Factorising into Single Brackets

Prior Knowledge:

- Using algebraic vocabulary.
- Calculating factors and highest common factors.
- Expanding brackets.

Factorising is the **inverse (opposite)** of multiplying out / expanding brackets. You have to look for **common factors** – numbers or letters (or both) that go into **every term**.

Example 1:

Fully factorise $10x + 15$.

Step 1.

Find the **highest common factor** for the expression. In this case, it is 5, because 5 is the highest number which will divide into both $10x$ and 15. Be careful - if you choose a common factor which is not the **highest** common factor, your final answer will not be fully factorised.

Step 2.

Write the **highest common factor** outside of the bracket:

5( )

Step 3.

Now, find the terms which go inside the bracket. To do this, divide each term in the original expression by the term outside the brackets (remember, we multiply to expand brackets and divide to factorise).

$10x \div 5 = 2x$

$15 \div 5 = 3$

The final answer is **$5(2x + 3)$**.

Step 4.

Always check your answer by multiplying out the bracket to see if it matches the original expression:

$5 \times 2x = 10x$

$5 \times 3 = 15$

This gives us $10x + 15$, therefore $5(2x + 3)$ is correct.

Sometimes the **highest common factor** may include a number and a letter.

Example 2:

Factorise $6x^2 - 9xy$

Step 1.

3 is the highest common factor of 6 and 9, and x is common to both x^2 and xy. Combine these to get the term outside the brackets: $3x$.

Step 2.

Place the common factor on the outside of the bracket.

$3x(\quad)$

Step 3.

Divide each term in the original expression by $3x$ to find the terms inside the bracket (watch out for the second term – as it is negative):

$6x^2 \div 3x = 2x$

$-9xy \div 3x = -3y$

Put these into the brackets to get the final answer:

$3x(2x - 3y)$

Step 4.

Expand the bracket to check your answer.

$3x \times 2x = 6x^2$

$3x \times -3y = -9xy$

This gives us $6x^2 - 9xy$, therefore the answer is correct.

Your Turn

1. Write the highest common factor of the two terms in each expression:

   a. $2x + 6$ _____

   b. $8x + 6$ _____

   c. $5x - 10$ _____

   d. $4x + 16$ _____

   e. $3x^2 + 9x$ _____

2. Fill in the gaps:

   a. $7x + 28 =$ _____$(x + 4)$

   b. $12x + 18 = 6($_____$ + 3)$

   c. $15x - 10 = 5(3x$ _____$)$

   d. $24x + 18 =$ _____$(4x + 3)$

   e. $14x - 21 = 7($_____$)$

   f. $6x + 4 =$ _____(_____)

3. Fully factorise each expression:

   a. $10x + 5$ _____

   b. $2x - 8$ _____

   c. $5m - 25$ _____

   d. $6x + 3$ _____

   e. $10t + 30$ _____

   f. $7a - 14$ _____

   g. $3y + 12$ _____

   h. $8z - 10$ _____

4. Fully factorise each of the following expressions.
   Hint: look for two common factors.

   a. $2x^2 + 6x$ _____

   b. $2y^2 - 8y$ _____

   c. $9x^2 + 3xy$ _____

   d. $4ab - 6bc$ _____

   e. $4q^2 - 8pq$ _____

   f. $2y^3 + 4y$ _____

5. Each of the expressions below have been fully factorised. Some are correct and some are not. For each question, say whether it is correct. If it is wrong, explain what mistake has been made and correct it.

   a. $5x^2 + 10x = 5x(x + 2)$

   b. $24x + 36 = 6(4x + 6)$

   c. $7x^2 - 14xy = 7x(x + 2y)$

   d. $2xy - 4y = 2y(x - 4y)$

   e. $18x + 3 = 3(1 + 6x)$

Challenge

Explain why $8x + 3y$ cannot be factorised.