Factorising quadratic trinomials

Year 9 Mathematics
Mainstream

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Learning Objectives

By the end of the lesson I hope that you understand and can apply the following to a range of questions from the Year 9 Mathematics course.

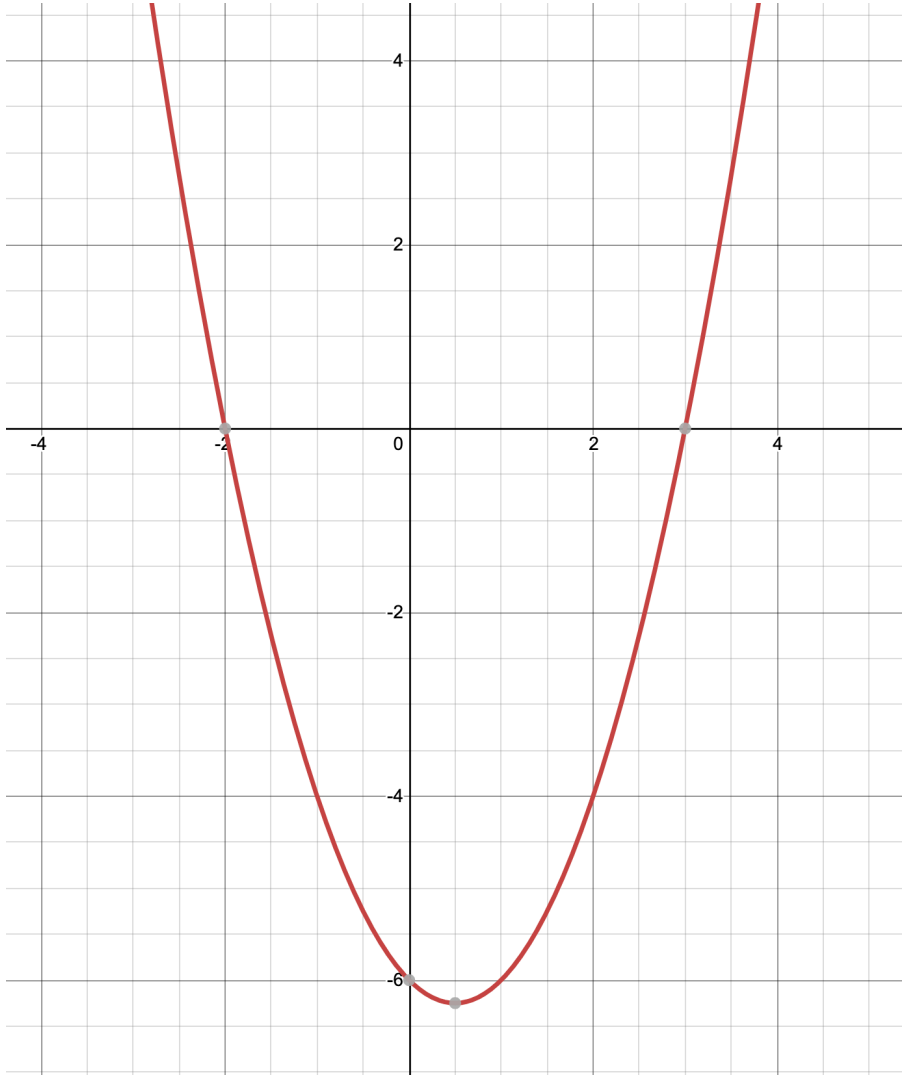
- To know the form of a quadratic trinomial
- To understand how a quadratic trinomial is formed from a binomial expansion
- To know how to find the numbers required to express a quadratic trinomial in factorised form

Recap of past learning

We are getting closer and closer to being able to use the theory of factorisation to be able to sketch quadratic graphs.

A quadratic graph is one where the highest floaty number in an expression (or equation) is a 2.

Quadratics can look lots of different ways, but once we know the general form, we can factorise it and find out lots of very important and useful information.



$(x+2)(x-3)$

Factorising by grouping

You have already met this in a previous exercise! So this isn't going to be anything new.

5 Factorise the following which involve a binomial common factor.

a $4(x+3)+x(x+3)$	**b** $3(x+1)+x(x+1)$	**c** $7(m-3)+m(m-3)$
d $x(x-7)+2(x-7)$	**e** $8(a+4)-a(a+4)$	**f** $5(x+1)-x(x+1)$
g $y(y+3)-2(y+3)$	**h** $a(x+2)-x(x+2)$	**i** $t(2t+5)+3(2t+5)$
j $m(5m-2)+4(5m-2)$	**k** $y(4y-1)-(4y-1)$	**l** $(7-3x)+x(7-3x)$

We are going to learn how to go from 3 terms to factorise once and then factorise again.
Factorising by grouping just means you factorise twice.

$(5m-2)(m+4)$

3 things can't be factorised very nicely

We have seen that quadratics can be expressed using three terms:

$$x^2 + 5x + 6$$
$$x^2 - 2x - 15$$
$$x^2 - x - 6$$

We find it really hard to factorise when there are three terms.

It's much easier when there are 4 terms!

When we see four terms we first check to see if we can **factorise by grouping.**

Note: DOPS quadratics will have two terms and it is for you to ensure you know how to identify a DOPS.

Most of the the tricks of being able to factorise quadratics come from identifying the type of quadratic. This then lets you identify which method to use.

The T-method

There is a wonderful way of turning three into four which I learned at school.

It is called the **T-Method**.

There is a reason it works (and I will explain why in another lesson), but for now, the best way to show how this works is to use lots of worked examples.

Example

Factorise the following quadratic expressions

$x^2 + 7x + 10$

$x^2 + 7x + 10$

$x^2 + 2x + 5x + 10$

$= x(x + 2) + 5(x + 2)$

$= (x + 2)(x + 5)$

	$+10$	
1		10
$+2$		$+5$
5		2

$+2 + 5 = +7$

$10 \quad 1$

Example

Factorise the following quadratic expressions

$x^2 + 2x - 8$

$x^2 + 2x - 8$

$= x^2 - 2x + 4x - 8$

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

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

-8	
-1	8
-2	4
-4	2
-8	1

Example

Factorise the following quadratic expressions

$x^2 - 7x + 10$

$x^2 - 7x + 10$

$= x^2 - 2x - 5x + 10$

$= x(x-2) - 5(x-2)$

$= (x-2)(x-5)$

-1	-10
-2	-5
-5	-2
-10	-1

Example

Factorise the following quadratic expressions

$x^2 + 9x + 14$

$x^2 + 9x + 14$

$= x^2 + 2x + 7x + 14$

$= x(x + 2) + 7(x + 2)$

$= (x + 2)(x + 7)$

$+14$	
1	14
2	7
7	2
14	1

Example

Factorise the quadratic expression below:

$2x^2 - 2x - 12$

$2x^2 - 2x - 12$

$= 2(x^2 - x - 6)$

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

-24

⋮	⋮

$1x^2 - x - 6$

$x^2 - 3x + 2x - 6$

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

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

-6

-1	6
-2	3
-3	2
-6	1

Example

Factorise the quadratic expression below:

$3x^2 - 6x - 45$

$3(x^2 - 2x - 15)$

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

$x^2 - 2x - 15$

$= x^2 - 5x + 3x - 15$

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

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

	−15
−1	15
−3	5
−5	3
−15	1

Example

Find the missing term in the following trinomial. There may be more than one answer!

$x^2 + ?? + 5$

$x^2 + 6x + 5$

5		
1	5	6
5	1	6

Questions to complete

The following work is the **minimum** you are expected to complete in class and at home.

You are welcome to answer more questions if you feel you have the time.

Exercise 8F
Questions: 2adg, 3adg, 4adg, 5adg, 6behk, 7bdfg, 9adg

Extension: 10