## 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?
	1. $x^{3}=8$
	2. $y^{3}=-1$
	3. $z^{4}=16$
	4. $w^{4}=-81$
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. The graph of $b=\sqrt{a}$ is shown.
* 
	1. Complete the table with the exact values and label the corresponding points on the graph with the exact values.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| * + $a$
 | * + 1
 | * + 4
 | * + 9
 | * + 12
 | * + 16
 | * + 20
 |
| * + $\sqrt{a}$
 |  |  |  |  |  |  |

* 1. Label the point on the graph that shows the solution to $\sqrt{a}=4$.
	2. Label the point on the graph that shows the solution to $\sqrt{a}=5$.
	3. Label the point on the graph that shows the solution to $\sqrt{a}=\sqrt{5}$.
1. The graph of $t=s^{2}$ is shown.
	1. Label the point(s) on the graph that show(s) the solution(s) to $s^{2}=25$.
	2. Label the point(s) on the graph that show(s) the solution(s) to $\sqrt{t}=5$.
	3. Label the point(s) on the graph that show(s) the solution(s) to $s^{2}=5$.
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### Lesson 6 Summary

The symbol $\sqrt{11}$ represents the *positive* square root of 11. If we want to represent the negative square root, we write $-\sqrt{11}$.

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.



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