

Solving equations with variables on both sides:

Example:

$$5x - 4 = 2x + 3$$

Step 1: Move  $2x$  to the left side:

$$5x - 2x - 4 = 3$$

Step 2: Simplify:

$$3x - 4 = 3$$

Step 3: Move the  $4$  to the right:

$$3x = 3 + 4$$

Step 4: Simplify:

$$3x = 7$$

Step 5: Divide by  $3$ :

$$\frac{3x}{3} = \frac{7}{3}$$

Step 6: On the left,  $\frac{3}{3} = 1$ :

$$x = \frac{7}{3}$$

Example of an equation with the distributive property:  $2(x+3) = 5$

1) Distribute the 2 into the parenthesis:  $2 \cdot x + 2 \cdot 3 = 5$

2) Now do the multiplications:  $2x+6=5$

3) Subtract 6 from both sides:  $2x=5-6$

4) Simplify:  $2x=-1$

5) Divide by 2:  $\frac{2x}{2} = \frac{-1}{2}$

6)  $\frac{2}{2} = 1$ :  $x = \frac{-1}{2}$

---

Example of an equation with fractions in the equation:  $\frac{1}{2}x + \frac{3}{2} = \frac{5}{2}$

Step 1) Clear away the denominators by multiplying by the LCD

This means multiply both sides by 2.

$$2 \cdot \left( \frac{1}{2}x + \frac{3}{2} = \frac{5}{2} \right)$$

Step 2) Carry out the multiplication:  $2 \cdot \frac{1}{2}x + 2 \cdot \frac{3}{2} = 2 \cdot \frac{5}{2}$

Step 3) Cancel the 2's:  $1x + 3 = 5$

Step 4) At this point, we have something we've seen before. Subtract 3:  $1x = 5 - 3$

Step 5) Simplify:  $1x = 2$

Step 6) Rewrite 1x as just x:  $x = 2$

Example of an equation with fractions in the equation:  $\frac{1}{4}x + \frac{3}{2} = \frac{5}{2}$

1) Find the LCD: The multiples of 4:  $4 = 4 \cdot 1, 4 \cdot 2, 4 \cdot 3 = 4, 8, 12$   
 $2 = 2 \cdot 1, 2 \cdot 2, 2 \cdot 3 = 2, 4, 6$

2) Because 4 is the lowest number shared between the two lists above, it's the LCD.

3) We multiply both sides of the equation by 4:  $4 \cdot \left( \frac{1}{4}x + \frac{3}{2} = \frac{5}{2} \right)$

4) Distribute the 4 into the parenthesis:  $4 \cdot \frac{1}{4} \cdot x + 4 \cdot \frac{3}{2} = 4 \cdot \frac{5}{2}$

5) Simplify by regrouping:  $\left( \frac{4}{4} \right) \cdot x + \left( \frac{4}{2} \right) \cdot 3 = \left( \frac{4}{2} \right) \cdot 5$

6) Simplify by dividing:  $1x + 2 \cdot 3 = 2 \cdot 5$

7) Simplify by multiplying:  $1x + 6 = 10$

8) Subtract 6 from both sides:  $1x = 4$

9) Now rewrite 1x as just x:  $x = 4$

Example of an equation with decimals in the equation:  $0.2x+0.3=0.9$

Because we have 0.2, 0.3, and 0.9, multiply both sides by 10 to get rid of the decimal.

0.2 is also  $\frac{2}{10}$  ,    0.3 is also  $\frac{3}{10}$     ,    0.9 is also  $\frac{9}{10}$

1) Multiply both sides by 10 because we have only the 10th's decimal place:

$$10(0.2x+0.3) = 10(0.9)$$

2) Distribute the 10:

$$10 \cdot 0.2 \cdot x + 10 \cdot 0.3 = 10 \cdot 0.9$$

$$10(0.2) = 2, 10(0.3) = 3$$

$$10(0.9) = 9$$

3) Carry out the multiplications:

$$2x + 3 = 9$$

4) Subtract 3 from both sides:

$$2x = 9 - 3$$

5) Simplify:

$$2x = 6$$

6) Divide both sides by 2:

$$\frac{2x}{2} = \frac{6}{2}$$

7) Simplify:

$$x = 3$$