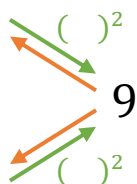


## TOPIC: RADICAL EXPRESSIONS

### Square Roots

- The \_\_\_\_\_ of **squaring** a number is taking the **square root**.
  - Positive real numbers always have TWO roots: A \_\_\_\_\_ (“principal”) and a \_\_\_\_\_ root.

### Square Roots



$$\sqrt{9} = \underline{\hspace{2cm}}$$

$$\sqrt{9} = \underline{\hspace{2cm}}$$



$$\sqrt{-9} = \underline{\hspace{2cm}}$$

Negative #s \_\_\_\_\_ be square rooted!

**Radical Symbol** {  $\sqrt{\hspace{1cm}}$  means **positive** root;  
 $-\sqrt{\hspace{1cm}}$  means **negative** root;  
 $\pm\sqrt{\hspace{1cm}}$  means **both**

**Radicand:** Term inside the radical

**Warning!**

$$\sqrt{9} \neq \pm 3$$

### MEMORY TOOL

Negatives \_\_\_\_\_ side  $\sqrt{\hspace{1cm}}$  → **\_\_** *kay*

Negatives \_\_\_\_\_ side  $\sqrt{\hspace{1cm}}$  → **\_\_** *maginary*

**EXAMPLE:** Evaluate the radicals.

(A)  $\sqrt{36}$

(B)  $-\sqrt{36}$

(C)  $\sqrt{-36}$

**PRACTICE:** Evaluate the radical.

$$-\sqrt{\frac{1}{4}}$$

**PRACTICE:** Evaluate the radical.

$$\sqrt{(-5)^2}$$

## TOPIC: RADICAL EXPRESSIONS

### Even vs. Odd Roots

- The reverse of raising a number to the  $n^{\text{th}}$  power is taking the \_\_\_\_\_.
- $n$  is the **index**, written at top-left of  $\sqrt{\quad}$  (Square Roots  $\rightarrow n = 2$ , not written)

$n^{\text{th}}$ Roots
$(a)^n = b \leftrightarrow \sqrt[n]{b} = a$

Even Index ( $n = 2, 4, 6, \dots$ )		Odd Index ( $n = 3, 5, 7, \dots$ )	
	(Square Root)		(Cube Root)
$(2)^2 = \underline{\quad}$	$\pm\sqrt{4} = \underline{\quad}$	$(2)^3 = \underline{\quad}$	$\sqrt[3]{\quad} = \underline{\quad}$
$(-2)^2 = \underline{\quad}$	$\sqrt{-4} = \underline{\quad}$	$(-2)^3 = \underline{\quad}$	$\sqrt[3]{\quad} = \underline{\quad}$
<ul style="list-style-type: none"> <li><b>[ 2   1 ]</b> root(s): 1 positive, 1 negative</li> <li>Neg inside <math>\sqrt{\quad} \rightarrow</math> Answer is <b>[IMAGINARY   NEGATIVE]</b></li> </ul>		<ul style="list-style-type: none"> <li><b>[ 2   1 ]</b> root(s) <math>\rightarrow</math> Roots always _____ sign as radicand</li> <li>Neg inside <math>\sqrt{\quad} \rightarrow</math> Answer is <b>[IMAGINARY   NEGATIVE]</b></li> </ul>	

**EXAMPLE:** Evaluate the following  $n^{\text{th}}$  roots if possible or indicate the answer is imaginary.

(A)  $\sqrt[4]{81}$       (B)  $\sqrt[5]{-32}$       (C)  $\sqrt[4]{-16}$       (D)  $\sqrt[7]{(-5)^7}$

- If a term in  $\sqrt{\quad}$  has an exponent = the index, they cancel out, leaving just the radicand.

PERFECT POWERS	
Squares	Cubes
$2^2 = 4$	$2^3 = 8$
$3^2 = 9$	$3^3 = 27$
$4^2 = 16$	$4^3 = 64$
$5^2 = 25$	$5^3 = 125$
$6^2 = 36$	Other
$7^2 = 49$	$2^4 = 16$
$8^2 = 64$	$2^5 = 32$
$9^2 = 81$	$3^4 = 81$
$10^2 = 100$	