Year 8 Knowledge Organiser
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.

hegartymaths
**177-186,
280-284, 287**

For each step in solving an equation we must do the **inverse** operation

Solve:
$$5(x-3) = 20$$
Expand
$$5x - 15 = 20$$
+15   +15
$$5x = 35$$
÷5   ÷5
$$x = 7$$

Solve:
$$12 = 3x - 18$$
+18   +18
$$30$$
$$= 3x$$
÷3   ÷3
$$x = 10$$

Solve:
$$7p - 5 = 3p + 3$$
-3p   -3p
$$4p - 5 = 3$$
+5   +5
$$4p = 8$$
÷ 2   ÷ 2
$$p = 2$$

Examples

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

1) Solve $7(x + 2) = 35$
2) Solve $4x - 12 = 28$
3) Solve $4x - 12 = 2x + 20$

4) Rearrange to make x the subject:
$$y = \frac{3x + 4}{2}$$

ANSWERS: 1) $x = 3$ 2) $x = 10$ 3) $x = 16$ 4) $x = \frac{2y - 4}{3}$

Year 8 Knowledge Organiser
EXPAND AND SIMPLIFY BRACKETS

Key Concepts

Expanding brackets
Single: Where each term inside the bracket is multiplied by the term on the outside of the bracket.
Double: Where each term in the first bracket is multiplied by all terms in the second bracket.

Factorising expressions
Putting an expression back into brackets. To "factorise fully" means take out the HCF.

Difference of two squares
When two brackets are repeated with the exception of a sign change. All numbers in the original expression will be square numbers.

Examples

Linear expressions

Expand and simplify where appropriate
1)   7 (3 + a) = 21 + 7a

2)   2(5 + a) + 3(2 + a) = 10 + 2a + 6 + 3a
                                                  = 5a + 16

3) Factorise $9x + 18$ = $9(x + 2)$

4) Factorise   6e² − 3e = 3e(2e − 1)

Quadratic expressions

Expand and simplify:

1) $(p + 2)(2p − 1)$

= $2p^2 + 4p − p − 2$
= $2p^2 + 3p − 2$

2) $(p + 2)^2$

$(p + 2)\ (p + 2)$

= $p^2 + 2p + 2p + 4$
= $p^2 + 4p + 4$

Factorise:

3) $x^2 − 2x − 3$
= $(x − 3)(x + 1)$

Factorise and solve:

4) $x^2 + 4x − 5 = 0$
$(x − 1)(x + 5) = 0$
Therefore the solutions are:
Either $x − 1 = 0$
$x = 1$
Or $x + 5 = 0$
$x = −5$

Key Words
Expand
Factorise
Simplify
Product
Solve

1) **Expand and simplify** (a) 3(2 − 7f)   (b) 5(m − 2) + 6 (c) 3(4 + t) + 2(5 + t)

2) **Factorise** (a) 6m + 12t   (b) 9t − 3p   (c) 4d² − 2d

3) **Expand** (5g − 4)(2g + 1)

4) (a) **Factorise** $x^2 − 8x + 15$ (b) **Factorise and solve** $x^2 + 7x + 10 = 0$

ANSWERS: 1) (a) 6 − 21f   (b) 5m − 4   (c) 22 + 5t   2) (a) 6(m +2t) (b) 3(3t − p) (c) 2d(2d −
1)
3) $10g^2 − 3g − 4$ 4) (a) $(x − 3)(x − 5)$ (b) $x = −2$ or $x = −5$
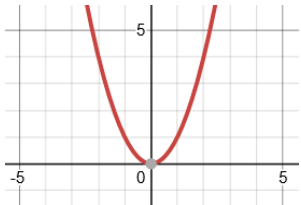
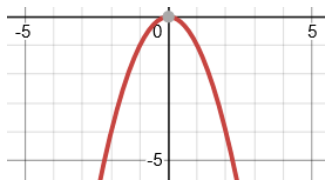# Year 8 Knowledge Organiser
QUADRATIC GRAPHS

Key Concepts

A quadratic graph will always be in the shape of a parabola.

$$y = x^2$$

$$y = -x^2$$

The roots of a quadratic graph are where the graph crosses the x axis. The roots are the solutions to the equation.

Examples

Line of symmetry $x = -1$

$$y = x^2 + 2x - 8$$

A quadratic equation can be solved from its graph.
The roots of the graph tell us the possible solutions for the equation.
There can be 1 root, 2 roots or no roots for a quadratic equation. This is dependant on how many times the graph crosses the x axis.
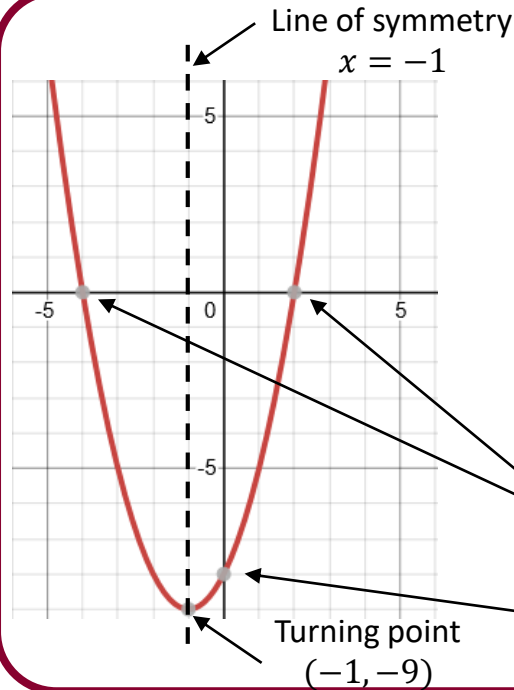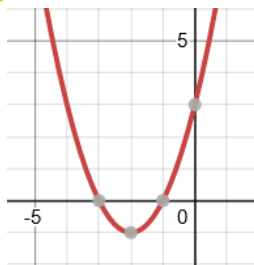
Roots $x = -4$
$x = 2$

y intercept $= -8$

Turning point $(-1, -9)$

Key Words
Quadratic
Roots
Intercept
Turning point
Line of symmetry

Identify from the graph of $y = x^2 + 4x + 3$:
1) The line of symmetry
2) The turning point
3) The y intercept
4) The two roots of the equation

ANSWERS 1) $x = -2$ 2) $(-2, -1)$ 3) 3 4) $x = -1$ and $x = -3$