LESSON 4-2

# SECONDARY MATH 2

**CORE STANDARDS**
II.3.A.REI.7

OBJECTIVE

**1. SWBAT solve systems of equations in two variables involving one linear and one non-linear equation.**

NOTES

## Systems of Equations: Two Ways to Solve

**Below you can see two ways to solve the same example problem.**

### Algebraically

Solve the system: $\begin{cases} y = x + 2 \\ y = x^2 - 2x - 8 \end{cases}$

Solve linear equation for one variable. $y = x + 2$

(This one's already solved for *y*.)

Substitute into the non-linear equation. $y = x^2 - 2x - 8$

Now solve for *x*. $x + 2 = x^2 - 2x - 8$

It's quadratic, so set equal to zero. $x^2 - 3x - 10 = 0$

Use factoring or quadratic formula $(x - 5)(x + 2) = 0$

Solve for each *x*-value. $x = 5$ | $x = -2$

Plug each *x*-value into original linear equation. $y = x + 2$ | $y = x + 2$

Solve for *y*. $y = 5 + 2$ | $y = -2 + 2$

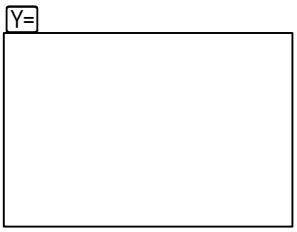
$y = 7$ | $y = 0$

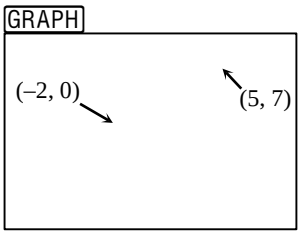
The ordered pair answers are then: $(5, 7)$ $(-2, 0)$

### Graphically

Solve the system: $\begin{cases} y = x + 2 \\ y = x^2 - 2x - 8 \end{cases}$

In order to graph the functions, they will both need to be solved for *y*, which is a possible disadvantage. Another trial will be getting an appropriate viewing window on the calculator. The intersections are the solutions to the system.



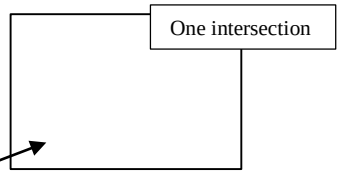




To find the intersections, press 2nd TRACE 5:intersect. Use arrow left or right to move cursor toward one intersection or the other. Then press ENTER three times. Repeat to find other intersection.

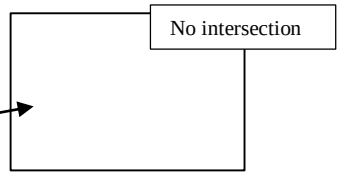
**Possible Outcomes**

**2-Solutions** Like the example above.

**1-Solution** The algebraic method would give only one solution for *x* and the graphical method might look like this:




**0-Solutions** The algebraic method would give only imaginary solutions for *x* and the graphical method might look like this:




EXAMPLES

**1.** Solve the system: $\begin{cases} y = x - 1 \\ x^2 + y^2 = 25 \end{cases}$

**2.** Solve the system: $\begin{cases} y = x + 4 \\ y = -x^2 \end{cases}$

PRACTICE **4-2**

NAME_____

**[SHOW YOUR WORK]**

Find all real solutions for each system, if they exist. **[IF USING THE GRAPHICAL METHOD, SKETCH A GRAPH.]**

1. $\begin{cases} y - x = 0 \\ x^2 + y^2 = 32 \end{cases}$

2. $\begin{cases} y = x - 9 \\ y = x^2 + 1 \end{cases}$

3. $\begin{cases} y = 5 \\ y = x^2 + 4x \end{cases}$

4. $\begin{cases} y = 6x - 9 \\ y = x^2 \end{cases}$

5. $\begin{cases} 2y + x = 8 \\ y = -x^2 + 8x \end{cases}$

6. $\begin{cases} x + y = 7 \\ x^2 + y^2 = 25 \end{cases}$

7. $\begin{cases} y = 3x + 5 \\ y + 2x^2 = 1 \end{cases}$

8. $\begin{cases} y = x + 12 \\ y = x^2 + 2x + 6 \end{cases}$

9. $\begin{cases} y = 4x - 18 \\ y = 2x^2 - 8x \end{cases}$

10. $\begin{cases} 4y - 4x = 15 \\ y = x^2 - 4x + 6 \end{cases}$

11. $\begin{cases} x = 6 \\ x^2 + y^2 = 61 \end{cases}$

12. $\begin{cases} y = -7x - 7 \\ y = -x^2 - 5x - 9 \end{cases}$

13. $\begin{cases} y = 9x - 2 \\ y = x^2 + 2x - 20 \end{cases}$

★ 14. Find the lengths of the 2 legs of the right triangle shown if the triangle's perimeter is 28.

*Hint: use Pythagorean Theorem*