



Expanding and simplifying Polynomials

Year 10 Mathematics

www.maffsguru.com

Learning Objectives

By the end of the lesson, I would hope that you have an understanding and be able to apply to questions the following concepts:

- To be able to apply the rules of expanding brackets to multiply polynomials
- To understand that multiplying polynomials results in a polynomial of higher degree



Recap of past learning

In the last lesson we learned what a polynomial was. To be fair, there wasn't much learning needed as we have been dealing with these throughout the whole of this book. But it's nice to know that there are things such as cubics and quartics etc. An example is shown below.

It's going to be important to be able to expand and simplify polynomials for all the work which is to come. Not all questions are going to give us a polynomial in expanded form!

This polynomial has degree 8

Leading term

Coefficient

$$3x^8 - 4x^5 + x - 3$$

Pronumeral

Constant



Expanding brackets (again!)

I can feel you shuddering now! But expanding brackets is really important.

In previous lessons we have used the acronym FOIL which stood for First, Outside, Inside and Last. Which is great when we expand two linear expressions ... but what if there are more?!?!

We need a structure or pattern. I always teach a different way for my students which I hope will help you!

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

$$(x^2 - x + 3)(2x^2 + x - 1)$$

$$\begin{aligned} &= \cancel{2x^4} + \cancel{x^3} - \cancel{x^2} - \cancel{2x^3} - \cancel{x^2} + \cancel{x} + \cancel{6x^2} + \cancel{3x} - \cancel{3} \\ &= 2x^4 - x^3 + 4x^2 + 4x - \underline{\underline{3}} \end{aligned}$$



Example: Expanding polynomials

The best way to get proficient with these is to practice. Over and over again!

Expand and simplify.

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

b $(x^2 + 1)(x^3 - x + 1)$

$$\begin{aligned}\text{a. } & x^3(x - 4x^2) \\ &= x^4 - 4x^5 \\ &= -4x^5 + x^4\end{aligned}$$

$$\begin{aligned}\text{b. } & (x^2 + 1)(x^3 - x + 1) \\ &= \cancel{x^5} - \cancel{x^3} + \cancel{x^2} + \cancel{x^3} - \cancel{x} + 1 \\ &= x^5 + x^2 - x + 1\end{aligned}$$

Question: What do you notice about the degree of each of the answers?



Example: Expanding $P(x) \times Q(x)$

If we always follow the pattern, you can't do wrong.

Well ... you might go wrong if you're not **super careful with all the signs**.

If $P(x) = x^2 + x - 1$ and $Q(x) = x^3 + 2x + 3$, expand and simplify the following.

a $P(x) \times Q(x)$

b $(Q(x))^2$

$$\begin{aligned} \text{a. } & (x^2 + x - 1)(x^3 + 2x + 3) \\ &= \cancel{x^5} + 2x^3 + 3x^2 + \cancel{x^4} + 2x^2 + 3x - \cancel{x^3} - 2x - 3 \\ &= x^5 + x^4 + x^3 + 5x^2 + x - 3 \end{aligned}$$

$$\begin{aligned} \text{b. } & (x^3 + 2x + 3)^2 = (x^3 + 2x + 3)(x^3 + 2x + 3) \\ &= x^6 + 4x^4 + 6x^3 + 4x^2 + 12x + 9 \end{aligned}$$



Example: Expanding $P(x) \times Q(x)$

If we always follow the pattern, you can't do wrong.

Well ... you might go wrong if you're not **super careful with all the signs**.

If $P(x) = x^2 + x - 1$ and $Q(x) = x^3 + 2x + 3$, expand and simplify the following.

a $P(x) \times Q(x)$

b $(Q(x))^2$



Example: Thinking questions

As I always state, being able to understand what you are doing is really important.

What would you do with the following question?

If $P(x)$ is of degree m and $Q(x)$ is of degree n and $m > n$, what is the highest possible degree of the following polynomials?

a $P(x) + Q(x) = \underline{\underline{m}}$

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

$$Q(x) = x - 3$$

$$+ = x^2 + 2 + x - 3$$

$$= \underline{\underline{x^2 + x - 1}}$$

Note: Most of the time the language of the question is what tricks people, not the Maths



Learning Objectives: Recapped

By the end of the lesson, I would hope that you have an understanding and be able to apply to questions the following concepts:

- To be able to apply the rules of expanding brackets to multiply polynomials ✓
- To understand that multiplying polynomials results in a polynomial of higher degree ✓



Making Maths Easy, Engaging Educational, Entertaining

Navigation: [Home](#)[Latest uploads](#)[Years 6 to 10](#)[VCE Courses](#)[Exam Solutions](#)[Buy Merchandise](#)

Why choose MaffsGuru?

I hate talking about myself.

So, here are some of the amazing comments I receive about the videos and content I produce followed by reasons to use the resource:

“I wish I watched your videos before naplan”
— Overjoyed Cherry (youtube)



VCAA exam questions

VCE lessons, where possible, include the use of past VCAA exam questions to



Professional Development

This resource isn't just meant for students. I hope it will be useful for teachers both new



Downloadable notes

Every lesson has downloadable notes. Whatever I write on the screen, you can download for



Respected Presenter

I currently present for Cambridge University Press and Nelson - as well as produce my own content for