

GCSE MATHEMATICS - HIGHER TIER

Algebraic Fractions & Completing the Square

Exam-Style Assignment

STUDENT DETAILS

Name: _____

Date: _____ Target grade / level: _____

ASSIGNMENT FOCUS

- Simplify algebraic fractions using factorisation, including quadratic expressions
- Add and subtract algebraic fractions using a common denominator
- Solve equations involving algebraic fractions that lead to quadratic equations
- Write quadratics in the form $(x \pm a)^2 \pm b$, including a coefficient of x^2
- Solve quadratic equations by completing the square and give exact answers where appropriate
- No quadratic graph questions are included in this assignment

Original K Education Centre questions informed by Pearson Edexcel GCSE Higher assessment style.

Section A - Algebraic Fractions

Show all factorisation and denominator work. Simplify fully where possible.

1. Simplify fully. State any values of x that are excluded from the original expression.

[3 marks]

$$\frac{x^2 - 9}{x^2 + 5x + 6}$$

Working / answer

2. Simplify fully.

[4 marks]

$$\frac{x^2 - 4x - 12}{x^2 - 9x + 18} \times \frac{x - 6}{x + 2}$$

Working / answer

Section A - Algebraic Fractions

3. Write as a single fraction in its simplest form.

[4 marks]

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

Working / answer

4. Write as a single fraction and simplify fully.

[5 marks]

$$\frac{2}{x-5} - \frac{3}{x+5} + \frac{4x}{x^2-25}$$

Working / answer

Section A - Algebraic Fractions

5. Solve the equation. Give your answers in exact form.

[6 marks]

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

Your method should show how the algebraic-fraction equation is converted into a quadratic equation.

Working / answer

Section B - Completing the Square

For Questions 6-10, do not use a graph. Rewrite each expression by completing the square. Keep exact values.

Section B - Completing the Square

6. Write in the form $(x + a)^2 + b$.

[3 marks]

$$x^2 + 8x + 3$$

Working / answer

7. Write in the form $(x - a)^2 + b$.

[3 marks]

$$x^2 - 10x + 7$$

Working / answer

8. Write in the form $2(x + a)^2 + b$.

[3 marks]

$$2x^2 + 12x - 5$$

Working / answer

Section B - Completing the Square

9. Write in the form $3(x - a)^2 + b$.

[3 marks]

$$3x^2 - 18x + 11$$

Working / answer

10. (a) Write the expression in completed-square form. (b) Hence solve the equation exactly.

[5 marks]

$$x^2 + 14x + 30 = 0$$

Your solution must use your completed-square form.

Working / answer

Section C - Solve by Completing the Square

You must use completing the square. Give exact answers unless the question states otherwise.

11. Solve by completing the square.

[4 marks]

$$x^2 + 6x - 7 = 0$$

Working / answer

12. Solve by completing the square. Give your answers in exact form.

[4 marks]

$$x^2 - 4x - 1 = 0$$

Working / answer

13. Solve by completing the square. Give your answers in exact form.

[5 marks]

$$2x^2 + 8x - 3 = 0$$

Working / answer

Section C - Solve by Completing the Square

14. Solve by completing the square. Give your answers in exact form.

[5 marks]

$$3x^2 - 12x + 5 = 0$$

Working / answer

15. Solve by completing the square. Give your answers in exact form and simplify any surds.

[5 marks]

$$4x^2 + 20x + 7 = 0$$

Working / answer

CHECK BEFORE YOU FINISH

Have you factorised fully? Used a common denominator correctly? Kept signs accurate? Shown the completed-square step before solving? Simplified exact answers?