979, M957

Key Words
Solve
Term
Inverse operation



1) If the perimeter is 40cm. What is the length of the longest side?

2) Jane is 12 years older than Jack.
Sarah is 3 years younger than Jack.
The sum of their ages is 36.
Using algebra, find the age of each person.

ANSWERS: 1) $x = 3$ therefore the longest length is 14cm 2) Jack = 9, $Jane = 21$, $Sarah = 6$