Algebra 2 Name _____

6-1 Roots & Radical Expressions Date _____ **A#3**

Goal: To find the *n*th root

Warm Up: Simplify each expression.

a. $\sqrt{36}$ b. $(3a)^2(2a)^3$ c. $\dfrac{4a^2b^{-4}c^3}{16ab^3c^{-5}}$ d. $\sqrt{144b^2c^4}$

Vocabulary	
4^2 = ____ 4^3 = ____ 4^4 = ____ 4^5 = ____	$\sqrt[n]{a}$

Key Concept

If $a^n = b$, with a and b real numbers and n a positive integer, then a is an **nth** root of b.

If *n* is odd . . .
there is one real nth root of b, denoted in radical form as $\sqrt[n]{b}$.

The only nth root of 0 is 0.

If *n* is even . . .
- and b is positive, there are two real nth roots of b. The positive root is the **principal root** (or principal nth root). Its symbol is $\sqrt[n]{b}$. The negative root is its opposite, or $-\sqrt[n]{b}$.
- and b is negative, there are no real nth roots of b.

Find all the real square roots of each number.

1. 400 **2.** –196 **3.** 10,000 **4.** 0.0625

Find all the real cube roots of each number.

5. 216 **6.** –343 **7.** –0.064 **8.** $\dfrac{1000}{27}$

Find all the real fourth roots of each number.

9. –81 **10.** 256 **11.** 0.0001 **12.** 625

Find each real root.

13. $\sqrt{144}$ **14.** $-\sqrt{25}$ **15.** $\sqrt{-0.01}$ **16.** $\sqrt[3]{0.001}$

17. $\sqrt[4]{0.0081}$ **18.** $\sqrt[3]{27}$ **19.** $\sqrt[3]{-27}$ **20.** $\sqrt{0.09}$

Simplify each radical expression. Use absolute value symbols when needed.

21. $\sqrt{81x^4}$ **22.** $\sqrt{121y^{10}}$ **23.** $\sqrt[3]{8g^6}$

24. $\sqrt[3]{125x^9}$ **25.** $\sqrt[5]{243x^5y^{15}}$ **26.** $\sqrt[3]{(x-9)^3}$

27. $\sqrt{25(x+2)^4}$ **28.** $\sqrt[3]{\frac{64x^9}{343}}$ **29.** $\sqrt[3]{-0.008}$

30. $\sqrt[4]{\frac{x^4}{81}}$ **31.** $\sqrt{36x^2y^6}$ **32.** $\sqrt[4]{(m-n)^4}$

33. A cube has volume $V = s^3$, where s is the length of a side. Find the side length for a cube with volume 8000 cm^3.

34. The temperature T in degrees Celsius (°C) of a liquid t minutes after heating is given by the formula $T = 8\sqrt{t}$. When is the temperature 48°C?