



Concept: Solving Two-Step Equations

Name: _____

COMPUTER COMPONENT

Instructions: Select the computer program *Understanding Equations* (Neufeld)
Follow the instructions to the Main Menu.
Select *Solving One-Step Equations* from the Main Menu.



Work through all sections of this topic **in order**:

- *Our Problem*
- *Concepts – Examples with Tiles*
- *Concepts – Examples without tiles*
- *Practice Questions*

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







As you work through the computer exercises, make your notes in the **NOTES** section of this page.

When you reach the end of the section *Practice Questions* on the computer, move on to the **OFF COMPUTER EXERCISES** below.

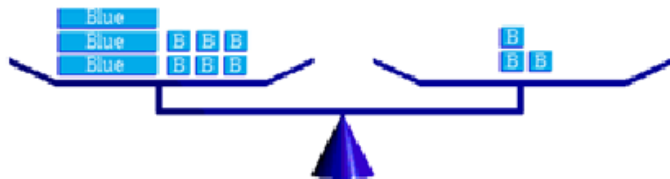
NOTES:

Remember:

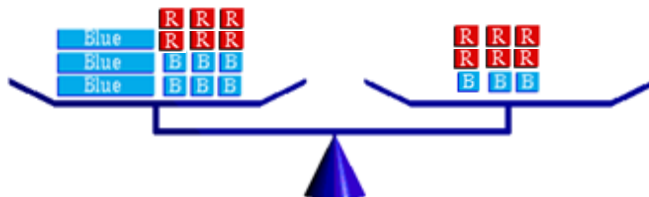
Tile	Represents
 Blue Tile	1
 Red Tile	-1
 + 	1-1 or 0

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

Step 1 $3x + 6 = 3$



Step 2 $3x + 6 - 6 = 3 - 6$



Isolate the x tile

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

Remember to keep the balance balanced.

Simplify

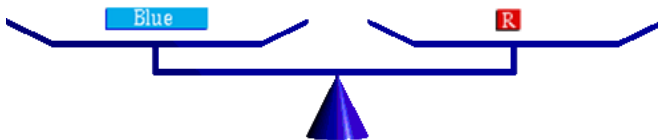
$$3x = -3$$



Simplify

Remember to keep the balance balanced.

Step 3 $\div 3$) $\frac{3x}{3} = \frac{-3}{3}$



$\therefore x = -1$

*Rearrange each side into 3 equal groups.
divide each side by 3.*

Of the four examples with tiles, pick the one that you felt was the most difficult and model the steps:

(Answers will vary)

Circle the step(s) that was (were) the most difficult and explain why it was (they were) complicated.

(Answers will vary)



Without Tiles

Fill in the blanks

Step 1: Rewrite the **equation**.

Step 2: **Isolate** the **x term**.

(Hint: Think of balancing the balance)

- Perform the **same** operation on **both** **sides** of the equation.
- Determine which operation; **(+), (-), (×), or (÷)** should be applied to **both** sides.

Step 3: **Simplify**

Step 4: **Isolate** the **x variable**

(Hint: Keep the balance balanced)

- Perform the **same** operation on **both** **sides** of the equation.
- Determine which operation; **(×) or (÷)** should be applied to **both** sides.

Step 5: **Simplify**

Step 6: **Check your answer in the original equation.**

Example:**Solve for x** (*fill in the blanks*)

Step 1: $7x + 9 = 51$

Step 2: $-9)$ $7x + 9 - 9 = 51 - 9$

Step 3: Simplify $7x = 42$

Step 4: $\div 7)$ $\frac{7x}{7} = \frac{42}{7}$

Step 5: Simplify $x = 6$

Step 6: Check

Left Side	=	$7x + 9$
	=	$7(6) + 9$
	=	$42 + 9$
	=	51

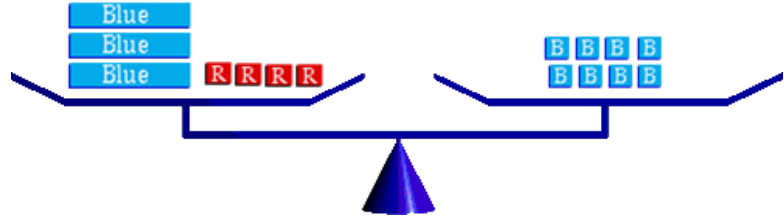
Right Side	=	51
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L.S. = R.S., the solution $x = 6$ is correct.

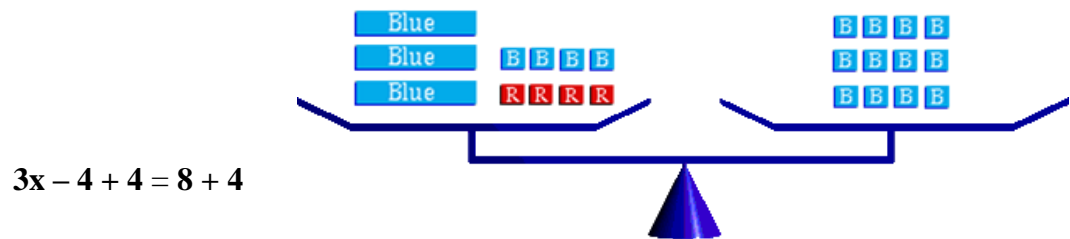
COMPUTER EXERCISES

1. Given the equation $3x - 4 = 8$

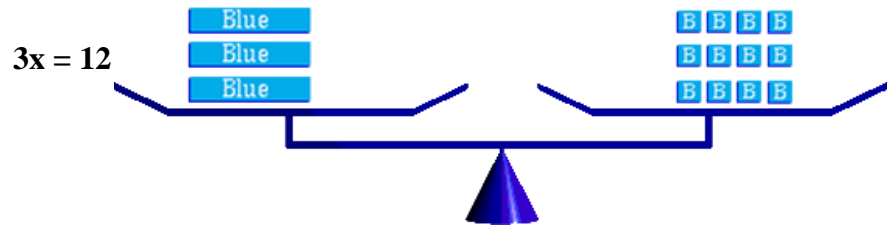
(a) Represent the equation on the balance by using tiles.



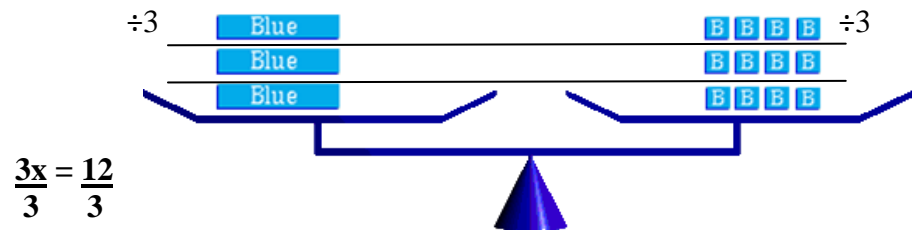
(b) Isolate the x tile by manipulating the tiles.



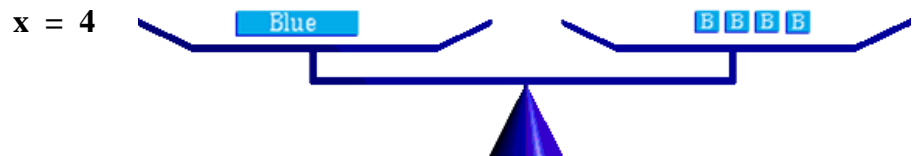
(c) Write the resulting equation and simplify it.



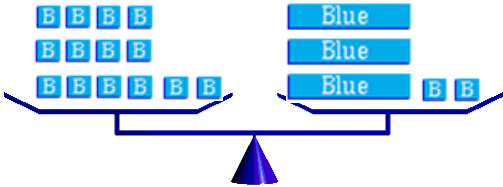
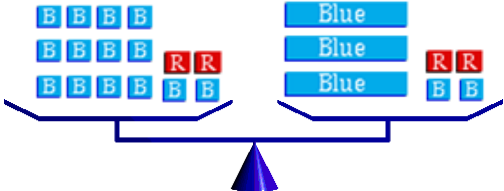
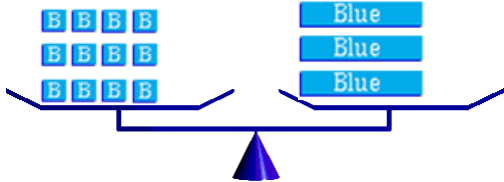
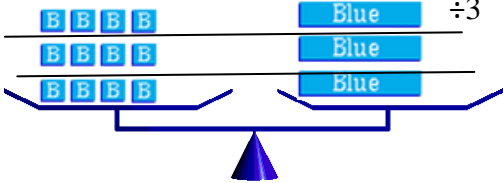
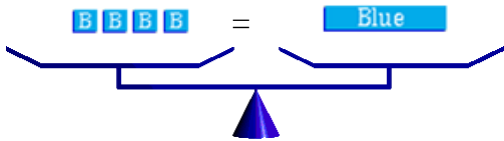
(d) Isolate the x tile by rearranging the tiles and perform the appropriate operation.



(e) Write the resulting equation and simplify it.



2. Solve each equation $14 = 3x + 2$ in two ways.

With the Balance	Without the Balance
	<p>Write the equation</p> $14 = 3x + 2$
	<p>Subtract 2 from both sides</p> $14 - 2 = 3x + 2 - 2$
	<p>Simplify</p> $12 = 3x$
<p>÷3</p> 	<p>Isolate x and divide both sides by 3</p> $\frac{12}{3} = \frac{3x}{3}$
	<p>Simplify</p> $4 = x$
	<p>Check:</p> $\begin{aligned} \text{L.S.} &= 14 & \text{R.S.} &= 3x + 2 \\ & & &= 3(4) + 2 \\ & & &= 12 + 2 \\ & & &= 14 \end{aligned}$ <p>L.S. = R.S., the solution $x = 4$ is correct.</p>

(a) Which method did you prefer? Why?

(Answers will vary)

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

$$\begin{array}{l}
 \text{(a)} \quad 2x - 5 = 7 \\
 +5) \quad 2x - 5 + 5 = 7 + 5 \\
 \quad \quad 2x = 12 \\
 \div 2) \quad \frac{2x}{2} = \frac{12}{2} \\
 \quad \quad x = 6
 \end{array}$$

$$\begin{array}{l}
 \text{(b)} \quad -5y + 3 = 8 \\
 -3) \quad -5y + 3 - 3 = 8 - 3 \\
 \quad \quad -5y = 5 \\
 \div (-5) \quad \frac{-5y}{-5} = \frac{5}{-5} \\
 \quad \quad y = -1
 \end{array}$$

Check:

$$\begin{array}{l}
 \text{L.S.} = 2x - 5 \quad \text{R.S.} = 7 \\
 = 2(6) - 5 \\
 = 12 - 5 \\
 = 7
 \end{array}$$

L.S. = R.S

Therefore $x = 6$ is the correct solution.

Check:

$$\begin{array}{l}
 \text{L.S.} = -5y + 3 \quad \text{R.S.} = 8 \\
 = -5(-1) + 3 \\
 = 5 + 3 \\
 = 8
 \end{array}$$

L.S. = R.S

Therefore $y = -1$ is the correct solution.

$$\begin{aligned}
 \text{(c)} \quad & 3z - 7 = 11 \\
 +7) \quad & 3z - 7 + 7 = 11 + 7 \\
 & 3z = 18 \\
 \div 3) \quad & \frac{3z}{3} = \frac{18}{3} \\
 & z = 6
 \end{aligned}$$

Check:

$$\begin{aligned}
 \text{L.S.} &= 3z - 7 & \text{R.S.} &= 11 \\
 &= 3(6) - 7 \\
 &= 18 - 7 \\
 &= 11
 \end{aligned}$$

$$\text{L.S.} = \text{R.S.}$$

Therefore $z = 6$ is the correct solution.

$$\begin{aligned}
 \text{(d)} \quad & 25 = 2m + 5 \\
 -5) \quad & 25 - 5 = 2m + 5 - 5 \\
 & 20 = 2m \\
 \div 2) \quad & \frac{20}{2} = \frac{2m}{2} \\
 & 10 = m
 \end{aligned}$$

Check:

$$\begin{aligned}
 \text{L.S.} &= 25 & \text{R.S.} &= 2m + 5 \\
 & & &= 2(10) + 5 \\
 & & &= 20 + 5 \\
 & & &= 25
 \end{aligned}$$

$$\text{L.S.} = \text{R.S.}$$

Therefore $m = 10$ is the correct solution.

$$\begin{aligned}
 \text{(e)} \quad & 3 = 2a + 7 \\
 -7) \quad & 3 - 7 = 2a + 7 - 7 \\
 & -4 = 2a \\
 \div 2) \quad & \frac{-4}{2} = \frac{2a}{2} \\
 & -2 = a
 \end{aligned}$$

Check:

$$\begin{aligned}
 \text{L.S.} &= 3 & \text{R.S.} &= 2a + 7 \\
 & & &= 2(-2) + 7 \\
 & & &= -4 + 7 \\
 & & &= 3
 \end{aligned}$$

$$\text{L.S.} = \text{R.S.}$$

Therefore $a = -2$ is the correct solution.

$$\begin{aligned}
 \text{(f)} \quad & 0.9x - 0.4 = 3.2 \\
 +0.4) \quad & 0.9x - 0.4 + 0.4 = 3.2 + 0.4 \\
 & 0.9x = 3.6 \\
 \div 0.9) \quad & \frac{0.9x}{0.9} = \frac{3.6}{0.9} \\
 & x = 4
 \end{aligned}$$

Check:

$$\begin{aligned}
 \text{L.S.} &= 0.9x - 0.4 & \text{R.S.} &= 3.2 \\
 &= 0.9(4) - 0.4 \\
 &= 3.6 - 0.4 \\
 &= 3.2
 \end{aligned}$$

$$\text{L.S.} = \text{R.S.}$$

Therefore $x = 4$ is the correct solution.

$$\begin{aligned}
 \text{(g)} \quad & \frac{1}{3}r - 4 = 1 \\
 +4) \quad & \frac{1}{3}r - 4 + 4 = 1 + 4 \\
 & \frac{1}{3}r = 5 \\
 \times 3) \quad & 3 \times \frac{1}{3}r = 5 \times 3 \\
 & r = 15
 \end{aligned}$$

Check:

$$\begin{aligned}
 \text{L.S.} &= \frac{1}{3}r - 4 & \text{R.S.} &= 1 \\
 &= \frac{1}{3}(15) - 4 \\
 &= 5 - 4 \\
 &= 1
 \end{aligned}$$

L.S. = R.S**Therefore r = 15 is the correct solution.**

$$\begin{aligned}
 \text{(i)} \quad & 0.9x = 9 \\
 \div 0.9) \quad & \frac{0.9x}{0.9} = \frac{9}{0.9} \\
 & x = 10
 \end{aligned}$$

Check:

$$\begin{aligned}
 \text{L.S.} &= 0.9r & \text{R.S.} &= 9 \\
 &= 0.9(10) \\
 &= 9
 \end{aligned}$$

L.S. = R.S**Therefore x = 10 is the correct solution.**

$$\begin{aligned}
 \text{(h)} \quad & \frac{1}{4}m + 2 = 5 \\
 -2) \quad & \frac{1}{4}m + 2 - 2 = 5 - 2 \\
 & \frac{1}{4}m = 3 \\
 \times 4) \quad & 4 \times \frac{1}{4}m = 3 \times 4 \\
 & m = 12
 \end{aligned}$$

Check:

$$\begin{aligned}
 \text{L.S.} &= \frac{1}{4}m + 2 & \text{R.S.} &= 5 \\
 &= \frac{1}{4}(12) + 2 \\
 &= 3 + 2 \\
 &= 5
 \end{aligned}$$

L.S. = R.S**Therefore m = 12 is the correct solution.**

$$\begin{aligned}
 \text{(j)} \quad & 7p - 1 = 34 \\
 +1) \quad & 7p - 1 + 1 = 34 + 1 \\
 & 7p = 35 \\
 \div 7) \quad & \frac{7p}{7} = \frac{35}{7} \\
 & p = 5
 \end{aligned}$$

Check:

$$\begin{aligned}
 \text{L.S.} &= 7p - 1 & \text{R.S.} &= 34 \\
 &= 7(5) - 1 \\
 &= 35 - 1 \\
 &= 34
 \end{aligned}$$

L.S. = R.S**Therefore p = 5 is the correct solution.**