

## Quadratics at GCSE

Learning Objective 1: to be able to factorise a range of quadratic expressions – including where there is a common factor of all the terms

Learning Objective 2: To recognise the difference of two squares

**Where possible**, factorise the following:

Part 1:

$x^2 + 8x + 12$	$x^2 + 5x + 6$	$x^2 + 8x + 16$
$x^2 + 12x + 20$	$x^2 + 8x + 7$	$x^2 + 6x + 10$
$x^2 + 7x + 20$	$x^2 + 10x + 25$	$x^2 + 9x + 8$

Part 2:

$x^2 + 5x - 14$	$x^2 + 3x - 10$	$x^2 + 10x - 24$
$x^2 + 4x - 5$	$x^2 - 3x - 10$	$x^2 - 8x - 20$
$x^2 + 5x - 12$	$x^2 - 6x - 27$	$x^2 + x - 2$

Part 3:

$x^2 - 16$	$x^2 - 36$	$x^2 - 100$
$x^2 - 1$	$x^2 - 20$	$5x^2 - 100$
$8x^2 - 32$	$\frac{x^2}{2} - 8$	$x^2 - 625$
$9x^2 - 25$	$16x^2 - 49$	$25x^2 - 49y^2$

Part 4:

$x^2 - 6x + 9$	$x^2 - 10x + 16$	$x^2 - 5x + 6$
$x^2 - 11x + 30$	$x^2 - 4x + 3$	$x^2 - 4x - 12$

Learning Objective 1: to solve quadratic equations by factorising – including where an initial re-arrangement is required

Learning Objective 2: to be able to sketch quadratic graphs by finding the roots, recognising and stating the line of symmetry

Solve the following equations and sketch the equivalent graph, stating the line of symmetry

Part 1:

$x^2 + 8x + 12 = 0$	$x^2 + 5x + 6 = 0$	$x^2 + 8x + 16 = 0$
$x^2 - 16 = 0$	$x^2 - 36 = 0$	$x^2 - 100 = 0$
$x^2 + 5x - 14 = 0$	$x^2 + 3x - 10 = 0$	$x^2 + 10x - 24 = 0$
$x^2 - 6x + 9 = 0$	$x^2 - 10x + 16 = 0$	$x^2 - 5x + 6 = 0$

Part 2:

$x^2 + 9x + 12 = 2x$	$x^2 + 10x + 7 = 2x$	$x^2 + 5x + 8 = 2$
$x^2 + 12x + 5 = 6x - 4$	$x^2 + 4x + 2 = 14$	$x^2 + 8x + 20 = 4$

Extended learning objective

Factorise the following

$3x^2 + 4x + 1$	$5x^2 + 6x + 1$	$7x^2 + 8x + 1$
$3x^2 + 7x + 2$	$3x^2 + 5x + 2$	$5x^2 + 16x + 3$

Try these SPECIAL CASES

$4x^2 + 36x + 9$	$25x^2 + 30x + 9$	$25x^2 + 100x + 100$
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Now try and factorise the following

$3x^2 + 2x - 1$	$5x^2 + 9x - 1$	$7x^2 - 13x - 2$
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Learning Objective 1 – to be able to complete the square

Learning Objective 2 – to use this method to find roots of quadratic equations

Learning Objective 3 – to write down the vertex of the quadratic graph

Part 1: expand the following brackets

$(x + 4)^2$	$(x + 5)^2$	$(x + 6)^2$
$(x + 1)^2$	$(x + 11)^2$	$(x + 1.5)^2$
$(x - 3)^2$	$(x - 6)^2$	$(x - 10)^2$
$(2x + 5)^2$	$(3x - 5)^2$	$(a + b)^2$

Part 2:

Write the following expressions in the form  $(x + a)^2 + b$  and write down the coordinate of the vertex of the graph

$x^2 + 8x + 20$	$x^2 + 10x + 31$	$x^2 + 12x + 40$
$x^2 + 4x + 20$	$x^2 + 10x + 2$	$x^2 + 6x + 3$
$x^2 - 6x + 50$	$x^2 - 10x + 23$	$x^2 + x + 2$

Part 3: solve the following equations (by completing the square) and hence sketch the corresponding graph indicating clearly the location of the roots and the vertex of the graph

$x^2 + 6x + 5 = 0$	$x^2 + 4x + 3 = 0$	$x^2 + 10x + 9 = 0$
$x^2 + 8x + 9 = 0$	$x^2 - 6x + 5 = 0$	$x^2 - 4x - 5 = 0$