GCSE Mathematics (Higher Tier) : Topic Test 1 - Advanced Algebra

Assessment Details	Specifications
Topics Covered	Quadratic Formula, Algebraic Fractions, Inequalities & Functions
Tier	Higher
Time Allowed	45 minutes
Total Marks	40 marks
Your Total Mark	**/ 40**

Instructions & Exam Tips:

- Answer all questions in the spaces provided.
- **Show all working out** — method marks may be awarded even if the final answer is incorrect.
- Calculators may be used
- Check your answers carefully if you finish before the time limit.

Questions

1. Solve $3x^2 + 8x - 5 = 0$ using the quadratic formula.

Give your solutions to 2 decimal places. **(3 marks)**

Working Space (Question 1)

Answer: _____

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2. Express as a single fraction in its simplest form:

$$\frac{3}{2x-1} - \frac{2}{x+4}$$

(3 marks)

Working Space (Question 2)

Answer: _____

3. Solve the inequality:

$$4(2x - 3) \leq 3x + 13$$

(2 marks)

Working Space (Question 3)

Answer: _____

4. The functions f and g are defined such that:

$$f(x) = 3x - 5$$

$$g(x) = x^2 + 2$$

(a) Find $f(-4)$. ***(1 mark)***

(b) Find $gf(3)$. ***(2 marks)***

(c) Find an expression for $f^{-1}(x)$. ***(2 marks)***

Working Space (Question 4)

Answer: _____

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5. Solve the inequality:

$$x^2 - 3x - 10 > 0$$

Represent your final answer using set notation or clear inequalities.

(3 marks)

Working Space (Question 5)

Answer: _____

6. Simplify fully:

$$\frac{2x^2+7x-15}{4x^2-9}$$

(3 marks)

Working Space (Question 6)

Answer: _____

7. Solve the algebraic equation:

$$\frac{x+2}{3} + \frac{2x-1}{x-1} = 4$$

Give your solutions to 3 significant figures.

(5 marks)

Working Space (Question 7)

Answer: _____

8. The functions h and k are defined such that:

$$h(x) = \frac{2x+1}{x-3}, x \neq 3$$

$$k(x) = \sqrt{x + 4}, x \geq -4$$

(a) Find $h^{-1}(x)$. ***(3 marks)***

(b) Solve $hk(x) = 7$. ***(3 marks)***

Working Space (Question 8)

Answer: _____

9. Solve the simultaneous inequalities:

$$2x + 5 > 1 \; and \; 2x^2 - 7x - 4 \leq 0$$

State the set of values of x that satisfies both inequalities.

(4 marks)

Working Space (Question 9)

Answer: _____

10. A rectangular lawn has a length of $(2x + 5)m$ and a width of $(x - 1)m$.

A paved border surrounds the lawn such that the total area of the lawn and border combined is given by $(2x^2 + 11x + 14)m^2$.

Given that the area of the lawn alone is at least $15m^2$ and at most $42m^2$:

Find the range of possible values for x.

(5 marks)

Working Space (Question 10)

Answer: _____