Unit 6, Lesson 6

Squares and Square Roots

Let's compare equations with squares and square roots.

6.1 Math Talk: Four Squares

Find the solutions of each equation mentally.

- $x^2 = 4$
- $x^2 = 2$
- $x^2 = 0$
- $x^2 = -1$

6.2 Finding Square Roots

Clare was adding $\sqrt{4}$ and $\sqrt{9}$, and at first she wrote $\sqrt{4} + \sqrt{9} = 2 + 3$. But then she remembered that 2 and -2 both square to make 4, and that 3 and -3 both square to make 9.

She wrote down all the possible combinations:

2 + 3 = 5
2 + (-3) = -1
(-2) + 3 = 1
(-2) + (-3) = -5

Then she wondered, "Which of these are the same as $\sqrt{4} + \sqrt{9}$? All of them? Or only some? Or just one?"

How would you answer Clare's question? Give reasons that support your answer.

Are you ready for more?

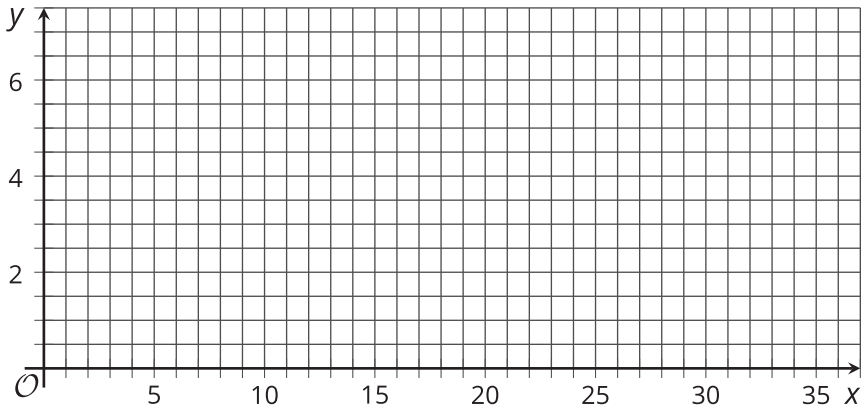
1. How many solutions are there to each equation?
   a. $x^3 = 8$
   b. $y^3 = -1$
   c. $z^4 = 16$
   d. $w^4 = -81$
2. Write a rule to determine how many solutions there are to the equation $x^n = m$ where n and m are non-zero integers.

6.3 One Solution or Two?

1. Complete the table.

x	0	1	4	9	16	25	36
$\sqrt{x}$							

2. Use the values from the table to plot seven points on the graph of $y = \sqrt{x}$. Then sketch the graph by smoothly connecting the points you drew.



3. Is the rule $y = \sqrt{x}$ a function? Explain your reasoning.

4. Explain how you could use the graph to find any solutions to the equation $\sqrt{x} = 5$. How many solutions are there?

5. Use the graph to approximate the value of $\sqrt{5}$. Explain your reasoning.

6. Approximate any solutions to the equation $x^2 = 20$. Explain your reasoning.

Lesson 6 Summary

To avoid confusion, we use the convention that $\sqrt{a}$ represents a single positive number (when a is positive). This allows us to easily describe both solutions to the equation $x^2 = a$. The solutions are $\sqrt{a}$ and $-\sqrt{a}$.

The equation $x^2 = 11$ has two solutions, because $\sqrt{11}^2 = 11$, and also $\left(-\sqrt{11}\right)^2 = 11$.

The equation $\sqrt{x} = 11$ only has one solution, namely 121.

The equation $\sqrt{x} = \sqrt{11}$ only has one solution, namely 11.

The equation $\sqrt{x} = -11$ doesn't have any solutions, because the left side is positive and the right side is negative, which is impossible, because a positive number cannot equal a negative number.