

## Roots, Radicals, and Rational Exponents

Warm-up: Fill in the table below as a reference.

$x$	$x^2$	$x^3$	$x^4$	$x^5$
1				
2				
3				
4				XXXXXXXXXXXXXXXXXXXX
5				XXXXXXXXXXXXXXXXXXXX
6			XXXXXXXXXXXXXXXXXXXX	XXXXXXXXXXXXXXXXXXXX
7			XXXXXXXXXXXXXXXXXXXX	XXXXXXXXXXXXXXXXXXXX
8			XXXXXXXXXXXXXXXXXXXX	XXXXXXXXXXXXXXXXXXXX
9			XXXXXXXXXXXXXXXXXXXX	XXXXXXXXXXXXXXXXXXXX
10			XXXXXXXXXXXXXXXXXXXX	XXXXXXXXXXXXXXXXXXXX

Term	Definition
Nth Root	
Index	
Radical	
Radicand	
Principal Root	
Fractional Exponents	

Property of Exponents	Specific Example	General Example
Product of Powers Property		
Quotient of Powers Property		
Power of a Power Property		
Power of a Product Property		
Power of a Quotient Property		
Negative Exponent Property		

Examples: Find the principal real roots.

1.  $\sqrt[3]{125}$     2.  $\sqrt[4]{16}$     3.  $\sqrt[4]{81}$     4.  $\sqrt[3]{64}$     5.  $\sqrt[3]{-1000}$     6.  $\sqrt[3]{-27}$     7.  $\sqrt[3]{-512}$

Examples: Simplify.

8.  $27^{\frac{2}{3}}$     9.  $25^{\frac{1}{2}}$     10.  $32^{\frac{2}{5}}$     11.  $16^{\frac{1}{4}}$     12.  $32^{-\frac{3}{5}}$     13.  $27^{-\frac{1}{3}}$     14.  $-16^{\frac{3}{4}}$

15.  $\sqrt[5]{32m^{15}}$     16.  $\sqrt[4]{x^{20}y^8}$     17.  $\sqrt[3]{-8a^3b^9}$     18.  $\sqrt[4]{256x^{12}y^{24}}$

Examples: Solve for x.

19.  $2x^5 = 64$

20.  $5x^3 = 320$

21.  $2x^4 = 162$

Examples: Simplify each expression using the properties of exponents:

22.  $81^{\frac{5}{6}} \cdot 81^{-\frac{1}{3}}$

23.  $\left(\frac{xy^3}{x^{1/2}}\right)^{2/3}$

24.  $\left(\frac{3}{32^{2/5}}\right)^{1/2}$

25.  $2a^{1/3} \left(ab^{1/2}\right)^{2/3}$