

Exercise walk-through

2.1

Notation, expressions, substitution, expanding and factorising (A1–A4)

AQA · GCSE · Mathematics

1. Unit 3.2 at a glance

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Foundation rows A1-A25 across three tiers (basic foundation, additional foundation, Higher only). Higher-only additions: surds and algebraic fractions, identities and proofs, inverse and composite functions, perpendicular lines, turning points by completing the square, cubic/reciprocal/exponential/trig graphs, the circle equation with tangents, the quadratic formula, linear-quadratic simultaneity, iteration, set-notation inequality regions, quadratic and surd-ratio sequences.

Must-know (Formulae Sheet gives only the quadratic formula): $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$; $a(x + b)^2 + c$ reads the turning point; perpendicular $m_1 m_2 = -1$; $x_{[n+1]} = f(x_n)$ with suffix notation; quadratic nth term with half the second difference.

5. Solving

Solving

Linear with the unknown both sides: $7x - 22 = 4x + 29$ gives $3x = 51$, $x = 17$ (the 1H June 2024 anchor). Quadratics by factorising, formula, or completing the square: $x^2 + 6x + 2 = 0$ gives $x = -3 \pm \sqrt{7}$. Simultaneous pairs keep both roots.

Iteration (Higher): from $x^3 - 3x - 1 = 0$, $x_{[n+1]} = (3x_n + 1)^{1/3}$ from $x_1 = 1$ gives 1.587, 1.793, 1.855, 1.872, converging to 1.879 (3 dp) - check back in the original. Inequalities: number line (open strict, closed included), set notation at Higher: $x^2 - x - 6 > 0$ gives $\{x: x < -2\}$ union $\{x: x > 3\}$; dashed boundaries for strict regions.

Check yourself

Check yourself

Notation and substitution; manipulation through surds and algebraic fractions; identities and proofs; formulae rearranged. Functions with inverse and composite.

Lines through points with perpendiculars; quadratic turning points by completing the square; the full graph-families bank with translations; circle equation and tangents; linear to linear-quadratic solving; iteration to a stated accuracy; inequalities with number lines, set notation and regions; sequence types and n th terms.

Exercises 2.1·2.3

2.1 Expand and simplify $3(2x - 5) + 4(x + 1)$ [2]

2.2 Expand and simplify $(x + 5)(x - 3)$ [2]

2.3 Factorise $x^2 - 2x - 24$ [2]

Exercises 2.1·2.3

2.1 Expand and simplify $3(2x - 5) + 4(x + 1)$ [2]

2.1 $6x - 15 + 4x + 4 = 10x - 11$.

2.2 Expand and simplify $(x + 5)(x - 3)$ [2]

2.2 $x^2 + 2x - 15$.

2.3 Factorise $x^2 - 2x - 24$ [2]

2.3 $(x - 6)(x + 4)$.

Exercises 2.4·2.6

2.4 Factorise $6x^2 - 7x - 3$ [2]

2.5 Expand and simplify $(3 + \sqrt{2})(1 - 2\sqrt{2})$ [3]

2.6 Make t the subject of $v = u + at$ [2]

Exercises 2.4·2.6

2.4 Factorise $6x^2 - 7x - 3$ [2]

2.4 $(3x + 1)(2x - 3)$.

2.5 Expand and simplify $(3 + \sqrt{2})(1 - 2\sqrt{2})$ [3]

2.5 $3 - 6\sqrt{2} + \sqrt{2} - 4 = -1 - 5\sqrt{2}$.

2.6 Make t the subject of $v = u + at$ [2]

2.6 $at = v - u$, so $t = \frac{v - u}{a}$.

Exercises 3.1·3.3

3.1 (*Original, 3H June 2024 Q4 family.*) Show that $(2x + 3)^2 - (2x + 1)(2x + 5) \equiv 4$. [3]

3.2 (*Original, 1H June 2024 Q17 family.*) Make x the subject of $y = \frac{3x + 7}{x}$. [4]

3.3 (*Original, 1H June 2024 Q9 family.*) Simplify fully $\frac{26}{16.4}$, giving your answer as a fraction in its lowest terms. [3]

Exercises 3.1·3.3

3.1 (*Original, 3H June 2024 Q4 family.*) Show that $(2x + 3)^2 - (2x + 1)(2x + 5) \equiv 4$. [3]

3.1 LHS = $(4x^2 + 12x + 9) - (4x^2 + 12x + 5) = 4 = \text{RHS}$ for all x : an identity. ✓

3.2 (*Original, 1H June 2024 Q17 family.*) Make x the subject of $y = \frac{3x + 7}{x}$. [4]

3.2 Multiply by x : $xy = 3x + 7$, so $xy - 3x = 7$, factorise $x(y - 3) = 7$, giving $x = \frac{7}{y - 3}$.

3.3 (*Original, 1H June 2024 Q9 family.*) Simplify fully $\frac{26}{16.4}$, giving your answer as a fraction in its lowest terms. [3]

3.3 $\frac{26}{16.4} = \frac{260}{164} = \frac{65}{41}$.

Local review guidance: factor before cancelling; simplest forms; identity proofs end with the “all values” statement. This is authored classroom guidance.