A Level Mathematics

Chapter 1

Algebraic Expressions

Chapter Overview

1. Basic Index Laws

2. Negative/ Fractional Indices

3. Factorise Quadratics and Cubics

4. Expanding Brackets

5. Surds



Basic Index Laws

Examples

1. Simplify $\left(a^{3}\right)^{2}×2a^{2}$

2. Simplify $\left(4x^{3}y\right)^{3}$

3. Simplify $2x^{2}\left(3+5x\right)-x\left(4-x^{2}\right)$

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

Test Your Understanding:

1. Simplify $\left(\frac{2a^{5}}{a^{2}}\right)^{2}×3a$ 2. Simplify $\frac{2x+x^{5}}{4x^{3}}$

3.Expand and simplify $2x\left(3-x^{2}\right)-4x^{3}\left(3-x\right)$

4.Simplify $2^{x}×3^{x}$

Extension





Exercise 1A Page 3

Negative and Fractional Indices

1. Prove that $x^{\frac{1}{2}}=\sqrt{x}$ 2. Evaluate $27^{-\frac{1}{3}}$

1. Evaluate $32^{\frac{2}{5}}$ 4. Simplify $\left(\frac{1}{9}x^{6}y\right)^{\frac{1}{2}}$

5. Evaluate $\left(\frac{27}{8}\right)^{-\frac{2}{3}}$

6. If $b=\frac{1}{9}a^{2}$, determine $3b^{-2}$ in the form $ka^{n}$ where $k,n$ are constants

Extension



Exercise 1D Page 11

Brackets: Expanding

Example: $\left(x+1\right)\left(x+2\right)\left(x+3\right)$

Questions

1. Expand and simplify

$$\left(x+5\right)\left(x-2\right)\left(x+1\right)$$

2. Expand and simplify:

$$2\left(x-3\right)\left(x-4\right)$$

3. Expand and simplify:

$$\left(2x-1\right)^{3}$$

Extension





Brackets: Factorising

Examples:

1. $x^{2}-5x-14$ 2. $2x^{2}+5x-12$

3. $4x^{2}-9 $4. $x^{3}-x$

5. $x^{3}+3x^{2}+2x$

Test your understanding: Factorise completely

1. $6x^{2}+x-2$ 2. $x^{3}-7x^{2}+12x$

3. $x^{4}-1$ 4. $x^{3}-1$

Exercise 1C Page 8

Surds:

1. $\sqrt{3}×2                      $ $ 2. 3\sqrt{5}×2\sqrt{5}$

3. $\sqrt{8}$ $ 4. \sqrt{12}+\sqrt{27}$

5. $\left(\sqrt{8}+1\right)\left(\sqrt{2}-3\right)$

Extension:

Exercise 1E Page 11

Rationalising the denominator:

Examples:

$1. \frac{3}{\sqrt{2}} 2.$ $\frac{6}{\sqrt{3}}$

3. $\frac{7}{\sqrt{7}}$ 4. $\frac{15}{\sqrt{5}}+\sqrt{5}$

Test your understanding:

$\frac{12}{\sqrt{3}}$

$\frac{2}{\sqrt{6}}$

$\frac{4\sqrt{2}}{\sqrt{8}}$

More Complicated Examples:

1. $\frac{3}{\sqrt{6}-2}$ 2. $\frac{4}{\sqrt{3}+1}$

3. $\frac{3\sqrt{2}+4}{5\sqrt{2}-7}$

Test Your Understanding: Rationalise the denominator and simplify

1. $\frac{4}{\sqrt{5}-2}$

2. $\frac{2\sqrt{3}-1}{3\sqrt{3}+1}$

3. Solve $y\left(\sqrt{3}-1\right)=8$

Give your answer in the form $a+b\sqrt{3}$ where $a$ and $b$ are integers.

Exercise 1F Page 15