EXAMPLE 6

Solve: $9x^2 - 64 = 0$

$$(3x)^2 - 8^2 = 0$$
$$(3x - 8)(3x + 8) = 0$$
$$x = \frac{8}{3} \text{ or } x = -\frac{8}{3}$$

Perform long division without a calculator.

EXAMPLE 7

Calculate $702 \div 26$

$$\begin{array}{r} 27 \\ 26\overline{)702} \\ \underline{520} \\ 182 \\ \underline{182} \\ 0 \end{array}$$

The answer is 27 with no remainder.

EXERCISE

REVISION EXERCISE 3A

1. Simplify:
   a) $a + 3a - b - 3b$ b) $2c - (-d) + c$ c) $2e - f + ef + f$
   d) $a^2 + b^2 - 5a + 6b - 2ab$ e) $a + 6b - 4b - 2a$ f) $d - (-7c) + (-2d) - c$
   g) $7e - 2f + 3f + ef$ h) $2g^2 + 3h^2 - 4g - 3h + 2gh$
2. Evaluate these expressions using the value of x given:
   a) If $x = 1$, find $3x - 7$ b) If $x = 2$, find $x^3 - 2x^2$
   c) If $x = 3$, find $3(1 - x)$ d) If $x = 4$, find $(x - 5)(x + 5)(x - 4)$
   e) $f(x) = x^2 - 2x - 7$. Find $f(1)$ f) If $x = 5$, find $x^2 - 2x + 1$
   g) If $x = 2$, find $2 + 2x^2$ h) If $x = 3$, find $3(1 - x)(2 - x)$
   i) If $x = 4$, find $(x - 4)(x^3 - 3x^2 + 21x - 17)$ j) $f(x) = 3x^2 + 2x - 7$. Find $f(1)$
3. Expand the brackets in the following expressions:
   a) $2v(1 + v)$ b) $-4(w^2 - 2)$ c) $y(3y + 1)$ d) $(4x + 3)(4x - 3)$
   e) $4v(2 + 3v)$ f) $-3(2w^2 - 1)$ g) $y(-2y + 6)$ h) $(4x + 4)(4x - 4)$
4. Factorise the following expressions:
   a) $-5y^2 - 25y$ b) $36p - 6p^3$ c) $26qr - 13r$ d) $-4s^5 + 5s^4$
   e) $-9y^2 - 24y$ f) $6p - p^2$ g) $16q - 8qr$ h) $3s^4 - 4s^3$
5. Factorise the following quadratic expressions:
   a) $x^2 + 5x + 4$ b) $x^2 + 20x + 100$ c) $x^2 - 12x + 27$ d) $x^2 - 15x + 54$
   e) $x^2 + 10x + 16$ f) $x^2 - 5x + 4$ g) $x^2 + 14x + 48$ h) $x^2 - 2x - 24$

EXERCISE

EXERCISE

6. Use the difference of two squares to factorise the following:
   a) $x^2 - 4$ b) $16x^3 - 36x$ c) $x^2 - 9$ d) $9x^3 - 16x$
7. Calculate by long division:
   a) $1248 \div 24$ b) $9999 \div 99$ c) $2088 \div 32$ d) $2920 \div 71$
   e) $2208 \div 23$ f) $975 \div 39$ g) $5466 \div 65$ h) $3840 \div 85$

EXERCISE

What You Will Learn

In this chapter, you will learn how to:

- Divide by an algebraic fraction;
- Cancel algebraic terms;
- Put an algebraic expression over a common denominator;
- Perform algebraic division (similar to the long division above).

3.2 Algebraic Manipulation of Polynomials

All of the above skills (expanding brackets, collecting like terms and factorisation) will be put to use in this section. In addition, we will introduce further techniques, which you may or may not have met before.

Divide by an Algebraic Fraction

Remember that dividing by a fraction is easily achieved by turning the fraction upside down (finding the **reciprocal**) and multiplying instead of dividing.

EXAMPLE 1

Work out $16 \div \frac{2}{3}$

$$16 \div \frac{2}{3} = 16 \times \frac{3}{2}$$
$$= \frac{48}{2}$$
$$= 24$$

You can perform division by an algebraic fraction in the same way.

EXAMPLE 2

Simplify $\frac{1}{x} \div \frac{a+b}{c}$

$$\frac{1}{x} \div \frac{a+b}{c}$$
$$= \frac{1}{x} \times \frac{c}{a+b}$$
$$= \frac{c}{x(a+b)}$$