## Lesson 2: Square Roots and Cube Roots

* Let’s think about square and cube roots.

### 2.1: It’s a Square

Find the area of square $ABCD$.



### 2.2: Squares and Their Side Lengths

1. Complete the table with the area of each square in square units, and its exact side length in units.
* 

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| * figure
 | * A
 | * B
 | * C
 | * D
 | * E
 |
| * area
 | *
 | *
 | *
 | *
 | *
 |
| * side length
 | *
 | *
 | *
 | *
 | *
 |

1. This table includes areas in square units and side lengths in units of some more squares. Complete the table.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| * area
 | * 9
 | *
 | * 23
 | *
 | * 89
 |
| * side length
 | *
 | * 4
 | *
 | * 6.4
 | *
 |

#### Are you ready for more?

In the first question, all of the squares have vertices at grid points.

1. Is there a square whose vertices are at grid points and whose area is 7 square units? Explain how you know.
2. Is there a square whose vertices are at grid points and whose area is 10 square units? Explain how you know.

### 2.3: Cube It



1. A cube has edge length 3 units. What is the volume of the cube?
2. A cube has edge length 4 units. What is the volume of the cube?
3. A cube has volume 8 units. What is the edge length of the cube?
4. A cube has volume 7 units. What is the edge length of the cube?
5. $\sqrt[3]{1,​200}$ is between 10 and 11 because $10^{3}=1,​000$ and $11^{3}=1,​331$. Determine the whole numbers that each of these cube roots lies between:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| * $\sqrt[3]{5}$
 | * $\sqrt[3]{10}$
 | * $\sqrt[3]{50}$
 | * $\sqrt[3]{100}$
 | * $\sqrt[3]{500}$
 |

*

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| between | 1 and 2 | 2 and 3 | 3 and 4 | 4 and 5 | 5 and 6 | 6 and 7 | 7 and 8 | 8 and 9 |
|   |   |   |   |   |   |   |   |   |

### Lesson 2 Summary

If a square has side length $s$, then the area is $s^{2}$. If a square has area $A$, then the side length is $\sqrt{A}$. For a positive number $b$, the square root of $b$ is defined as the positive number that squares to make $b$, and it is written as $\sqrt{b}$. In other words, $\left(\sqrt{b}\right)^{2}=b$. We can also think of $\sqrt{b}$ as a solution to the equation $x^{2}=b$. This square has an area of $b$ because its sides have length $\sqrt{b}$:



Similarly, if a cube has edge length $s$, then the volume is $s^{3}$. If a cube has volume $V$, then the edge length is $\sqrt[3]{V}$. The number $\sqrt[3]{a}$ is defined as the number that cubes to make $a$. In other words, $\left(\sqrt[3]{a}\right)^{3}=a$. We can also think of $\sqrt[3]{a}$ as a solution to the equation $x^{3}=a$. This cube has a volume of $a$ because its sides have length $\sqrt[3]{a}$:





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