

# Algebraic Fractions and Proof

ANSWERS

Calculator | 30 minutes | Total marks: 29

Name ..... Class .....

1 Simplify fully

(a)  $\frac{6x^2y}{9xy^3}$

Answer  $\frac{2x}{3y^2}$  (1)(1) [2 marks]

(b)  $\frac{x^2 + 5x}{x^2 - 25}$

$$\frac{x(x+5)}{(x+5)(x-5)} \quad (1)(1)$$

Answer  $\frac{x}{x-5}$  (1) [3 marks]

(c)  $\frac{x^2 + 5x + 6}{x^2 + x - 2}$

$$\frac{(x+2)(x+3)}{(x+2)(x-1)} \quad (1)(1)$$

Answer  $\frac{x+3}{x-1}$  (1) [3 marks]

2 Write as a single fraction in its simplest form

(a)  $\frac{3}{x} + \frac{2}{x+1}$

$$\frac{3(x+1) + 2x}{x(x+1)} \quad (1)(1)$$

Answer  $\frac{5x+3}{x(x+1)}$  (1) [3 marks]

(b)  $\frac{x+1}{2} - \frac{x-3}{5}$

$$\frac{5(x+1) - 2(x-3)}{10} \quad (1)(1)$$

Answer  $\frac{3x+11}{10}$  (1) [3 marks]

3

Simplify fully

(a)  $\frac{x^2-9}{4} \times \frac{8}{x+3}$

$$\frac{(x+3)(x-3)}{4} \times \frac{8}{x+3} \quad (1)(1)$$

Answer  $2(x-3) \quad (1)$

[3 marks]

(b)  $\frac{x}{x+2} \div \frac{x^2}{3}$

$$\frac{x}{x+2} \times \frac{3}{x^2} \quad (1)$$

Answer  $\frac{3}{x(x+2)} \quad (1)$

[2 marks]

4

Solve  $\frac{6}{x} - \frac{6}{x+1} = 1$

$$6(x+1) - 6x = x(x+1) \quad (1)$$

$$x^2 + x - 6 = 0 \quad (1)$$

$$(x+3)(x-2) = 0 \quad (1)$$

$x = 2 \text{ or } -3 \quad (1)$

[4 marks]

5

Prove that  $(n+3)^2 - (n+1)^2$  is always a multiple of 4 when  $n$  is a whole number.

$$n^2 + 6n + 9 - (n^2 + 2n + 1) \quad (1)$$

$$= 4n + 8 \quad (1)$$

$$= 4(n+2), \text{ which is a multiple of 4} \quad (1)$$

[3 marks]

6

Prove that the sum of two consecutive odd numbers is always a multiple of 4

$$2n + 1 \text{ and } 2n + 3 \text{ (1)}$$

$$2n + 1 + 2n + 3 = 4n + 4 \text{ (1)}$$

$$= 4(n + 1), \text{ which is a multiple of 4 (1)}$$

[3 marks]

| Question | Topic                                            | RAG |
|----------|--------------------------------------------------|-----|
| 1        | I can simplify algebraic fractions               |     |
| 2        | I can add and subtract algebraic fractions       |     |
| 3        | I can multiply and divide algebraic fractions    |     |
| 4        | I can solve an equation with algebraic fractions |     |
| 5        | I can prove a result by expanding                |     |
| 6        | I can set up and complete an algebraic proof     |     |