

Factorising Expressions

'Factorising' means re-writing the expression using brackets. It is the opposite operation to expanding brackets or 'multiplying out' brackets.

Check first that you can expand single brackets and double brackets (using any appropriate method, such as using a grid or 'FOIL' for double brackets) e.g.

- 1) $5(x - 3) = 5x - 15$
- 2) $4x(x - 7) = 4x^2 - 28$
- 3) $(x + 1)(x - 6) = x^2 - 6x + x - 6$
 $= x^2 - 5x - 6$

Factorising by finding the highest common factor

When every term in an expression has a common factor it is possible to factorise the expression by placing the highest common factor outside of the brackets. This is the largest number or letter (or both) that divides exactly into every term of the expression. There are many methods to factorise, only one of which is given here e.g.

1

Factorise $6x+18$

1,2,3 and 6 are all numbers that divide into both terms but 6 is the highest common factor therefore this is placed outside of the brackets.

$$6(\quad)$$

To complete the brackets we must find the terms that multiply with 6 to give $6x$ ($6 \times x$) and to give $+18$ (6×3)

$$\text{Therefore } 6x + 18 = 6(x + 3)$$

2

Factorise $8x^2-12x$

1,2 and 4 are all numbers that divide into both terms in the expression, with 4 being the largest. Both terms are also divisible by x therefore $4x$ is the highest common factor of $8x^2$ and $-12x$ so this is the term placed outside of the brackets.

$$4x(\quad)$$

To complete the brackets we must find the terms that multiply with $4x$ to give $8x^2$ ($4x \times 2x$) and $-12x$ ($4x \times -3$)

$$\text{Therefore } 8x^2 - 12x = 4x(2x - 3)$$

3

Factorise $6a^2b + 15ac^2$

1 and 3 are the numbers that divide into both terms in the expression, with 3 being the largest. Both terms are also divisible by a therefore $3a$ is the highest common factor and this is the term placed outside of the brackets.

$$3a(\quad)$$

To complete the brackets we must find the terms that multiply with $3a$ to give $6a^2b$ ($3a \times 2ab$) and $+15ac^2$ ($3a \times 5c^2$)

$$\text{Therefore } 6a^2b + 15ac^2 = 3a(2ab + 5c^2)$$

Factorising quadratic expressions

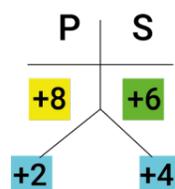
A quadratic expression can take the form $x^2 + ax + b$. There are many possible methods to factorise a quadratic expression, only one of which is given here. e.g.

Remember you can check that you have factorised correctly by expanding the brackets!

1

Factorise $x^2 + 6x + 8$.

Here you need two numbers with a product of $+8$ and a sum of $+6$.



(If you can't find the numbers immediately, try listing factor pairs of $+8$, namely 1×8 , -1×-8 , 2×4 , -2×-4)

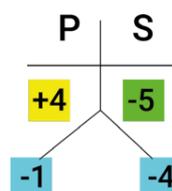
Place the two numbers in brackets like this

$$(x + 2)(x + 4) \quad \text{or} \quad (x + 4)(x + 2)$$

2

Factorise $x^2 - 5x + 4$

Here you need two numbers with a product of $+4$ and a sum of -5 .



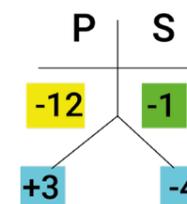
Place the two numbers in brackets like this

$$(x - 1)(x - 4) \quad \text{or} \quad (x - 4)(x - 1)$$

3

Factorise $x^2 - x - 12$

Here you need two numbers with a product of -12 and a sum of -1 .



Place the two numbers in brackets like this

$$(x - 4)(x + 3) \quad \text{or} \quad (x + 3)(x - 4)$$

Questions to ask yourself when factorising

Do the terms in the expression have a common factor?

Can the expression be factorised into two brackets?