

## Factorising Quadratics ( $a = 1$ )

### Starter

1. **(Review of last lesson)**  
Factorise these expressions: (a)  $x^2 + 5x + 3x + 15$  (b)  $3x^2 - 6x + 8x - 16$
2. Find two whole numbers that:
  - (a) multiply to give 15 and add to give 8
  - (b) multiply to give  $-12$  and add to give  $-4$

### Notes

Factorising means putting an expression into brackets. We use **factorising by grouping** to help us to factorise quadratic expressions of the form  $ax^2 + bx + c$ . The answer is usually two brackets multiplied together e.g.  $(x - 4)(x + 2)$ .

There are 2 stages to the process:

1. "2 numbers that..."
2. Factorising by grouping

### Success criteria – factorising quadratics

1. **Multiply** the coefficient of  $x^2$  by the constant term
2. **Find two numbers** that **multiply** to get the number from 1. and **add** to get the coefficient of  $x$
3. **Separate into two terms** the  $x$  term using the 2 numbers you found in 2.
4. **Factorise** the expression **by grouping**

**N.B.** After the first step of factorising by grouping, the **brackets must be the same**

**E.g. 1** Factorise  $x^2 + 8x + 15$ .

**Working:**  $1 \times 15 = 15 \quad \Rightarrow \quad$  Multiply:  $15 = 5 \times 3$   
 Add:  $8 = 5 + 3$   
**Split  $8x$  into  $5x + 3x$ :**  $x^2 + 8x + 15 = x^2 + 5x + 3x + 15$   
**Factorise by grouping (same brackets):**  $= x(x + 5) + 3(x + 5)$   
 $= (x + 5)(x + 3)$

**N.B.**  $8x$  could also be split into  $3x + 5x$ .

**E.g. 2** Factorise  $a^2 + 10a + 16$ .

**E.g. 3** Factorise  $x^2 + 2x - 8$ .

**Working:**  $1 \times -8 = -8 \quad \Rightarrow \quad$  Multiply:  $-8 = -2 \times 4$   
 Add:  $2 = -2 + 4$   
**Split  $2x$  into  $-2x + 4x$ :**  $x^2 + 2x - 8 = x^2 - 2x + 4x - 8$   
**Factorise by grouping (same brackets):**  $= x(x - 2) + 4(x - 2)$   
 $= (x - 2)(x + 4)$

**N.B.**  $2x$  could also be split into  $4x - 2x$ .

**E.g. 4** Factorise  $x^2 - 7x + 10$ .

**E.g. 5** Factorise  $p^2 + 3p - 18$ .

If a factor can be taken out of the initial expression, do that at the beginning.

**E.g. 6** Factorise  $2z^2 + 16z + 24$ .

**Working:**  $2z^2 + 16z + 24 = 2(z^2 + 8z + 12)$   
Now factorise  $z^2 + 8z + 12$ :  
 $1 \times 12 = 12 \quad \Rightarrow \quad$  Multiply:  $12 = 6 \times 2$   
Add:  $8 = 6 + 2$   
**Split  $8z$  into  $6z + 2z$ :**  $z^2 + 8z + 12 = z^2 + 6z + 2z + 12$   
**Factorise by grouping (same brackets):**  $= z(z + 6) + 2(z + 6)$   
 $= (z + 6)(z + 2)$   
 $\therefore 2z^2 + 16z + 24 = 2(z + 6)(z + 2)$   
**N.B.**  $8z$  could also be split into  $2z + 6z$ .

**E.g. 7** Factorise  $2x^2 - 4x - 30$ .

**Video:** [Factorising quadratics \(a = 1\)](#)

[Solutions to Starter and E.g.s](#)

### Exercise

9-1 class textbook: p109 M4.8 Qu 1-30 (odd), 31, 32, 33-45 (odd)  
A\*-G class textbook: p98 M4.7 Qu 1-30 (odd), 31, 32, 33-41 (odd)  
9-1 homework book: p39 M4.8 Qu 1-23  
A\*-G homework book: p28 M4.7 Qu 1-20

### Summary

Factorising quadratics

1. **Multiply** the coefficient of  $x^2$  by the constant term
2. **Find two numbers** that **multiply** to get the number from 1. and **add** to get the coefficient of  $x$
3. **Separate into two terms** the  $x$  term using the 2 numbers you found in 2.
4. **Factorise** the expression **by grouping** (make sure the **brackets are the same**)

[Homework book answers \(only available during a lockdown\)](#)