

# Unit 7 Lesson 5: How Many Solutions?

## 1 Math Talk: Four Equations (Warm up)

### Student Task Statement

Decide whether each statement is true or false.

3 is the only solution to  $x^2 - 9 = 0$ .

A solution to  $x^2 + 25 = 0$  is -5.

$x(x - 7) = 0$  has two solutions.

5 and -7 are the solutions to  $(x - 5)(x + 7) = 12$ .

## 2 Solving by Graphing

### Student Task Statement

Han is solving three equations by graphing.

$$(x - 5)(x - 3) = 0$$

$$(x - 5)(x - 3) = -1$$

$$(x - 5)(x - 3) = -4$$

1. To solve the first equation,  $(x - 5)(x - 3) = 0$ , he graphed  $y = (x - 5)(x - 3)$  and then looked for the  $x$ -intercepts of the graph.

a. Explain why the  $x$ -intercepts can be used to solve  $(x - 5)(x - 3) = 0$ .

b. What are the solutions?

2. To solve the second equation, Han rewrote it as  $(x - 5)(x - 3) + 1 = 0$ . He then graphed  $y = (x - 5)(x - 3) + 1$ .

Use graphing technology to graph  $y = (x - 5)(x - 3) + 1$ . Then, use the graph to solve the equation. Be prepared to explain how you use the graph for solving.

3. Solve the third equation using Han's strategy.

4. Think about the strategy you used and the solutions you found.

a. Why might it be helpful to rearrange each equation to equal 0 on one side and then graph the expression on the non-zero side?

b. How many solutions does each of the three equations have?

### 3 Finding All the Solutions (Optional)

#### Student Task Statement

Solve each equation. Be prepared to explain or show your reasoning.

1.  $x^2 = 121$

2.  $x^2 - 31 = 5$

3.  $(x - 4)(x - 4) = 0$

4.  $(x + 3)(x - 1) = 5$

5.  $(x + 1)^2 = -4$

6.  $(x - 4)(x - 1) = 990$

## 4 Analyzing Errors in Equation Solving

### Student Task Statement

1. Consider  $(x - 5)(x + 1) = 7$ . Priya reasons that if this is true, then either  $x - 5 = 7$  or  $x + 1 = 7$ . So, the solutions to the original equation are 12 and 6.

Do you agree? If not, where was the mistake in Priya's reasoning?

2. Consider  $x^2 - 10x = 0$ . Diego says to solve we can just divide each side by  $x$  to get  $x - 10 = 0$ , so the solution is 10. Mai says, "I wrote the expression on the left in factored form, which gives  $x(x - 10) = 0$ , and ended up with two solutions: 0 and 10."

Do you agree with either strategy? Explain your reasoning.