

Algebra Focus

Mixed practice paper · Calculator allowed · 15 questions · 40 marks · seed 7

1. Quadratic formula

3 marks

Solve $x^2 - 5x - 3 = 0$. Give your answers to 3 significant figures.

Answer: $x = -0.541$ or $x = 5.54$

M1 Substitute into the quadratic formula

M1 Discriminant = $(-5)^2 - 4(1)(-3) = 37$

A1 $x = -0.541$ or $x = 5.54$

2. Rearranging formulae

3 marks

Make x the subject of $y = (3x - 3)/5$.

Answer: $x = (5y + 3)/3$

M1 Multiply both sides by 5: $5y = 3x - 3$

M1 Add 3 to both sides, then divide by 3

A1 $x = (5y + 3)/3$

3. Expanding brackets

2 marks

Expand and simplify $(x - 3)(x + 5)$.

Answer: $x^2 + 2x - 15$

M1 Correct expansion of the two brackets (four terms)

A1 $x^2 + 2x - 15$

4. Direct & inverse proportion

3 marks

y is directly proportional to x . When $x = 2$, $y = 6$. Work out y when $x = 4$.

Answer: 12

M1 Write $y = kx$

M1 $k = 6 \div 2 = 3$

A1 $y = 12$

5. Sequences (nth term)

2 marks

Here are the first five terms of a sequence:

7, 12, 17, 22, 27

(a) Find an expression for the n th term.

(b) Hence find the 50th term.

Answer: (a) $5n + 2$ (b) 252

B1 (a) $5n + 2$

B1 (b) 252

6. Completing the square

3 marks

Write $x^2 - 10x + 32$ in the form $(x + p)^2 + q$.

Answer: $(x - 5)^2 + 7$

M1 $p = -10/2 = -5$

M1 $q = 32 - (-5)^2 = 7$

A1 $(x - 5)^2 + 7$

7. Factorising quadratics

2 marks

Factorise $x^2 + 3x + 2$.

Answer: $(x + 1)(x + 2)$

M1 Find two numbers with product 2 and sum 3

A1 $(x + 1)(x + 2)$

8. Surds

2 marks

Rationalise the denominator of $28/\sqrt{7}$. Give your answer in its simplest form.

Answer: $4\sqrt{7}$

M1 Multiply numerator and denominator by $\sqrt{7}$

A1 $4\sqrt{7}$

9. Functions

4 marks

$f(x) = 5x + 4$ and $g(x) = x^2 - 9$.

(a) Work out $fg(2)$.

(b) Find $f^{-1}(x)$.

Answer: (a) -21 (b) $(x - 4)/5$

M1 (a) $g(2) = 2^2 - 9 = -5$

A1 (a) -21

M1 (b) Let $y = f(x)$ and rearrange for x

A1 (b) $(x - 4)/5$

10. Solving linear equations

3 marks

Solve the equation $(3x - 1)/2 = (x - 17)/4$.

Answer: $x = -3$ **M1** Multiply both sides by a common denominator**M1** Expand and collect terms to reach $10x + 30 = 0$ **A1** $x = -3$

11. Simultaneous equations

4 marks

Solve the simultaneous equations

$$4x + 5y = 24$$

$$x + 3y = 13$$

Answer: $x = 1, y = 4$ **M1** Eliminate one variable by multiplying and adding/subtracting**M1** Solve for the remaining variable**A1** $x = 1$ **A1** $y = 4$

12. Inequalities

3 marks

Find the integer values of x that satisfy $-1 < 2x + 1 \leq 11$.

Answer: 0, 1, 2, 3, 4, 5**M1** Subtract 1: $-2 < 2x \leq 10$ **M1** Divide by 2: $-1 < x \leq 5$ **A1** 0, 1, 2, 3, 4, 5

13. Algebraic fractions

2 marks

Simplify $\frac{x^2 - 49}{x - 7}$.

Answer: $x + 7$ **M1** Factorise the numerator: $x^2 - 49 = (x - 7)(x + 7)$ **A1** $x + 7$

14. Compound measures

2 marks

A metal block has a density of 7.5 g/cm^3 and a volume of 30 cm^3 . Work out its mass.

Answer: 225 g**M1** Use mass = density $\times$ volume**A1** 225 g

15. **Standard form**

2 marks

Work out $(5.9 \times 10^{-3}) \times (8.3 \times 10^0)$. Give your answer in standard form.

Answer: 4.897×10^{-2}

M1 Multiply the number parts and add the powers: 48.97×10^{-3}

A1 4.897×10^{-2}