

AQA Level 2 Further mathematics Number & algebra

Section 2: Algebraic manipulation

Exercise

1. Factorise the following expressions:

(i) $10ab + 5ac$

(ii) $2x^2 + 4xy - 8xz$

(iii) $3s^2t - 9s^3t + 12s^2t^2$

(iv) $3(b - c) - 2a(b - c)$

2. Factorise these quadratic expressions.

(i) $x^2 + 5x + 6$

(ii) $x^2 + x - 12$

(iii) $x^2 - 9$

(iv) $x^2 - 6xy + 8y^2$

(v) $2x^2 + 3xy + y^2$

(vi) $3x^2 + x - 2$

(vii) $4x^2 - 8x + 3$

(viii) $4x^2 - 25y^2$

(ix) $6x^2 - xy - 12y^2$

3. Factorise these expressions.

(i) $(x+4)^2 - (x-3)^2$

(ii) $(2x - y)^2 - (x + 3y)^2$

4. Simplify the following as much as possible:

(i) $\frac{2a^2b}{4ab^2}$ (ii) $\frac{12p^2qr^3}{9pq^2r}$

(iii) $\frac{x^2y + xy^2}{x + y}$ (iv) $\frac{a}{2b} \times \frac{3bc}{a^2} \times \frac{a}{6c}$

5. Simplify these expressions where possible.

(i) $\frac{x^2 + x - 6}{x^2 - x - 2}$ (ii) $\frac{x^2 - 4x + 4}{x^2 + x - 6}$

(iii) $\frac{x^2 + x - 2}{x^2 + 4x + 3}$ (iv) $\frac{4x^2 - 1}{4x^2 - 4x - 3}$

(v) $\frac{2x+3}{3x+1} \times (3x^2 - 2x - 1)$ (vi) $\frac{x+2}{2x^2 - x - 1} \div \frac{x^2 - x - 6}{2x+1}$

6. Write as single fractions:

(i) $\frac{2x}{5} + \frac{3x}{2}$ (ii) $\frac{3a}{4} - \frac{2b}{3}$

(iii) $\frac{2x+1}{12} - \frac{x-2}{8}$ (iv) $\frac{3x+4}{2x} - \frac{5x+6}{3x}$

(v) $\frac{1}{p} + \frac{1}{q}$ (vi) $\frac{a}{2b} + \frac{5b}{3a}$

(vii) $\frac{3}{2x+1} - \frac{2}{x-1}$ (viii) $\frac{2x}{x-2} - \frac{x+1}{x+3}$

7. Make x the subject of each of these formulae:

(i) $ax + b = c$

(ii) $p - qx^2 = r$

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(iii) $\sqrt{\frac{x}{s}} = t$

(iv) $a - \frac{b}{x} = c$

(v) $px + q = a - bx$

(vi) $y = \frac{1}{w(z - x^2)}$

8. Write each of the following quadratic functions in the form $a(x + b)^2 + c$:

(i) $x^2 + 2x - 3$

(ii) $x^2 - 6x + 1$

(iii) $x^2 + x + 1$

(iv) $-x^2 + 5x$

(v) $2x^2 + 4x + 3$

(vi) $3x^2 + 8x - 2$

9. Solve

$$\frac{x^2 + 6x + 8}{2x^2 + 7x - 4} = 3$$

10. m and n are both positive integers. Prove that $(m + n)^2 + m^2 - n^2$ is even.