

# Solving Algebraic Fractions Mastery

## *Practice Worksheet*

**I DO**

Solve the equation:

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

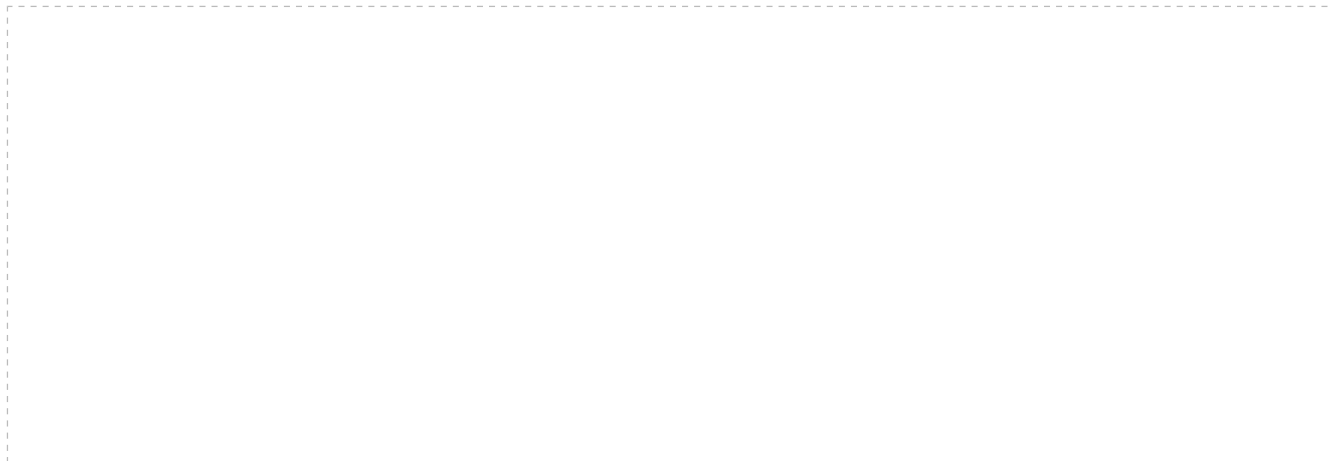
Show clear algebraic working.

## WE DO

Solve the equation:

$$\frac{5}{x-2} + \frac{2}{x+1} = 2$$

Show clear algebraic working.

A large dashed rectangular box intended for the student to show their algebraic working for solving the equation.

**YOU DO 1**

Solve the equation:

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

Show clear algebraic working.

**YOU DO 2**

Solve the equation:

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

Show clear algebraic working.

**CHALLENGE**

Solve the equation:

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

Give your answers in the form  $a \pm b\sqrt{10}$ , where  $a$  and  $b$  are integers.

Show clear algebraic working.

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ANSWERS & WORKED SOLUTIONS

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**I Do**

**Step 1:** Create a single fraction on the left by finding a common denominator:

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

**Step 2:** Expand and simplify the numerator:  $6x + 3 - 4x + 8 = 2x + 11$

**Step 3:** Multiply both sides by the denominator:  $2x + 11 = 2(x - 2)(2x + 1)$

**Step 4:** Expand the right hand side:  $2x + 11 = 2(2x^2 - 3x - 2) \rightarrow 2x + 11 = 4x^2 - 6x - 4$

**Step 5:** Rearrange to form a quadratic equation equal to zero:  $4x^2 - 8x - 15 = 0$

**Step 6:** Factorise the quadratic:  $(2x - 5)(2x + 3) = 0$

**Step 7:** Solve for x:  $2x - 5 = 0 \rightarrow x = 2.5$ , or  $2x + 3 = 0 \rightarrow x = -1.5$ . **Answer:  $x = 2.5$ ,  $x = -1.5$**

## We Do

**Step 1:** Multiply both sides by  $(x - 2)(x + 1)$  to clear the fractions:

$$5(x + 1) + 2(x - 2) = 2(x - 2)(x + 1)$$

**Step 2:** Expand the left hand side:  $5x + 5 + 2x - 4 = 7x + 1$

**Step 3:** Expand the right hand side:  $2(x^2 - x - 2) = 2x^2 - 2x - 4$

**Step 4:** Equate and rearrange to form a quadratic:  $7x + 1 = 2x^2 - 2x - 4 \rightarrow 2x^2 - 9x - 5 = 0$

**Step 5:** Factorise:  $(2x + 1)(x - 5) = 0$

**Step 6:** Solve for x. **Answer:**  $x = -0.5, x = 5$

**ANSWERS & WORKED SOLUTIONS (CONTINUED)**

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**You Do 1**

**Step 1:** Multiply through by  $(x - 1)(x + 2)$ :

$$4(x + 2) - 2(x - 1) = 1(x - 1)(x + 2)$$

**Step 2:** Expand both sides:  $4x + 8 - 2x + 2 = x^2 + x - 2$

**Step 3:** Simplify the left hand side:  $2x + 10 = x^2 + x - 2$

**Step 4:** Rearrange to form a quadratic:  $x^2 - x - 12 = 0$

**Step 5:** Factorise:  $(x - 4)(x + 3) = 0$

**Step 6:** Solve for x. **Answer:**  $x = 4$ ,  $x = -3$

## You Do 2

**Step 1:** Multiply through by  $(2x - 1)(x + 2)$ :

$$6(x + 2) - 1(2x - 1) = 1(2x - 1)(x + 2)$$

**Step 2:** Expand both sides:  $6x + 12 - 2x + 1 = 2x^2 + 3x - 2$

**Step 3:** Simplify the left hand side:  $4x + 13 = 2x^2 + 3x - 2$

**Step 4:** Rearrange to form a quadratic:  $2x^2 - x - 15 = 0$

**Step 5:** Factorise:  $(2x + 5)(x - 3) = 0$

**Step 6:** Solve for x. **Answer:  $x = -2.5$ ,  $x = 3$**

**ANSWERS & WORKED SOLUTIONS (CONTINUED)**

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## Challenge

**Step 1:** Multiply every term by  $x(x - 1)(x + 2)$  to clear all denominators:

$$2(x - 1)(x + 2) + 3x(x + 2) = 4x(x - 1)$$

**Step 2:** Expand the brackets:  $2(x^2 + x - 2) + 3x^2 + 6x = 4x^2 - 4x$

**Step 3:** Distribute the 2:  $2x^2 + 2x - 4 + 3x^2 + 6x = 4x^2 - 4x$

**Step 4:** Collect like terms on the left:  $5x^2 + 8x - 4 = 4x^2 - 4x$

**Step 5:** Rearrange into a standard quadratic:  $x^2 + 12x - 4 = 0$

**Step 6:** Solve by completing the square:  $(x + 6)^2 - 36 - 4 = 0 \rightarrow (x + 6)^2 = 40$

**Step 7:** Square root both sides:  $x + 6 = \pm\sqrt{40} \rightarrow x + 6 = \pm 2\sqrt{10}$

**Step 8:** Isolate x. **Answer:**  $x = -6 \pm 2\sqrt{10}$