Section 1.1 Polynomial expressions

4. Simplify each of the following.

(i) $3x^2 - 6x + 7 + 5x^2 + 2x - 9$

6. Expand each of the following.

(iii) $(3x - 2)(x + 3)$

10. If $25x^2 + tx + 4$ is a perfect square for all values of x, find the value of t.

23. Simplify each of the following:

(i) $\dfrac{2x^2 + 5x - 3}{2x - 1}$

Section 1.2 Polynomial functions, an introduction

11. The volume of a cone, $V(r, h)$, is given by the formula $V(r, h) = \frac{1}{3}\pi r^2 h$, where r is the radius and h is the perpendicular height of the cone. Find

(i) the volume, in terms of π, of a cone with height 21 cm and radius 14 cm

(ii) the volume of a cone, in terms of r and π, if the cone has the same height as the radius r

(iii) the volume of a cone, in terms of h and π, if the radius of the base is twice the height h.

Section 1.3 Factorising algebraic expressions

Using the highest common factor, factorise each of the following:

7. $2a^2b - 4ab^2 + 12abc$

Factorise each of the following by grouping terms.

12. $2c^2 - 4cd + c - 2d$

Using the difference of two squares, factorise the following:

23. $1 - 36x^2$

Factorise each of the following quadratic expressions:

38. $2x^2 - 7x + 3$

Factorise each of the following quadratic expressions:

50. $12x^2 + 17xy - 5y^2$

FACTORISE

53. (i) $27x^3 - y^3$

Section 1.4 Simplifying algebraic fractions

2. Express each of the following as a single fraction:

(h) $\frac{3x+5}{6} - \frac{2x+3}{4} - \frac{1}{12}$

3. By factorising the numerator and the denominator fully, simplify each of the following.

(v) $\frac{2}{a+4} - \frac{a+2}{a^2-9}$

7. Simplify (iii) $\dfrac{x+y}{\frac{1}{x}+\frac{1}{y}}$

11. Simplify each of the following.

(i) $\dfrac{\frac{a+b}{a-b}-\frac{a-b}{a+b}}{1+\frac{a-b}{a+b}}$

Section 1.5 Algebraic identities

6. Find the values of a and b if $(2x + a)^2 = 4x^2 + 12x + b$, for all x.

21. If $(x - 2)^2$ is a factor of $x^3 + px + q$, find the value of p and the value of q.

27. If $x^2 + ax + b$ is a factor of $x^3 - k$, show that (i) $a^3 = k$ (ii) $b^3 = k^2$.

Section 1.6 Manipulating formulae

7. In each of the following, express a in terms of the other variables:

(i) $\frac{x}{y} = \frac{a+b}{a-b}$ (ii) $bc - ac = ac$.

10. Write c in terms of the other variables in each of the following.

(i) $d = \sqrt{\dfrac{a-b}{ac}}$ (ii) $b = \dfrac{2c-1}{c-1}$

Section 1.7 Algebraic patterns, an introduction

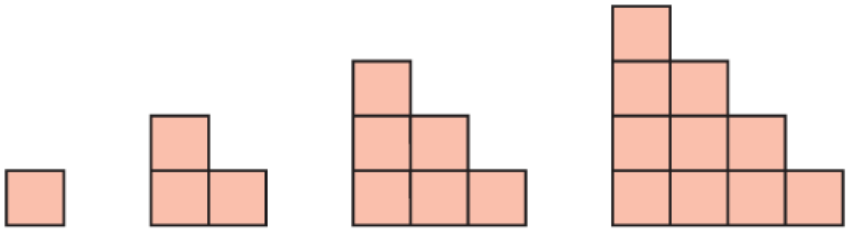
1. Examine each of the following patterns of numbers and determine if the pattern has a linear or quadratic relationship.

(a) 4, 7, 10, 13, 16, …

1. Examine each of the following patterns of numbers and determine if the pattern has a linear or quadratic relationship.

(i) 0, 3, 12, 27, 48, …

1. By converting the following designs into a number pattern, write down a rule for the pattern. Use the rule to find out how many bricks are needed to build the 49th design.



Section 1.8 Solving equations

4. Solve

(iii) $\frac{x-3}{4} = \frac{x-2}{5}$

6. Find the value of the unknown in each of the following equations:

(iv) $\frac{3r-2}{5} - \frac{2r-3}{4} = \frac{1}{2}$

7. Solve each of the following:

(ii) $\frac{2}{3}(x-1)-\frac{1}{5}(x-3)=x+1$

Section 1.9 Solving simultaneous linear equations

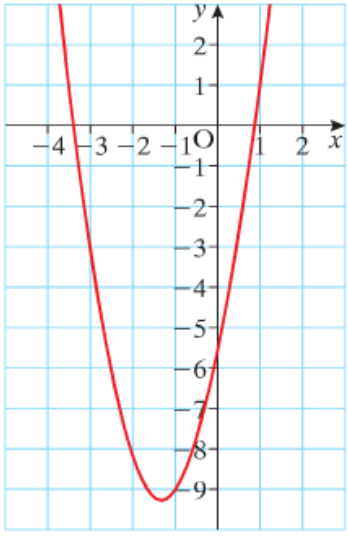
2. Solve (iii) $\frac{4x-2}{5}=\frac{8y}{10}$

$18x-20y=4$

5. Solve the following equations with three unknowns.

(iii) $2x + y - z = 9$
$x + 2y + z = 6$
$3x - y + 2z = 17$

9. A curve of the form $f(x) = y = ax^2 + bx + c$ is drawn as shown.
By picking any three points on the curve, form three equations connecting the coefficients a, b and c and hence solve to find $f(x)$.



10. 44,000 people attended a match in Croke Park. The two ticket prices on the day were €30 and €20. The total receipts for the game came to €1.2 million.
How many people paid the higher ticket price?