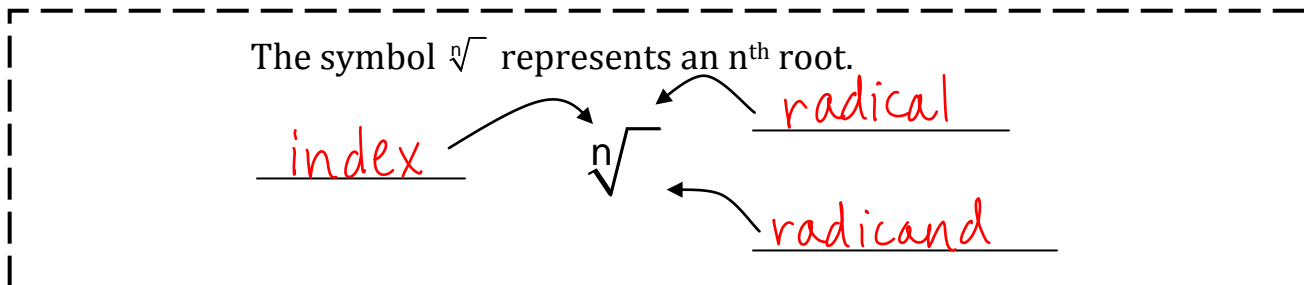


Sect 7.4 - n^{th} Roots

Finding the square root of a number and squaring a number are _____ operations.

Powers	Factors	Roots
$x^2 = 100$	$10 \cdot 10 = 100$	10 is the <u>square root</u> of 100
$x^3 = 125$	$5 \cdot 5 \cdot 5 = 125$	5 is the <u>cube root</u> of 125
$x^4 = 81$	$3 \cdot 3 \cdot 3 \cdot 3 = 81$	3 is the <u>4th root</u> of 81
$x^5 = 32$	$2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 = 32$	2 is the <u>5th root</u> of 32
$x^n = b$	$\underbrace{x \cdot x \cdot x \cdot \dots \cdot x}_n = b$ n factors of x	x is the <u>n^{th} root</u> of b



What if the n is not there? $\sqrt{16} = \sqrt[2]{16}$

What is the square root of 16? 4 and -4

When there is more than one real root, the positive root is called the principal root.

Given: $\sqrt[n]{b} = b^{1/n}$ $\sqrt[2]{81} = 9$ $\sqrt[3]{27^2} = \frac{(27)^{2/3}}{(3^3)^{2/3}} = (3)^2$

Memorize these!

$2^3 = 8$

$2^4 = 16$

$2^5 = 32$

$2^6 = 64$

$3^3 = 27$

$3^4 = 81$

$4^3 = 64$

$5^3 = 125$

$6^3 = 216$

$7^3 = 343$

$8^3 = 512$

$9^3 = 729$

Use a calculator to approximate each value to three decimal places.

1. $\sqrt[4]{237}$ 3.924	2. $\sqrt[3]{-594}$ 8.406	3. $\sqrt[11]{1111111}$ 3.545
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Simplify.

4. $\sqrt{36} = \boxed{6}$	5. $\sqrt{x^3} = \overset{\text{take out}}{\overset{\text{leave}}{2}} \sqrt{x^2 \cdot x} = \boxed{x\sqrt{x}}$	6. $\sqrt{-9} = \boxed{\emptyset}$
7. $\sqrt[5]{32x^{15}y^{20}}$ $\sqrt[5]{2^5 \cdot (x^3)^5 \cdot (y^4)^5}$ $\boxed{2x^3y^4}$	8. $\sqrt[2]{(3y^2)^4}$ $\sqrt[2]{3^4 \cdot y^8}$ $\sqrt[2]{(3^2)^2 \cdot (y^4)^2}$ $\boxed{9y^4}$	9. $\sqrt[4]{81x^6}$ ← stays! $\sqrt[4]{3^4 \cdot x^4 \cdot x^2}$ $\boxed{3x\sqrt[4]{x^2}}$
10. $-\sqrt[2]{(y^2+2)^8}$ $-\sqrt[2]{((y^2+2)^4)^2}$ $\boxed{-(y^2+2)^4}$	11. $\sqrt[2]{\left(\frac{1}{5}y^2\right)^4} = \sqrt[2]{\left(\left(\frac{1}{5}y^2\right)^2\right)^2}$ $= \left(\frac{1}{5}y^2\right)^2$ $= \boxed{\frac{1}{25}y^4}$	12. $\sqrt[3]{125x^6y^{16}}$ ← stays! $\sqrt[3]{5^3(x^2)^3(y^5)^3} \cancel{y}$ $\boxed{5x^2y^5\sqrt[3]{y}}$
13. $\sqrt[4]{x^{12}y^8}$ $\sqrt[4]{(x^3)^4(y^2)^4}$ $\boxed{x^3y^2}$	14. $\sqrt[3]{x^{12}y^8}$ $\sqrt[3]{(x^4)^3(y^2)^3} \cancel{y^2}$ $\boxed{x^4y^2\sqrt[3]{y^2}}$	15. $\sqrt[2]{(-12)^2x^3y^6}$ $\sqrt[2]{12^2(x)^2x(y^3)^2}$ $\boxed{12xy^3\sqrt{x}}$