

# SIMPLIFYING ALGEBRAIC EXPRESSIONS

Note Title

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## Adding and Subtracting Terms

If terms are written with the same letter we can add or subtract:

$$\textcircled{1} \quad 7x + 4x = 11x$$

$$\textcircled{2} \quad 13x - 4x = 9x$$

$$\textcircled{3} \quad 8x - x = 7x$$

( $x$  is the same as  $1x$ )

$$\textcircled{4} \quad 7x - 10x = -3x$$

$$\textcircled{5} \quad -4x - 3x = -7x$$

We cannot simplify a sum or difference of terms with different letters.

$$\textcircled{6} \quad 7x + 3y \quad \text{cannot be simplified.}$$

$$\textcircled{7} \quad 7x + 3y + 2x + 5y = 9x + 8y$$

$$\textcircled{8} \quad \underline{8x} + \underline{2y} - \underline{3x} + \underline{4y} = 5x + 6y$$

Note that the sign on the left of a term belongs to the term.

e.g. the third term in  $\textcircled{8}$  is " $-3x$ "

$$\textcircled{9} \quad \underline{4x} + \underline{7y} + \underline{x} - \underline{2y} = 5x + 5y$$

$$\textcircled{10} \quad \underline{8x} - \underline{3y} - \underline{x} - \underline{2y} = 7x - 5y$$

# Multiplying Terms

We CAN multiply together different letters into one term, simply by writing them next to each other

## Examples

$$\textcircled{1} \quad x \times y = xy$$

$$\textcircled{2} \quad 3x \times 5y = 3 \times x \times 5 \times y \\ = 15xy$$

To multiply terms with the same letter, we use indices.

$$\textcircled{3} \quad x \times x = x^2$$

$$\textcircled{4} \quad 3x \times 5x = 3 \times x \times 5 \times x \\ = 15x^2$$

$$\textcircled{5} \quad x^3 \times x^4 = (x \times x \times x) \times (x \times x \times x \times x) \\ = x^7$$

Note that to multiply powers of the same letter, we can ADD the indices.

$$\textcircled{6} \quad y^2 \times y^7 = y^9$$

$$\textcircled{7} \quad 3y^4 \times 4y^3 = 3 \times y^4 \times 4 \times y^3 = 12y^7$$

$$\textcircled{8} \quad 5x^2y^3 \times 2xy^2 \times y^5 \\ = 5 \times x^2 \times y^3 \times 2 \times x^1 \times y^2 \times y^5 \\ = 10x^3y^{10}$$

↖ (x = x<sup>1</sup>)

# Multiplying Brackets

If we have an expression like

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

this means that the  $3x$  has to multiply the expression in the bracket ie, multiply each term in the bracket.

$$\textcircled{1} \quad 3x(2x + 5y) = 6x^2 + 15xy$$

$$\textcircled{2} \quad 7(3x - 4y) = 21x - 28y$$

$$\textcircled{3} \quad -3(2x - 5y) = -6x + 15y$$

$$\textcircled{4} \quad 5(2x + 3y) + 3(4x - 3y)$$

$$= 10x + 15y + 12x - 9y$$

$$= 22x + 6y$$

$$\textcircled{5} \quad 3x(2x - 5y) - 2y(3x - 4y)$$

$$= 6x^2 - 15xy - 6xy + 8y^2$$

$$= 6x^2 - 21xy + 8y^2$$

$$\textcircled{6} \quad 3(5a - 4b) - 2(7a - 5b)$$

$$= 15a - 12b - 14a + 10b$$

$$= a - 2b$$

# Factorising

In algebra, this means writing an expression using brackets.

## Examples

①  $12x - 21y$

What number goes into 12 and 21?  
3

$$3(4x - 7y)$$

②  $16a + 24b = 8(2a + 3b)$

look for the BIGGEST number you can put here.

③  $x^3 - 2x^2 + 7x = x(x^2 - 2x + 7)$

$x$  appears in every term so we can put it outside the bracket

④  $12x^3 - 20x^2 = 4x^2(3x - 5)$

Both terms contain  $x^2$  because  $x^3 = x^2 \times x$

⑤  $15x^3y^2z - 25xy^3z^2 + 5xy^2 = 5xy^2(3x^2z - 5yz^2 + 1)$