6.2 Radicals & Rational Exponents DAY TWO

WARM-UP: Review

1) 142^0

2) $(-16)^0 \qquad -16^0$

3) $3x^2 + 4x^3 - 2x^2$

4) $3x^2 \cdot 4x^3 \cdot (-2x^2)$

5) $(x^4)^5$

6) $4(2x)^3$

7) $(x^{\frac{1}{3}})^2$

8) $4^{\frac{1}{2}}$

9) $81^{\frac{1}{4}}$

10) $(-27)^{\frac{1}{3}}$

WARM-UP: Review ANSWERS

PEMDAS

1) $142^0 = 1$

2) $(-16)^0 = 1 \qquad -16^0 = -1$

3) $3x^2 + 4x^3 - 2x^2 = 4x^3 + x^2$

4) $3x^2 \cdot 4x^3 \cdot (-2x^2) = -24x^7$

5) $(x^4)^5 = x^{20}$

6) $4(2x)^3 = 4(8x^3) = 32x^3$

7) $(x^{\frac{1}{3}})^2 = x^{\frac{2}{3}} \qquad x^{\frac{1}{3}\cdot\frac{2}{1}} =$

8) $4^{\frac{1}{2}} = 2 \qquad \sqrt{4}$

9) $81^{\frac{1}{4}} = 3$

10) $(-27)^{\frac{1}{3}} = -3$

A rational exponent does not have to be of the form $\frac{1}{n}$. Other rational numbers such as $\frac{3}{2}$ can also be used as exponents. You can use the properties of exponents to evaluate or simplify expressions involving rational exponents.

CORE CONCEPT

Rational Exponents

Let $a^{\frac{1}{n}}$ be an n^{th} root of a, and let m be a positive integer.

Algebra	$a^{\frac{m}{n}} = (a^{\frac{1}{n}})^m = (\sqrt[n]{a})^m$
Numbers	$27^{\frac{2}{3}} = (27^{\frac{1}{3}})^2 = (\sqrt[3]{27})^2 = (3)^2 = 9$

Whole Number Cubed	Perfect Cube (cube root is whole number)
0^3	$0 \cdot 0 \cdot 0 = 0$ $\quad \sqrt[3]{0} = 0$
1^3	$1 \cdot 1 \cdot 1 = 1$ $\quad \sqrt[3]{1} = 1$
2^3	$2 \cdot 2 \cdot 2 = 8$ $\quad \sqrt[3]{8} = 2$
3^3	$3 \cdot 3 \cdot 3 = 27$ $\quad \sqrt[3]{27} = 3$
4^3	$4 \cdot 4 \cdot 4 = 64$ $\quad \sqrt[3]{64} = 4$
5^3	$5 \cdot 5 \cdot 5 = 125$ $\quad \sqrt[3]{125} = 5$
6^3	$6 \cdot 6 \cdot 6 = 216$ $\quad \sqrt[3]{216} = 6$
7^3	$7 \cdot 7 \cdot 7 = 343$ $\quad \sqrt[3]{343} = 7$
8^3	$8 \cdot 8 \cdot 8 = 512$ $\quad \sqrt[3]{512} = 8$
9^3	$9 \cdot 9 \cdot 9 = 729$ $\quad \sqrt[3]{729} = 9$

Evaluate.

a) $16^{\frac{3}{4}}$ m n

$(\sqrt[4]{16})^3 = (2)^3$

$4\ 4$ $2\ 2\ 2\ 2$

$= (2)^3 = \boxed{8}$

b) $27^{\frac{4}{3}} = (\sqrt[3]{27})^4 = (3)^4$

$= 3 \cdot 3 \cdot 3 \cdot 3$

$= \boxed{81}$

Your Turn to Evaluate:

1) $243^{\frac{2}{5}}$

$\sqrt[5]{243}$ 3

Ans^2 9

$(\sqrt[5]{243})^2$

$(\sqrt[5]{3^5})^2 = (3)^2 = \boxed{9}$

2) $16^{\frac{3}{2}}$

$16^{(3/2)}$ 64

4^3 64

$(\sqrt{16})^3$

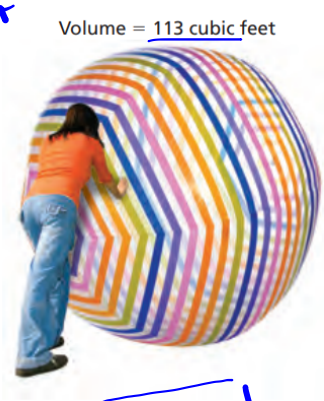
$(\sqrt{4^2})^3 = 4^3 = \boxed{64}$

Real-Life Application Example:

The radius, r, of a sphere is given by the equation $r = \left(\frac{3V}{4\pi}\right)^{\frac{1}{3}}$, where V is the volume of the sphere. Find the radius of the beach ball to the nearest foot.

Volume of a sphere: $V = \frac{4}{3}\pi r^3$

$3.14 = \pi$



$r = \left(\frac{3(113)}{4(3.14)}\right)^{\frac{1}{3}}$

$= \left(\frac{339}{12.56}\right)^{\frac{1}{3}} = (26.99)^{\frac{1}{3}} = \sqrt[3]{26.99}$

≈ 2.9996 $\approx \boxed{3 \text{ ft}}$

3(113) 339

4(3.14) 12.56

339/12.56 26.99044586

26.99044586

$26.99^{(1/3)}$ 2.999629584

$\sqrt[3]{26.99}$ 2.999629584

End of Section Quiz Review:

1) Find the indicated real *n*th roots of a when n = 4 and a = 625.

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

Evaluate each expression.

2) $-\sqrt[4]{1296}$ -6 $\sqrt[4]{1296}$

3) $64^{\frac{4}{3}}$ 6 $64^{(4/3)}$ 256

4) Use the equation $r = \left(\frac{F}{P}\right)^{\frac{1}{n}} - 1$ to calculate the annual inflation rate r (in decimal form) of an item that increases in value from P to F over *n* years. The cost of a gallon of milk increased from \$2.81 to \$3.48 over 10 years. Find the annual inflation rate to the nearest tenth of a percent.

3.48/2.81
1.238434164
$\sqrt[10]{1.238}$
1.021579253

6.2 DAY TWO Assignment:

pg. 303: 19 - 34 (no calc), 54 - 57