

Expanding 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.

- Understand how to expand brackets
- Be able to expand brackets
- Know how to expand brackets first before collecting like terms when being asked to simplify algebraic expression



Recap of past learning

Year 9 is full to the brim of topics which relate to algebra. The reason is that algebra becomes more and more important as we head through this year and into the next three.

We have spent the last two lessons looking at understanding the language of algebra as well as how to collect like terms and cancel down fractions.

Being able to “expand” algebraic expressions is really important.

$$x + 4$$



Another way of multiplying two numbers

If I asked you to do 5×23 we might do short multiplication.

$$\begin{array}{r} 23 \\ \times 5 \\ \hline 115 \\ | \end{array}$$

$$\begin{array}{r} 5 \times 3 = 15 \\ 5 \times 20 = \underline{100} \end{array}$$

This would certainly provide an answer, but is there another way about thinking about the question?

What about $5(20 + 3)$ this is really what we were doing in the example above.

So, it seems like we can multiply everything inside the bracket by the number outside?

$$5 \times 3 + 5 \times 20$$

$$5(3 + 20)$$

$$5(23)$$



The distributive law

The method shown before uses the **distributive law** which basically means that we can multiply everything inside of a set of brackets by what is outside.

Note: We must be very careful with signs.

$$\begin{aligned} & 6 \times 24 \\ &= 6(20 + 4) \\ &= 6 \times 20 + 6 \times 4 \\ &= (20 + 48) \\ &= \underline{\underline{168}} \end{aligned}$$

$$\begin{aligned} & 2(x + 4) \\ &= 2x + \underline{\underline{8}} \\ & 3(b - 5) \\ &= \underline{\underline{3b - 15}} \end{aligned}$$



Example

Expand the following:

$$\begin{aligned}3(x + 4) \\ 5(x - 11) \\ -2(x - 5)\end{aligned}$$

$$3(x + 4)$$

$$= 3x + 12$$

=

$$-2(x - 5)$$

$$= -2x + 10$$

==

$$5(x - 11)$$

$$= 5x - 55$$

$3 \times x$

$-2 \times x$



Example

Expand the following:

$$4(x + 3y) \\ -2x(4x - 3)$$

$$4(x + 3y) \\ = 4x \underline{\underline{+}} 12y \\ - 2x(4x - 3) \\ - 8x^2 \underline{\underline{+}} 6x$$

$$4 \times 3y \\ = 4 \times 3 \times y \\ - 2x \times 4x \\ - 2 \times x \times 4 \times x \\ - 2 \times 4 \times x \times x \\ - 2x \times -3 \\ - 2 \times -3 \times x$$



Example

Expand the following and collect like terms.

$$2 - 3(x - 4)$$

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

$$2(x + 3) + 3(x + 2)$$

$$-2(2x - 4) - 3(3x + 5)$$

$$2 - 3x + 12 = -3x + 14$$

$$3x + 6y - 3x - y = 5y$$

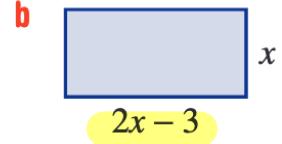
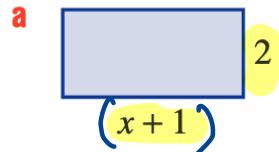
$$2x + 6 + 3x + 6 = 5x + 12$$

$$-4x + 8 - 9x - 15 = -13x - 7$$



Example

Find the area of the following shape:



$$2(x+1) = 2\underline{x} + 2$$

$$x \times 2x$$

$$= x \times 2 \times x$$

$$= 2 \times x \times x$$

$$= 2 \times x^2$$

$$= 2x^2$$

$$x(2x-3) = 2x^2 \underline{-} 3x$$



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 2C

Questions: 2aceg, 3bdfh, 4acegik, 5acegik, 6acegik, 7, 8cde, 11

