- By definition $\sqrt{25}$ is the number you would multiply times itself to get 25 for an answer.

- Because we are familiar with multiplication, we know that $\sqrt{25} = 5$

- Numbers like 25, which have whole numbers for their square roots, are called **perfect squares**

- You need to **memorize** at least the first 15 perfect squares

Perfect square	Square root
1	$\sqrt{1} = 1$
4	$\sqrt{4} = 2$
9	$\sqrt{9} = 3$
16	$\sqrt{16} = 4$
25	$\sqrt{25} = 5$
36	$\sqrt{36} = 6$
49	$\sqrt{49} = 7$
64	$\sqrt{64} = 8$

Perfect square	Square root
81	$\sqrt{81} = 9$
100	$\sqrt{100} = 10$
121	$\sqrt{121} = 11$
144	$\sqrt{144} = 12$
169	$\sqrt{169} = 13$
196	$\sqrt{196} = 14$
225	$\sqrt{225} = 15$

- Every whole number has a square root
- Most numbers are not perfect squares, and so their square roots are not whole numbers.
- Most numbers that are not perfect squares have square roots that are **irrational numbers**
- **Irrational numbers** can be represented by decimals that do not terminate and do not repeat
- The decimal approximations of whole numbers can be determined using a calculator

Obj: To find the square root of a number

- **Find the square roots of the given numbers**
- **If the number is not a perfect square, use a calculator to find the answer correct to the nearest thousandth.**

81	$\sqrt{81} = 9$
37	$\sqrt{37} \approx 6.083$
158	$\sqrt{158} \approx 12.570$

Obj: To find the square root of a number

- **Find two consecutive whole numbers that the given square root is between**
- **Try to do this without using the table**

$\sqrt{18}$

$\sqrt{16} = 4$ and $\sqrt{25} = 5$ so

$\sqrt{18}$ is between 4 and 5

$\sqrt{115}$

$\sqrt{100} = 10$ and $\sqrt{121} = 11$ so

$\sqrt{115}$ is between 10 and 11

Multiplying radicals

The product of the square roots of two numbers is the same as the square root of the product of the numbers

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Examples:

$\sqrt{3} \bullet \sqrt{12} = \sqrt{36}$

$\sqrt{7} \bullet \sqrt{11} = \sqrt{77}$

Simplify the following expressions

$-\sqrt{4} = \mathbf{-2}$

$7\sqrt{64} + 9 = 7 \cdot 8 + 9$

$= 56 + 9 = \mathbf{65}$

$5\sqrt{25} + \sqrt{49} = 5 \cdot 5 + 7$

$= 25 + 7 = \mathbf{32}$

Simplify the following expressions

$$\sqrt{\frac{4}{81}} = \frac{\sqrt{4}}{\sqrt{81}} = \frac{\mathbf{2}}{\mathbf{9}}$$

$$\sqrt{\frac{1}{36}} - \sqrt{\frac{1}{144}} = \frac{1}{6} - \frac{1}{12}$$

$$= \frac{2}{12} - \frac{1}{12}$$

$$= \frac{\mathbf{1}}{\mathbf{12}}$$

Simplified radical form

No factor inside the radical should be a perfect square.

$$\sqrt{18} = \sqrt{9 \cdot 2} = \sqrt{9}\sqrt{2} = \mathbf{3\sqrt{2}}$$

$$\sqrt{108} = \sqrt{36 \cdot 3} = \sqrt{36}\sqrt{3} = \mathbf{6\sqrt{3}}$$

$$\sqrt{96} = \sqrt{16 \cdot 6} = \sqrt{16}\sqrt{6} = \mathbf{4\sqrt{6}}$$