## 2 Higher Engineering Mathematics

Problem 5. Simplify 
$$\frac{(x^2\sqrt{y})(\sqrt{x}\sqrt[3]{y^2})}{(x^5y^3)^{\frac{1}{2}}}$$
$$\frac{(x^2\sqrt{y})(\sqrt{x}\sqrt[3]{y^2})}{(x^5y^3)^{\frac{1}{2}}} = \frac{x^2y^{\frac{1}{2}}x^{\frac{1}{2}}y^{\frac{2}{3}}}{x^{\frac{5}{2}}y^{\frac{3}{2}}}$$
$$= x^{2+\frac{1}{2}-\frac{5}{2}}y^{\frac{1}{2}+\frac{2}{3}-\frac{3}{2}}$$
$$= x^0y^{-\frac{1}{3}}$$
$$= y^{-\frac{1}{3}} \text{ or } \frac{1}{y^{\frac{1}{3}}} \text{ or } \frac{1}{\sqrt[3]{y}}$$

(b) Brackets, factorization and precedence

**Problem 6.** Simplify 
$$a^2 - (2a - ab) - a(3b + a)$$
.

$$a^{2} - (2a - ab) - a(3b + a)$$
  
=  $a^{2} - 2a + ab - 3ab - a^{2}$   
=  $-2a - 2ab$  or  $-2a(1 + b)$ 

**Problem 7.** Remove the brackets and simplify the expression:

 $2a - [3\{2(4a - b) - 5(a + 2b)\} + 4a].$ 

 $2a - [3\{8a - 2b - 5a - 10b\} + 4a]$ 

[-120] + 4a]

g the 'curly' brackets gives:

-6a - 36b + 4a]

2a - [13a - 36b]

Removing the square brackets gives:

Removing the innermost brackets gives:



36b - 11a**Problem 8.** Factorize (a) xy - 3xz(b)  $4a^2 + 16ab^3$  (c)  $3a^2b - 6ab^2 + 15ab$ .

2a - 13a + 36b = -11a + 36b or

- (a) xy 3xz = x(y 3z)
- (b)  $4a^2 + 16ab^3 = 4a(a + 4b^3)$
- (c)  $3a^2b 6ab^2 + 15ab = 3ab(a 2b + 5)$

**Problem 9.** Simplify  $3c + 2c \times 4c + c \div 5c - 8c$ .

The order of precedence is division, multiplication, addition and subtraction (sometimes remembered by BODMAS). Hence

## **6** Higher Engineering Mathematics



Before looking at long division in algebra let us revise long division with numbers (we may have forgotten, since calculators do the job for us!)

and **polynomial division** is sometimes required when resolving into partial fractions—see Chapter 2.)