

Irrational number: Cannot be written as a fraction:

$\sqrt{2}$   $\sqrt[3]{5}$   $\pi$   $e$  - Euler's number

Since many roots are irrational numbers, let's first look at some easy ones that are considered rational.

**EXAMPLE:** square root the following rational numbers

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

$$\sqrt{36} \\ = 6$$

$$\sqrt{49} \\ = 7$$

$$\sqrt{144} \\ = 12$$

$$\sqrt{9} \\ = 3$$

**EXAMPLE:** use your calculator to approximate the square roots

$$\sqrt{2} \\ \approx 1.4142$$

$$\sqrt{19} \\ \approx 4.3589$$

$$\sqrt{24} \\ \approx 4.8989$$

$$\sqrt{27} \\ \approx 5.1961$$

Simplify a square root: Find two numbers that multiply to equal the number. One can be rooted evenly and the other cannot.

**EXAMPLE:** simplify the following square roots

$$\begin{array}{c} \sqrt{32} \\ \wedge \\ \sqrt{16} \cdot \sqrt{2} \\ 4\sqrt{2} \end{array}$$

$$\begin{array}{c} \sqrt{75} \\ \wedge \\ \sqrt{25} \cdot \sqrt{3} \\ 5\sqrt{3} \end{array}$$

$$\begin{array}{c} \sqrt{288} \\ \wedge \\ \sqrt{144} \cdot \sqrt{2} \\ 12\sqrt{2} \end{array}$$

$$\begin{array}{c} \sqrt{48} \\ \wedge \\ \sqrt{16} \cdot \sqrt{3} \\ 4\sqrt{3} \end{array}$$

$$\begin{array}{c} \sqrt{8} \\ \wedge \\ \sqrt{4} \cdot \sqrt{2} \\ 2\sqrt{2} \end{array}$$

$$\begin{array}{c} \sqrt{27} \\ \wedge \\ \sqrt{9} \cdot \sqrt{3} \\ 3\sqrt{3} \end{array}$$

### Powers and Square Roots To Memorize!!!

$1^2 = 1$	$1^3 = 1$	$\sqrt{1} = 1$
$2^2 = 4$	$2^3 = 8$	$\sqrt{4} = 2$
$3^2 = 9$	$3^3 = 27$	$\sqrt{9} = 3$
$4^2 = 16$	$4^3 = 64$	$\sqrt{16} = 4$
$5^2 = 25$	$5^3 = 125$	$\sqrt{25} = 5$
$6^2 = 36$	$6^3 = 216$	$\sqrt{36} = 6$
$7^2 = 49$	$1^4 = 1$	$\sqrt{49} = 7$
$8^2 = 64$	$2^4 = 16$	$\sqrt{64} = 8$
$9^2 = 81$	$3^4 = 81$	$\sqrt{81} = 9$
$10^2 = 100$	$4^4 = 256$	$\sqrt{100} = 10$
$11^2 = 121$	$5^4 = 625$	$\sqrt{121} = 11$
$12^2 = 144$	$1^5 = 1$	$\sqrt{144} = 12$
$13^2 = 169$	$2^5 = 32$	$\sqrt{169} = 13$
$14^2 = 196$	$3^5 = 243$	$\sqrt{196} = 14$
$15^2 = 225$	$4^5 = 1024$	$\sqrt{225} = 15$
$16^2 = 256$	$1^6 = 1$	$\sqrt{256} = 16$
$17^2 = 289$	$2^6 = 64$	$\sqrt{289} = 17$
$18^2 = 324$	$3^6 = 729$	$\sqrt{324} = 18$
$19^2 = 361$	$1^7 = 1$	$\sqrt{361} = 19$