Introduction to n^{th} Roots

Name _____

Date _____ Period _____

n^{th} Root

s is the n^{th} root of t if $s^n = t$

Is 2 the 3rd root of 8?

$2^3 = 8$

$2 \cdot 2 \cdot 2 = 8$ ✓

Is 5 the 4th root of 625?

$5^4 = 625$

$5 \cdot 5 \cdot 5 \cdot 5 = 625$ ✓

Is 3 the 2nd root of 9?

$3^2 = 9$

$3 \cdot 3 = 9$ ✓

The 3rd root of 8 is 2

$\sqrt[3]{8} = 2$

index → 3, radicand → 8

The 4th root of 625 is 5

$\sqrt[4]{625} = 5$

index → 4, radicand → 625

The square root of 9 is 3?

$\sqrt{9} = 3$

index → (2), radicand → 9

if n (index) is odd, then t has one real n^{th} root.

if n (index) is even and t (radicand) > 0, then t has two real n^{th} roots.

if n (index) is even and t (radicand) < 0, then t has no real n^{th} roots.

if t (radicand) = 0, then t has one real n^{th} root.

$\sqrt[4]{81}$

$\sqrt[3]{-8}$

if n (index) is odd, then t has one real n^{th} root.

if n (index) is even and t (radicand) > 0, then t has two real n^{th} roots.

if n (index) is even and t (radicand) < 0, then t has no real n^{th} roots.

if t (radicand) = 0, then t has one real n^{th} root.

$\sqrt[5]{32}$ $\sqrt[4]{-16}$

if n (index) is odd, then t has one real n^{th} root.

if n (index) is even and t (radicand) > 0, then t has two real n^{th} roots.

if n (index) is even and t (radicand) < 0, then t has no real n^{th} roots.

if t (radicand) = 0, then t has one real n^{th} root.

$\sqrt[4]{625}$ $\sqrt[5]{0}$

Popular Positive n^{th} Roots

3^{rd} roots

x	x^3	$\sqrt[3]{x^3} = x$
1	1	$\sqrt[3]{1} = 1$
2	8	$\sqrt[3]{8} = 2$
3	27	$\sqrt[3]{27} = 3$
4	64	$\sqrt[3]{64} = 4$
5	125	$\sqrt[3]{125} = 5$
6	216	$\sqrt[3]{216} = 6$

4^{th} roots

x	x^4	$\sqrt[4]{x^4} = x$
1	1	$\sqrt[4]{1} = 1$
2	16	$\sqrt[4]{16} = 2$
3	81	$\sqrt[4]{81} = 3$
4	256	$\sqrt[4]{256} = 4$
5	625	$\sqrt[4]{625} = 5$

5^{th} roots

x	x^5	$\sqrt[5]{x^5} = x$
1	1	$\sqrt[5]{1} = 1$
2	32	$\sqrt[5]{32} = 2$
3	273	$\sqrt[5]{273} = 3$