PLOTTING AND INTERPRETING GRAPHS

Key Concept

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

If a = 5 and b = 2

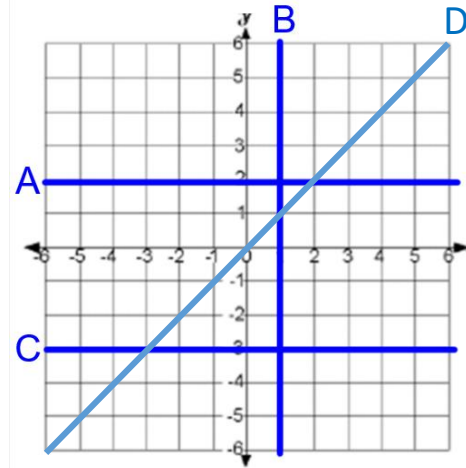|	
a + b =	5 + 2 = 7
a − b =	5 − 2 = 3
3a =	3 × 5 = 15
ab =	5 × 2 = 10
a^2 =	5^2 = 25

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.
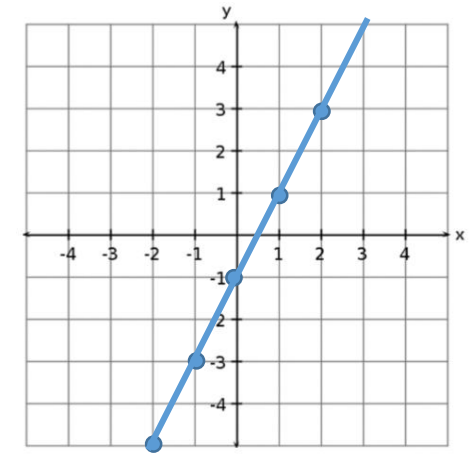**Quadratic:** A quadratic graph is curved, u or n shape.

Tip
Parallel lines have the same gradient.

M932, M544,M888

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:
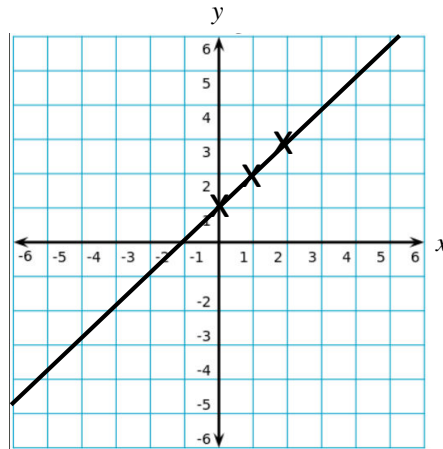$$y = mx + c$$
m is the **gradient** i.e. the steepness of the graph.
c is the **y intercept** i.e. where the graph cuts the y axis.

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

Examples

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 $y = 2x + 7$

Calculate the equation of this line:
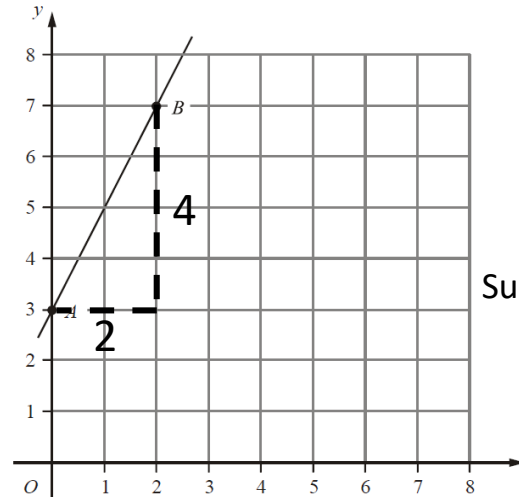
$$y = mx + c$$

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

$$= 2$$

$$y = 2x + c$$

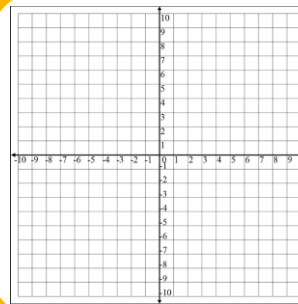Substitute in a coordinate: (2,7)

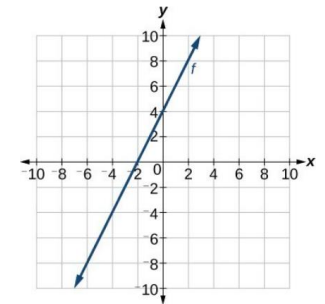$$7 = (2 \times 2) + c$$

$$3 = c$$

$$y = 2x + 3$$

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.

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   -3p
$$4p - 5 = 3$$
+5   +5
$$4p = 8$$
÷ 2   ÷ 2
$$p = 2$$

Solve:

$$5(x - 3) = 4(x + 2)$$
expand   expand
$$5x - 15 = 4x + 8$$
-4x   -4x
$$x - 15 = 8$$
+15   +15
$$x = 23$$

Rearrange to make r the subject of the formulae :

$$Q = \frac{2r - 7}{3}$$
×3   × 3
$$3Q = 2r - 7$$
+7   +7
$$3Q + 7 = 2r$$
÷ 2   ÷ 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   +2c
$$6a = 7c + 1$$
-1   -1
$$6a - 1 = 7c$$
÷ 7   ÷ 7
$$\frac{6a - 1}{7} = c$$

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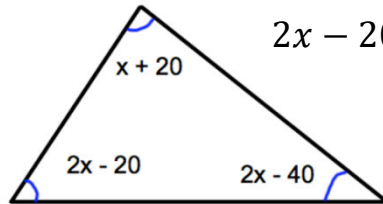
HINT: Write on all of the lengths of the sides.

$2x + 3$

x ⬜ x

$2x + 3$

We know the perimeter is 42cm
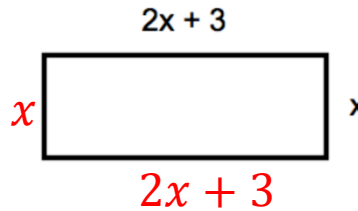
$$2x + 3 + 2x + 3 + x + x = 42$$
$$9x + 6 = 42$$
$$6x = 36$$
$$x = 6$$

Angles in a triangle sum to 180°

$x + 20$

$2x - 20$ $2x - 40$

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

Examples

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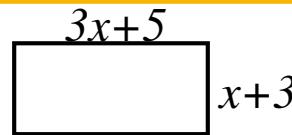The sum of their ages is 60.
Using algebra, find the age of each person.

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

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

Key Words
Solve
Term
Inverse
operation

$3x+5$
⬜ $x+3$

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