

MTH1W Grade 9 Mathematics

## 2.5 Solving Simple Equations

- Goal(s)**
- Identify and use inverse operations to simplify equations and solve for unknown values
  - Simplify equations by collecting like terms
  - Verify solutions by comparing the left and right sides of the original equation value substituted for the variable

Page 82 #s 1ace, 2ace, 3ace, 4ace, 5ac,  
6acegik, 7, 8bdfh, 10, 12a

Page 84 #s 14, 15a, 18a, 20b, 21c

An equation is a mathematical statement that says two expressions are equal:

$$3x + 3 = 2x - 1$$

To **solve** an equation means to find the *value of the variable that makes the statement true*. This is also called finding the **root** of the equation.

Equations can be solved:

- using algebra tiles
- by inspection
- by isolating the variable using opposite operations while maintaining balance within the equation.

### Solving by Inspection

Sometimes it is possible to solve an equation by **inspection**, which means just looking at it and applying number sense.

$$x + 4 = 13$$

$$x = 9$$



$$5s = 25$$

$$s = 5$$



$$21 - y = 13$$

$$y = 8$$



$$w \div 4 = 3$$

$$w = 12$$



When an equation can't be solved by inspection, use **opposite operations** to isolate the variable and find the solution.

Operation	Opposite
+	-
-	+
×	÷
÷	×
$\square^2$	$\sqrt{\quad}$
$\sqrt{\quad}$	$\square^2$

In solving an equation, it is necessary to maintain **balance** within the equation. This means that *whatever is done to the left side of the equation, must also be done to the right side of the equation.*

$$17 + x = -23$$

← Here 17 is being added to x. In order to isolate x, 17 must be subtracted.

$$17 - 17 + x = -23 - 17$$

← To balance the equation, 17 is subtracted from both the left and right sides of the equation.

$$x = -40$$

Solve each equation by isolating the variable using opposite operations and maintaining balance within the equation.

a)  $-5 + y = -12$

$$-5 + y + 5 = -12 + 5$$

$$y = -7$$

b)  $t - 13 = 43$

$$t - 13 + 13 = 43 + 13$$

$$t = 56$$

c)  $4m = 124$

$$\frac{4m}{4} = \frac{124}{4}$$

$$m = 31$$

Solve each equation by isolating the variable using opposite operations and maintaining balance within the equation.

d)  $5w - 12w = 6 + 15$   
 $\frac{-7w}{-7} = \frac{21}{-7}$   
 $w = -3$

e)  $x^2 = 64$   
 $\sqrt{x^2} = \sqrt{64}$   
 $x = 8$  (could also be  $-8$ )

f)  $\sqrt{p} = 11$   
 $(\sqrt{p})^2 = 11^2$   
 $p = 121$

To check if your solution is correct, substitute the root into the left side and right side of the equation. Both sides must be equal.

Solve each equation by isolating the variable using opposite operations and maintaining balance within the equation. Check your answer.

**Solve**  
 $2x + 4x = 8 - 14$

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

$$x = -1$$

**Check**

$$\text{L.S.} = 2x + 4x \quad \text{R.S.} = 8 - 14$$

$$2(-1) + 4(-1) \quad 8 - 14$$

$$= -2 + -4 \quad -6$$

$$= -6$$

$$\text{LS} = \text{RS} \quad \checkmark$$