

## Concept: Solving Multi-Step Equations

Name: \_\_\_\_\_

### Warm Up

Recall: A two-step equation requires 2 operations in order to isolate and solve for the variable.

Solve each two-step equation below. Show all your steps.

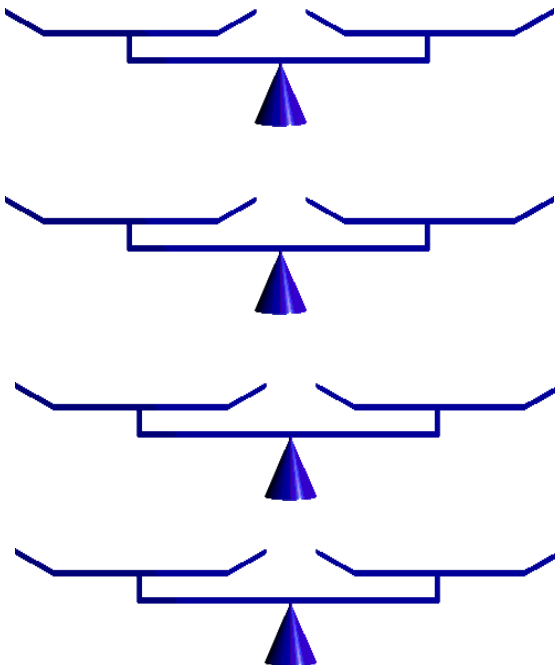
(a)  $4x + 3 = 23 - 3$

(b)  $12m - 4 = 104$

(c)  $24 = 20 - \frac{t}{3}$

(d)  $1.5 + 3z = 8.1$

### Try This One:

Equation	Corresponding Tile Representation
$3x - 2 = x + 4$	

(You can check your answer with the computer later)	
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### COMPUTER COMPONENT

**Instructions:** In follow the **Content Menu** path:

**Equations > Solving Multi-Step Equations**

Work through all Sub Lessons of the following Lessons **in order**:

- *Our Problem*
- *Examples With Tiles*
- *Examples Without Tiles*

Additional Required Materials: *Pencil Crayons (red and blue)*

NOTE: You will not be finishing the entire section before stopping to complete some **OFF COMPUTER EXERCISES**.

As you work through the computer exercises, you will be prompted to make notes in your notebook/math journal.

When you reach the end of the lesson *Concepts – Examples without Tiles* on the computer, move on to the **OFF COMPUTER EXERCISES** below.

### NOTES:

#### Remember:

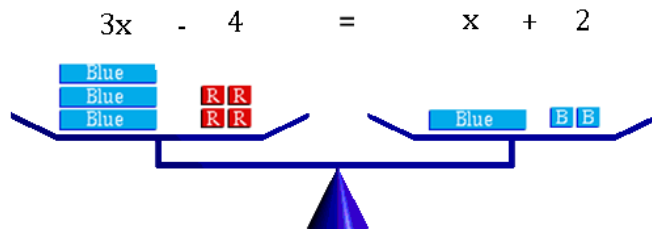
Tile	Represents
<div style="background-color: blue; color: white; padding: 2px 10px; display: inline-block;">Blue</div>	
<div style="background-color: red; color: white; padding: 2px 10px; display: inline-block;">Red</div>	
<div style="background-color: blue; color: white; padding: 2px 10px; display: inline-block;">Blue</div> <div style="background-color: red; color: white; padding: 2px 10px; display: inline-block;">Red</div>	

Solve the following examples with tiles as you fill in the blanks and keep the balance balanced:

1. Solve  $3x - 4 = x + 2$

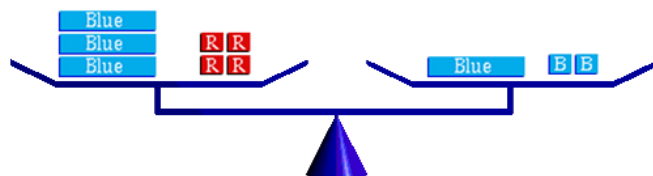
**Step 1**

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



**Step 2**

$$3x \quad - 4 = x \quad + 2$$

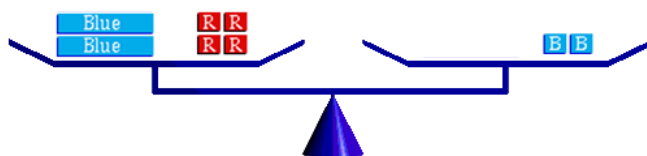


*Group all x tile on 1 side of the balance  
Hint: Draw the appropriate number of red tiles over the blue tiles.*

*Remember to keep the balance balanced.*

**Step 3 Simplify**

$$\quad x - 4 = \quad$$

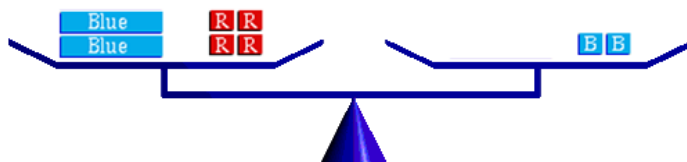


*Simplify*

*Remember to keep the balance balanced.*

**Step 4**

$$2x - 4 \quad = 2 + \quad$$



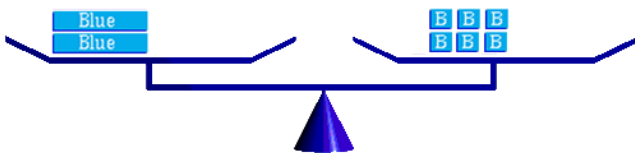
*Isolate the x tiles*

*Hint: Draw the appropriate number of blue tiles (+1) over the red tiles (-1).*

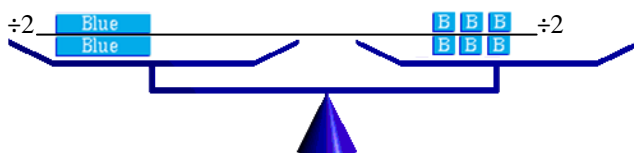
*Remember to keep the balance balanced.*

**Step 5 Simplify**

$$\underline{\hspace{2cm}} \quad x = \underline{\hspace{2cm}}$$


**Step 6**

$$\underline{\hspace{2cm}} \quad \frac{2x}{\hspace{1cm}} = \frac{6}{\hspace{1cm}} \quad \underline{\hspace{2cm}}$$

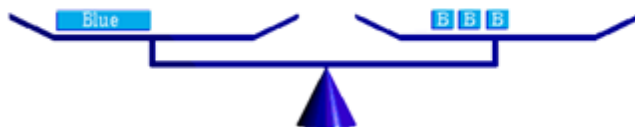


*Rearrange each side into 2 equal groups.*

*\_\_\_\_\_ each side by 2*

**Step 7 Simplify**

$$x = \underline{\hspace{2cm}}$$


**Step 8 Check**

<b>Left Side</b>	=	<b>3x</b>	-	<b>4</b>
	=	<b>3( )</b>	-	<b>4</b>
	=	_____	-	<b>4</b>
	=	_____		
<b>Right Side</b>	=	<b>x</b>	+	<b>2</b>
	=	<b>( )</b>	+	<b>2</b>
	=	_____		
	=	_____		

L.S. = R.S., the solution  $x = \underline{\hspace{2cm}}$  is correct.

**Review**

A multi-step equation is an equation that requires \_\_\_\_\_ steps in order to solve it.

**Fill in the steps to the examples and complete the step instructions by filling in the blanks:**

(a) Solve the following equation  $3x - 4 = 6x + 5$ .

$$3x - 4 = 6x + 5$$

**Step 1**

\_\_\_\_\_ the equation.

$$3x - \underline{\quad} - 4 = 6x - \underline{\quad} + 5$$

**Step 2**

\_\_\_\_\_ all \_\_\_\_\_ variables together

(Keep the balance balanced)

Perform the same operations; \_\_\_\_\_,

or \_\_\_\_\_ the same quantity

from \_\_\_\_\_ sides.

$$-4 = \underline{\quad} x + 5$$

**Step 3**

\_\_\_\_\_

$$-4 - \underline{\quad} = \underline{\quad} x + 5 - \underline{\quad}$$

**Step 4**

\_\_\_\_\_ the term containing \_\_\_\_\_.

\_\_\_\_\_ or \_\_\_\_\_ the

\_\_\_\_\_ number from

\_\_\_\_\_ sides.

$$\underline{\quad} = \underline{\quad} x$$

**Step 5**

\_\_\_\_\_

$$\underline{\hspace{2cm}} = \underline{\hspace{2cm}} x$$

**Step 6**

\_\_\_\_\_ the \_\_\_\_ variable.

(Keep the balance balanced)

Perform the same operations; \_\_\_\_\_,  
or \_\_\_\_\_ sides by  
the same number.

$$\underline{\hspace{2cm}} = x$$

**Step 7**

\_\_\_\_\_

**Step 8**

\_\_\_\_\_

$$\begin{aligned} \text{Left Side} &= 3x - 4 \\ &= 3(\underline{\hspace{1cm}}) - 4 \\ &= \underline{\hspace{1cm}} - 4 \\ &= \underline{\hspace{1cm}} \end{aligned}$$

$$\begin{aligned} \text{Right Side} &= 6x + 5 \\ &= 6(\underline{\hspace{1cm}}) + 5 \\ &= \underline{\hspace{1cm}} + 5 \\ &= \underline{\hspace{1cm}} \end{aligned}$$

Substitute the \_\_\_\_\_

\_\_\_\_\_

sides are \_\_\_\_\_.

L.S. = R.S., the solution  $x = \underline{\hspace{1cm}}$  is correct.

(b) Solve the following equation  $2(x + 6) = 4x$ .

$$2(x + 6) = 4x$$

**Step 1**

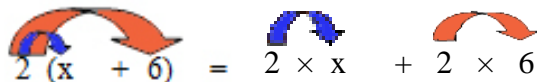
\_\_\_\_\_ the equation.

$$\underline{\quad} x + \underline{\quad} = 4x$$

**Step 2**

\_\_\_\_\_ the \_\_\_\_\_.

Remember:



$$2(x + 6) = 2 \times x + 2 \times 6$$

$$2x \underline{\quad} + 12 = 4x \underline{\quad}$$

**Step 3**

\_\_\_\_\_ all \_\_\_\_\_ variables together

(Keep the balance balanced)

Perform the same operations; \_\_\_\_\_,

or \_\_\_\_\_ the same quantity

from \_\_\_\_\_ sides.

$$12 = \underline{\quad} x$$

**Step 4**

\_\_\_\_\_

**Step 5**

\_\_\_\_\_ the term containing \_\_\_\_\_.

\_\_\_\_\_ or \_\_\_\_\_

the \_\_\_\_\_ number from

\_\_\_\_\_ sides.

$$\underline{12} = \underline{2x}$$

**Step 6**

\_\_\_\_\_

$$\underline{\quad} = x$$

$$\text{Left Side} = 2(x + 6)$$

$$= 2(\underline{\quad} + 6)$$

$$= 2(\underline{\quad})$$

$$= \underline{\quad}$$

$$\text{Right Side} = 4x$$

$$= 4(\underline{\quad})$$

$$= \underline{\quad}$$

L.S. = R.S., the solution  $x = \underline{\quad}$  is correct.

**Step 7**

\_\_\_\_\_

Substitute the \_\_\_\_\_

\_\_\_\_\_

sides are \_\_\_\_\_.

(c) Solve the following equation

$$\frac{8x + 3}{9} = \frac{3x - 1}{3}$$

$$\frac{8x + 3}{9} = \frac{3x - 1}{3}$$

**Step 1**

\_\_\_\_\_ the equation.

**Step 2**

\_\_\_\_\_ the \_\_\_\_\_.

Multiply \_\_\_\_\_ by the

\_\_\_\_\_.

*Need help with LCD – see: **Fractions:**  
Section 8 - **Adding Fractions**  
Lesson: **The Lowest Common Denominator.***

**Step 3**

\_\_\_\_\_

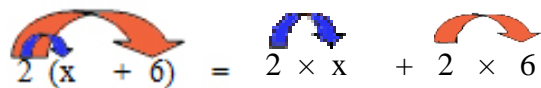
$$\underline{\quad} (8x + 3) = \underline{\quad} (3x - 1)$$



**Step 4**

$$\underline{\quad} x + \underline{\quad} = \underline{\quad} x - \underline{\quad}$$

Remember:



$$2(x + 6) = 2 \times x + 2 \times 6$$

**Step 5**

$$8x \underline{\quad} + 3 = 9x \underline{\quad} - 3$$

\_\_\_\_\_ like terms.

\_\_\_\_\_ or \_\_\_\_\_, the

\_\_\_\_\_ number or term from

 \_\_\_\_\_ sides, then **simplify**.

$$\underline{\quad} x + 3 = -3$$

**Step 6**

$$-1x + 3 \underline{\quad} = -3 \underline{\quad}$$

 \_\_\_\_\_ the term containing  
 \_\_\_\_\_.

\_\_\_\_\_ or \_\_\_\_\_, the

\_\_\_\_\_ number for \_\_\_\_\_ sides.

 Then **simplify**.

$$-1x = \underline{\quad}$$

**Step 7**

$$\underline{\quad} (-1x) = -6 \underline{\quad}$$

\_\_\_\_\_ the \_\_\_\_ variable.

(Keep the balance balanced)

Perform the same operations; \_\_\_\_\_,

or \_\_\_\_\_ for \_\_\_\_\_ sides.

*Hint: Try multiplying*

$$x = \underline{\quad}$$

 Then **simplify**.

**Step 8**

$$\text{Left Side} = \frac{8(\quad) + 3}{9}$$

$$= \frac{\quad + 3}{9}$$

$$= \frac{\quad}{9}$$

$$= \underline{\quad}$$

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 Substitute the 

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 sides are 

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$$\text{Right Side} = \frac{3(\quad) - 1}{3}$$

$$= \frac{\quad - 1}{3}$$

$$= \frac{\quad}{3}$$

$$= \underline{\quad}$$

.S. = R.S., the solution  $x = \underline{\quad}$  is correct.

Of the three examples, *pick the one that you felt was the most difficult and tell why.*

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**OFF COMPUTER EXERCISES**

1. Solve each equation. *Be sure to write out all of your steps and to check each answer.*

(a)  $6x + 14 = -5x - 8$

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

(c)  $2(x - 3) + (x + 3) = 6x$

(d)  $3(x - 10) = 5(4 - 3x) - 14$

(e)  $3x - 0.5 = 0.7$

$$(f) \quad 7(m - 1) - 2(m - 6) = 2(m + 5) + 1$$

$$(g) \quad \frac{5x + 6}{3} = \frac{3x + 4}{2}$$

$$(h) \quad 5 - \frac{4}{3}n = \frac{3}{4}n + 5$$