Algebraic Fractions

GCSE Mathematics • **Higher Tier** • Grades 8–9 • Non-calculator

WORKED SOLUTIONS

Name: worked example Class: _____ Total: 62 / 62

Show all your working. Marks are given for correct method as well as the final answer.

1. Simplify $\frac{6x}{9}$. **[1 mark]**

divide top and bottom by 3

Answer: $\frac{2x}{3}$

2. Simplify $\frac{x^2}{x^5}$. **[2 marks]**

subtract the powers

Answer: $\frac{1}{x^3}$

3. Simplify $\frac{4x^3}{12x}$. **[2 marks]**

$4 \div 12 = \frac{1}{3}$
$x^3 \div x = x^2$

Answer: $\frac{x^2}{3}$

4. Simplify $\frac{2x+6}{4}$. **[2 marks]**

factorise the top: $2(x + 3)$
cancel the 2

Answer: $\frac{x+3}{2}$

5. Simplify $\frac{3x+12}{x+4}$. **[3 marks]**

top = $3(x + 4)$
cancel $(x + 4)$ a whole FACTOR

Answer: 3

6. Simplify $\frac{x^2-9}{x+3}$. **[3 marks]**

top is DOTS: $(x + 3)(x - 3)$
cancel $(x + 3)$

Answer: $x - 3$

7. Simplify $\frac{x^2-16}{x^2+5x+4}$. **[4 marks]**

top: $(x + 4)(x - 4)$
bottom: $(x + 4)(x + 1)$
cancel $(x + 4)$

Answer: $\frac{x-4}{x+1}$

8. Simplify $\dfrac{x^2+7x+10}{x^2+3x-10}$. **[4 marks]**

top: $(x+5)(x+2)$
bottom: $(x+5)(x-2)$
cancel $(x+5)$
what is LEFT is x+2 over x−2

Answer: $\frac{x+2}{x-2}$

9. Simplify $\dfrac{2x^2+5x-3}{x^2-9}$. **[4 marks]**

top: $(2x-1)(x+3)$
bottom: $(x+3)(x-3)$
cancel $(x+3)$

Answer: $\frac{2x-1}{x-3}$

10. Explain why $\dfrac{x+4}{x}$ does NOT simplify to 4. **[2 marks]**

the top is a SUM, not a product
you can only cancel whole factors

Answer: x is a term, not a factor

11. Simplify $\dfrac{x}{3}\times\dfrac{6}{x^2}$. **[3 marks]**

tops: $6x$
bottoms: $3x^2$
cancel to $\frac{2}{x}$

Answer: $\frac{2}{x}$

12. Simplify $\dfrac{x+2}{5}\times\dfrac{10}{x+2}$. **[3 marks]**

$(x+2)$ cancels
$\frac{10}{5} = 2$

Answer: 2

13. Simplify $\dfrac{x}{4}\div\dfrac{x}{8}$. **[3 marks]**

KEEP, FLIP, CHANGE
$\frac{x}{4}\times\frac{8}{x} = 2$

Answer: 2

14. Simplify $\dfrac{x}{3}+\dfrac{x}{4}$. **[3 marks]**

common denominator 12
$\frac{4x}{12} + \frac{3x}{12}$

Answer: $\frac{7x}{12}$

15. Simplify $\dfrac{2x}{5}-\dfrac{x}{3}$. **[3 marks]**

common denominator 15
$\frac{6x}{15} - \frac{5x}{15}$

Answer: $\frac{x}{15}$

16. Write $\frac{1}{x} + \frac{1}{y}$ as a single fraction. **[3 marks]**

common denominator xy

$\frac{y}{xy} + \frac{x}{xy}$

Answer: $\frac{y+x}{xy}$

17. Write $\frac{2}{x} + \frac{3}{x+1}$ as a single fraction. **[4 marks]**

common denominator x(x + 1)

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

top: 2x + 2 + 3x = 5x + 2

Answer: $\frac{5x+2}{x(x+1)}$

18. Write $\frac{3}{x-2} - \frac{1}{x}$ as a single fraction. **[4 marks]**

common denominator x(x – 2)

$\frac{3x}{x(x-2)} - \frac{x-2}{x(x-2)}$

top: 3x – x + 2 = 2x + 2

Answer: $\frac{2x+2}{x(x-2)}$

19. Solve $\frac{x}{2} + \frac{x}{3} = 5$. **[4 marks]**

common denominator 6: $\frac{5x}{6} = 5$

5x = 30

x = 6

Answer: x = 6

20. Simplify $\frac{x^2-4}{x^2-x-6}$.

(a) Factorise the numerator and the denominator. **[3 marks]**

top: (x + 2)(x – 2)

bottom: (x – 3)(x + 2)

(b) Hence simplify the fraction fully. **[2 marks]**

cancel (x + 2)

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

Answer: $\frac{x-2}{x-3}$

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