Factorising by grouping

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.

- Understand why we might want to factorise an expression by using grouping.
- Understand how to factorise by grouping

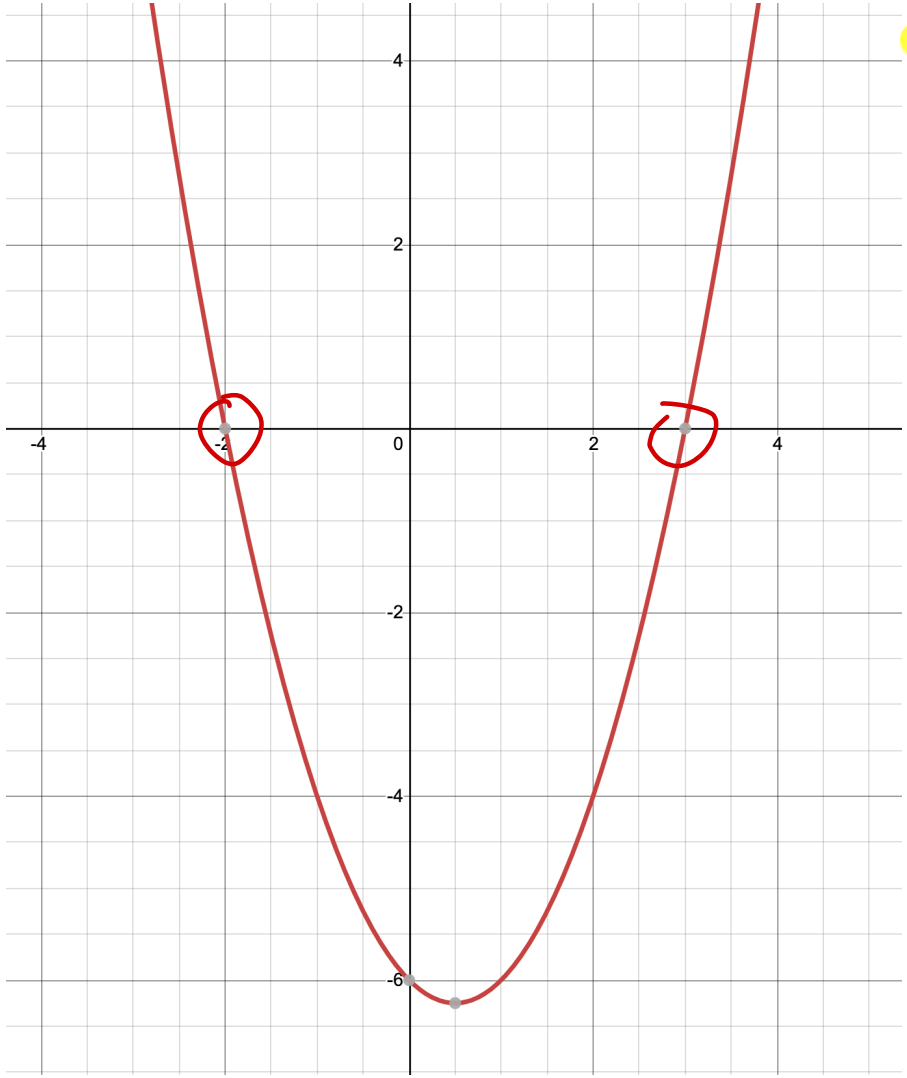
Recap of past learning

In a previous lesson we have looked at the basic ideas behind why we factorise quadratics.

We know that a quadratic looks has the general form shown in the diagram.

We can see that, when it is factorised in a certain way, we can link the factorised form with the crossing points on the x-axis.

Note: The values in the brackets are always the opposite sign to the crossing points (**more on that in another lesson**).



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

x^2

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.**

$x^2 + 5x + 6$

$x^2 \_\_\_\_ \_\_\_\_ + 6$

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.

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 4 terms to make factorise once and then factorise again.
Factorising by grouping just means you factorise twice.

$$\frac{4(x+3)}{(x+3)_1} + \frac{x(x+3)}{(x+3)_1}$$

$$= (x+3)(4+x)$$

Factorise and factorise again

Factorising by grouping is simply factorising twice.

Remember: When you factorise you are moving outside of a set of bracket the highest common factor (in this case between two terms**).**

Let's look at some examples

Example

Use the method of grouping to factorise the expression below:

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

$= x^2 + 2x + 3x + 6$

$= x(x + 2) + 3(x + 2)$ F.

$= (x + 2)(x + 3)$ F.

Example

Use the method of grouping to factorise the expression below:

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

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

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

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

Example: Harder … but not really!

Use the method of grouping to factorise the expression below:

$$3ab + 5bc + 3ad + 5cd$$

$3ab + 5bc + 3ad + 5cd$

$= b(3a + 5c) + d(3a + 5c)$ F.

$= (3a + 5c)(b + d)$ F.

$=$

Example: Trying to trick you!

Maths is about testing you understand. To factorise, you need to have two terms together which can factorise nicely.

You also need to check that you will get something which will factorise **twice**.

$2x^2 - 7 - 14x + x$

x^2 ___ x ___ x ___ num

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

$= 2x(x - 7) + 1(x - 7)$ F

$= (x - 7)(2x + 1)$ F.

=

Example: You can have 6 terms too

So long as there is an even number of terms, and you can factorise twice, there is nothing stopping you from having six terms.

Here is a great example:

$$3(a-4)-x(a-4)-y(a-4)$$

$$= (a-4)(3-x-y)$$

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 8E
Questions: 2adgj, 3ace, 4, 5adg, 6, 7, 10aceg

Extension: None