

Chapter 1

Algebraic Expressions

Chapter Overview

1. Basic Index Laws
2. Negative/ Fractional Indices
3. Factorise Quadratics and Cubics
4. Expanding Brackets
5. Surds

Topics	What students need to learn:		
	Content	Guidance	
2 Algebra and functions	2.1	<p>Understand and use the laws of indices for all rational exponents.</p>	<p>$a^m \times a^n = a^{m+n}$, $a^m \div a^n = a^{m-n}$, $(a^m)^n = a^{mn}$</p> <p>The equivalence of $a^{\frac{m}{n}}$ and $\sqrt[n]{a^m}$ should be known.</p>
	2.2	<p>Use and manipulate surds, including rationalising the denominator.</p>	<p>Students should be able to simplify algebraic surds using the results</p> <p>$(\sqrt{x})^2 = x$, $\sqrt{xy} = \sqrt{x}\sqrt{y}$ and</p> <p>$(\sqrt{x} + \sqrt{y})(\sqrt{x} - \sqrt{y}) = x - y$</p>

Basic Index Laws



Examples

1. Simplify $(a^3)^2 \times 2a^2$

2. Simplify $(4x^3y)^3$

3. Simplify $2x^2(3 + 5x) - x(4 - x^2)$

4. Simplify $\frac{x^3 - 2x}{3x^2}$ (2 methods)

Test Your Understanding:

1. Simplify $\left(\frac{2a^5}{a^2}\right)^2 \times 3a$

2. Simplify $\frac{2x+x^5}{4x^3}$

3. Expand and simplify $2x(3 - x^2) - 4x^3(3 - x)$

4. Simplify $2^x \times 3^x$

Extension

[MAT 2006 1A]

Which of the following numbers is largest?

- $\left((2^3)^2\right)^3$
- $(2^3)^{(2^3)}$
- $2\left((3^2)^3\right)$
- $2\left(3^{(2^3)}\right)$

[MAT 2012 1B]

Let $N = 2^k \times 4^m \times 8^n$ where k, m, n are positive whole numbers.

Then N will definitely be a square number whenever:

- k is even;
- $k + n$ is odd;
- k is odd but $m + n$ is even;
- $k + n$ is even.