

GCSE MATHEMATICS - HIGHER TIER

Algebraic Fractions

Exam-Style Question Set

STUDENT DETAILS

Name: _____

Date: _____ Target grade / level: _____

ASSIGNMENT FOCUS

- Simplify algebraic fractions by factorising and cancelling common factors
- Multiply and divide algebraic fractions
- Add and subtract fractions using a common denominator
- Write algebraic expressions as a single fraction in simplest form
- Solve equations involving algebraic fractions, including equations leading to quadratics
- Practise both non-calculator and calculator Higher-tier question styles

Original K Education Centre questions informed by Pearson Edexcel GCSE Mathematics (1MA1) Higher assessment style.

Section A - Non-Calculator

Do not use a calculator. Give algebraic answers in their simplest form and show every stage of your working.

1. Simplify fully

$$\frac{12x^3y^2}{18xy^4}$$

[2 marks]

2. Simplify fully

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

[3 marks]

3. Simplify fully

$$\frac{3x}{x-4} \times \frac{x^2-16}{6x^2}$$

[3 marks]

Section A - Non-Calculator

Continue to simplify fully. Show factorisation clearly where it is needed.

4. Simplify fully

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

[3 marks]

5. Write

$$\frac{2x + 3}{4x} + \frac{5}{8}$$

as a single fraction in its simplest form.

[3 marks]

Section A - Non-Calculator

Use a suitable common denominator.

6. Write

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

as a single fraction in its simplest form.

[3 marks]

7. Write

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

as a single fraction in its simplest form.

[3 marks]

8. Show that

$$\frac{1}{2x} + \frac{1}{3y} + \frac{3y-2x}{6xy} = \frac{1}{x}$$

Show every stage of your algebra.

[3 marks]

Section A - Non-Calculator

Solve each equation algebraically.

9. Solve

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

[3 marks]

Answer: _____

10. Solve

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

[3 marks]

Answer: _____

Section B - Calculator

A calculator may be used. Show enough working to make your method clear.

11. Simplify

$$\frac{x^2 - 16}{x - 4}$$

and hence find its value when $x = 3.7$.

[3 marks]

Answer: _____

12. Simplify fully

$$\frac{2x^2 + 7x + 3}{4x^2 - 1}$$

Then find its value when $x = 2.6$. Give your answer to 3 significant figures.

[4 marks]

Answer: _____

Section B - Calculator

Work accurately and give numerical answers to the stated degree of accuracy.

13. Solve

$$\frac{3x + 2}{x - 1} = 4.6$$

Give your answer to 3 significant figures.

[3 marks]

Answer: _____

14. Write

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

as a single fraction in its simplest form.

[4 marks]

15. Show that

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

Show the factorisation used.

[3 marks]

Section B - Calculator

Some equations in this section lead to quadratic equations.

16. Solve

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

Give both solutions to 3 significant figures.

[5 marks]

Answer: _____

17. A rectangle has area

$$6x^2 - 19x - 7 \text{ cm}^2$$

and width $3x + 1$ cm.

(a) Write an expression for the length of the rectangle in its simplest form.

(b) When $x = 4.8$, calculate the length of the rectangle.

[4 marks]

Answer: _____

Section B - Calculator

Higher-tier algebraic fraction problems.

18. Simplify fully

$$\frac{x+4}{x^2+x-6} \div \frac{x+4}{x^2-9} + \frac{2}{x-2}$$

[5 marks]

19. Write

$$\frac{4x+y}{12xy} + \frac{2}{3x} - \frac{5y-2x}{6xy}$$

as a single fraction in its simplest form.

[4 marks]

Section B - Calculator

Final challenge.

20. Solve

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

Give both solutions to 3 significant figures.

[5 marks]

Answer: _____

Check before you finish: Have you factorised fully, used correct common denominators, shown reciprocals when dividing fractions, and checked that your final expressions are simplified?