

Simplifying algebraic expressions

Year 9 Mathematics
Mainstream

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Learning Objectives

By the end of the lesson I hope that you understand and can apply the following to a range of questions from the Year 9 Mathematics course.

- To review the conventions and processes for multiplication and division of algebraic terms
- To understand what is meant by like terms and that only like terms can be collected under addition and subtraction
- To be able to simplify algebraic expressions using addition and subtraction



Recap of past learning

This is the second lesson in the series on Linear and Simultaneous equations.

In the last lesson we looked at the basics of algebra and how the language is really important. We continue in this lesson by looking at how we can manipulate terms.



Like terms

Like terms have **exactly the same pronumerals**. The can have different coefficients but they have to be exactly the same otherwise.

The following are like terms:

$$5x \text{ and } 7x$$

$$3a^2 \text{ and } -5a^2$$

$$3ab^2 \text{ and } 10b^2a$$

a^2

ab^2 b^2a

Notice that the letters do not have to be in the same order.

In general we would always write the pronumerals in alphabetical order.



Collecting like terms

Like we add numbers together (as they are like terms!), we can add like terms together.

So, using the previous examples we see:

$$5x + 7x = 12x$$

$$3a^2 - 5a^2 = -2a^2$$

$$3ab^2 + 10b^2a = 13ab^2$$

$3ab^2 + 10ab^2 = 13ab^2$



Unlike terms

We need to be careful and recognise terms which are **not** alike.

$$5x \text{ and } 7x^2$$

$$3a^2 \text{ and } -5a^3$$

$$3ab^2 \text{ and } 10ba^2$$



Maths is a big fat trick

Maths isn't hard .. I promise … but Barry is employed to try and make it sound complicated.

For example:

We don't normally write the times sign between coefficients and pronumerals:

$$3x = 3 \times x$$

Likewise, we normally don't write the division sign, or if we do, we are trying to trick you!

$$3 \div x = \frac{3}{x}$$

$\frac{3}{x}$ $\frac{\bullet}{\bullet}$



Common factors can be cancelled in fractions

Cancelling down fractions is really important and is also a pretty big section of the course which will come up over and over again.

You ask yourself the following questions when cancelling down:

- Do all the terms have a number which can be cancelled down
- Do all the terms have one (or more) letters which are common

The best way to learn this is through example!

$\frac{1}{1} = 1$ $\frac{2}{2} = 1$ $\frac{10}{10} = 1$

$\frac{a}{a} = 1$ $\frac{b}{b} = 1$ $\frac{x}{x} = 1$



Examples: Cancelling down fractions

Simplify the following.

$$\frac{6ab}{8b}$$

$$12a^2b \div (3ab)$$

$$\frac{\cancel{6}^{3}ab}{\cancel{8}^{4}b} = \frac{3 \times a \times b}{4 \times b}$$

$$= \frac{3}{4} \times \frac{a}{1} \times \frac{\cancel{b}^{1}}{\cancel{b}_{1}}$$

$$= \frac{3a}{4}$$

$\frac{1}{2}$ $\frac{\cancel{2}^{1}}{\cancel{4}_{2}}$



Examples: Cancelling down fractions

Simplify the following.

$$\frac{6ab}{8b}$$

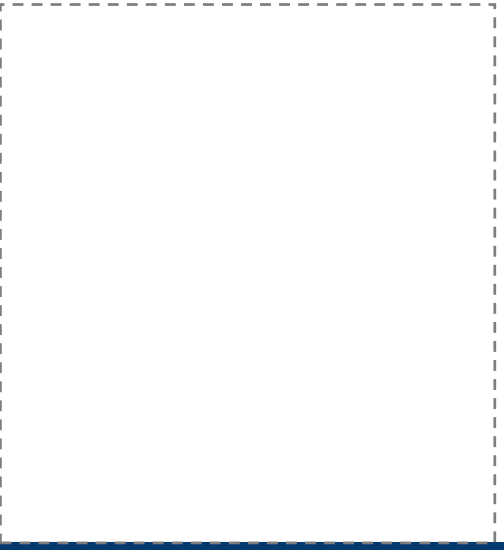
$$12a^2b \div (3ab)$$

Question:
Why is the second term in brackets?
Why did they put the division sign in?

$$\frac{12a^2b}{3ab} = \frac{12aab}{3ab}$$

$$= \frac{\overset{4}{\cancel{12}}}{\cancel{3}_1} \times \frac{\overset{1}{\cancel{a}}}{\cancel{a}_1} \times \frac{a}{1} \times \frac{\overset{1}{\cancel{b}}}{\cancel{b}_1}$$

$$= \frac{4a}{1} = 4a$$





Example: Multiplying algebraic terms

Simplify the following.

$3 \times 2b$

$3 \times 2 \times b$

$= 6 \times b$

$= 6b$

$-2a \times 3ab$

$-2 \times a \times 3 \times a \times b$

$= -2 \times 3 \times a \times a \times b$

$= -6a^2b$

$1 \times 2 \times 3$

$2 \times 3 \times 1$

$3 \times 2 \times 1$



Example: Collecting like terms

Simplify the following by collecting like terms.

$3x + 4 - 2x$ $= 1x + 4 = x + 4$

$3x + 2y + 4x + 7y$ $= 7x + 9y$

$8ab^2 - 9ab - ab^2 + 3ba$ $= 7ab^2 - 6ab$



Questions to complete

The following work is the **minimum** you are expected to complete in class and at home.

You are welcome to answer more questions if you feel you have the time.

Exercise 2B
Questions: 2aceg, 3, 4, 5adgj, 6adgj, 8, 9acegi, 10, 11, 14

