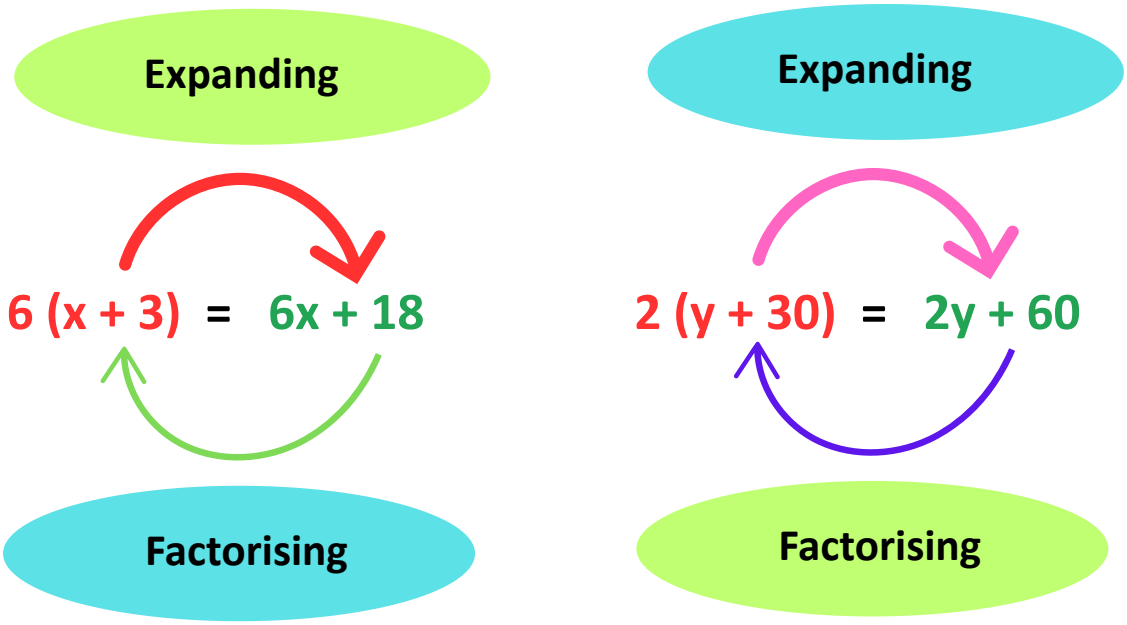
# Expanding and Factorising - GCSE Maths

## Contents



## 1. Introduction

- **Expanding:** Simplifying the expression or equation by eliminating the brackets present. Multiplying the number outside the brackets with numbers inside.
- **Factorising:** Writing the simplified equation in a brief form means using brackets.



# Expanding and Factorising - GCSE Maths

## 2. Expansion and Factorisation in detail

### Expansion

**Example:** $2(3x + 5) + 7x$

- **Step#1:** Identify the paranthesis in expression -
- **Step#2:** Apply the distributive property, multiply the term outside the paranthesis by the term inside -

$$(2 \times 3x) + (2 \times 5) + 7x$$

$$6x + 10 + 7x$$

- **Step#3:** Combine the terms with same variable if any -

$$13x + 10$$

### Factorisation

**Example:** $5x + 10 + 3y + 9$

- **Step#1:** Find the common factors -

$5x = 5 \times x$
$10 = 5 \times 2$ } **Common Factor = 2**

$3y = 3 \times y$
$9 = 3 \times 3$ } **Common Factor = 3**

- **Step#2:** Combine the terms having common factors-

$$5(x + 2) + 3(y + 3)$$

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- Expand the following algebric equations -

  These are also used as general formulae.

**(1)**

$$(a + b)^2$$
$$(a + b)(a + b)$$
$$(a \times a) + (a \times b) + (b \times a) + (b \times b)$$
$$a^2 + ab + ab - b^2$$
$$a^2 + 2ab + b^2$$
$$(a + b)^2 = a^2 + 2ab + b^2$$

**(2)**

$$(a - b)^2$$
$$(a - b)(a - b)$$
$$(a \times a) + (a \times -b) + (-b \times a) + (-b \times -b)$$
$$a^2 - ab - ab - b^2$$
$$a^2 - 2ab - b^2$$
$$(a + b)^2 = a^2 - 2ab - b^2$$

**(3)** **Difference of Squares Property**

$$(a + b)(a - b)$$
$$(a \times a) + (a \times -b) + (b \times a) + (b \times -b)$$
$$a^2 - ab + ab - b^2$$
$$a^2 - b^2$$
$$(a + b)(a - b) = a^2 - b^2$$

## 4. Reasoning Problems

**Example:** Represent the multiplication of three consecutive integers in algebric form. Write the equation by expanding it further.

**Solution:** Suppose x is an integer -


$x(x+1)(x+2) = 0$

$x(x^2 + 2x + x + 2) = 0$

$x^3 + 2x^2 + x^2 + 2x = 0$

$x^3 + 3x^2 + 2x = 0$

Expansion

**Example:** What will be the total price of 2 sets of 5 toffees and 6 chocolates if the price individually is represented by variables?

**Solution:** Suppose the price of one toffees is x and that of one chocolate is y, then the total price will be -

$2(5x + 6y)$


$(2 \times 5x) + (2 \times 6y)$

$10x + 12y$ (Expansion)

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**Example:** Suppose that there are total 5 baskets of Apples and 6 baskets of Bananas. If Bananas are 15 more than Apples, represent them in algebric form in both the expanded and factorised forms.

**Solution:** If there are **x** number of apples in one basket then bananas will be **x + 15**, And we can represent the total number of Apples and Bananas in all the baskets as follows:

$5x + 6(x + 15)$ **Factorisation**

$5x + 6x + 90$

$11x + 90$ **Expansion**

**Example:** Suppose a person owns **x** no. of cows and horses 10 more than cows. similarly another person owns the **y** no. of cows and horses which are 15 more than the cows he owns. Then represent the total number of cows and horses these two persons own.

**Solution:** It can be represented as-

$x + (x + 10) + y + (y + 15)$ **Factorisation**

$2x + 10 + 2y + 15$

$2x + 2y + 25$ **Expansion**