Algebra 2

Ch. 7   Handout 7.1

Roots and Radical Expressions

Radical Symbol

Index $\quad\longrightarrow\quad$ $\sqrt[4]{2^8}$ $\quad\longleftarrow\quad$ Power

Radicand
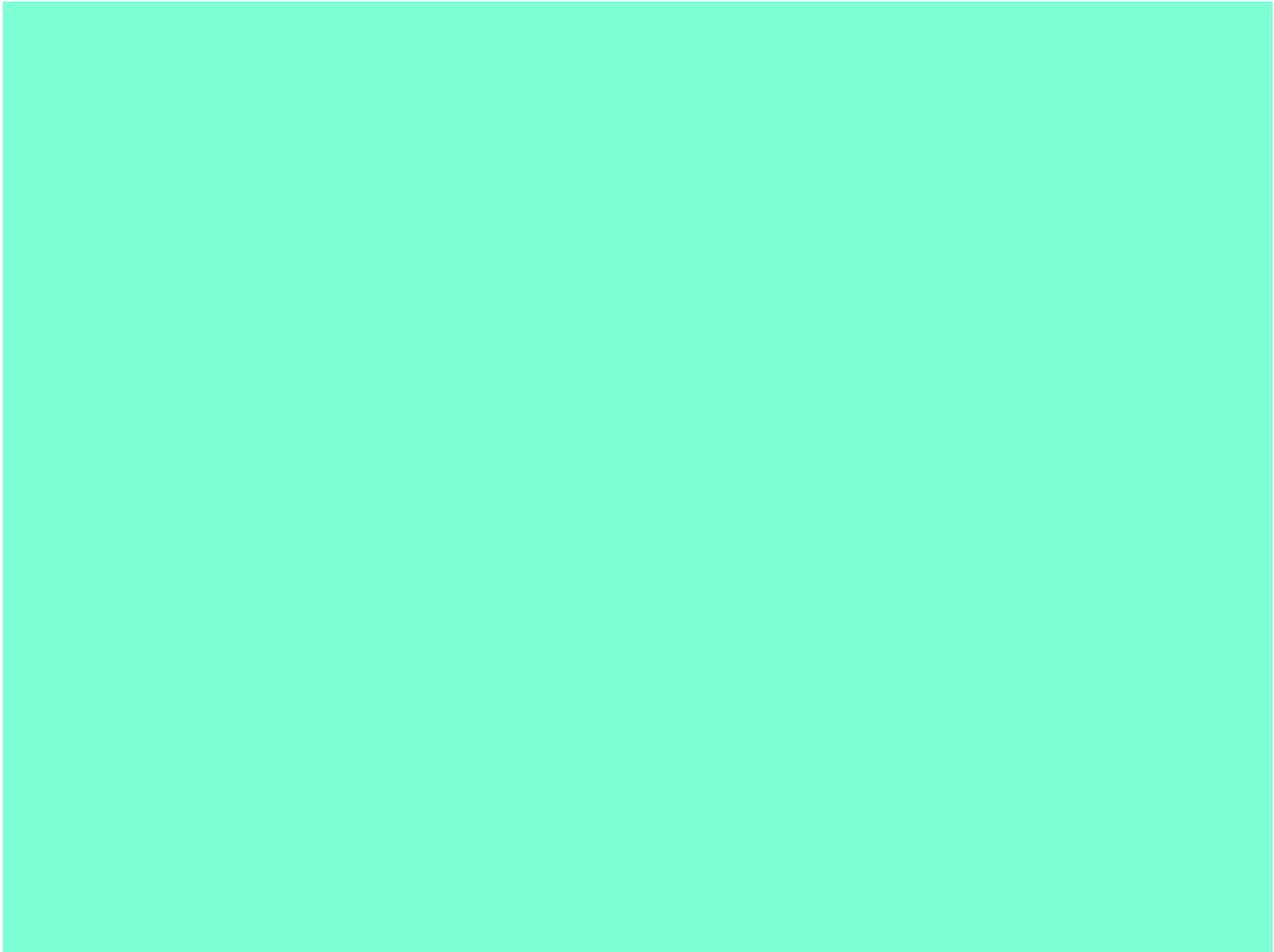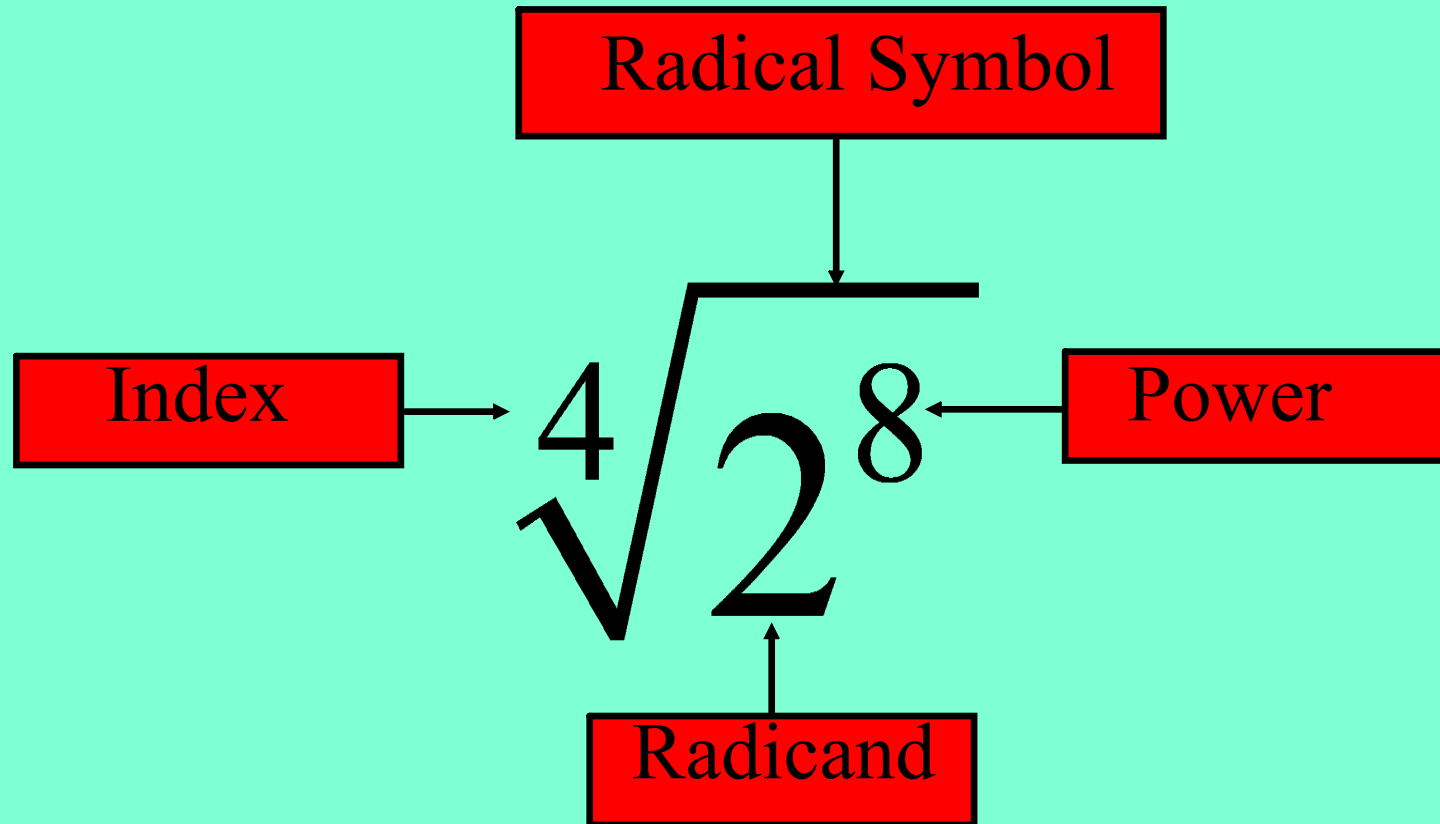
nth Root

For any real numbers a and b, and any positive integer, if $a^n = b$. then a is the **nth root** of b.

nth Root of a^n, $a < 0$

For any negative real number a, $\sqrt[n]{a^n} = |a|$ when n is even.

1. Find all the real square roots of each number.

a. 121

$11 , -11$

b. -49

No Real #

c. 64

$8 , -8$

d. $-\dfrac{1}{25}$

Not Real

2. Find all the real cube roots of each number.

a. -8000

-20

b. $\dfrac{1}{216}$

$\dfrac{1}{6}$

3. Find each real-number root.

a. $\sqrt[3]{-1000}$

$\boxed{-10}$

b. $\sqrt{-81}$

$\boxed{\text{Not Real}}$

c. $\sqrt{0.49} = \sqrt{\dfrac{49}{100}} = \dfrac{\sqrt{49}}{\sqrt{100}} = \dfrac{7}{10} = \boxed{.7}$

3. Find each real-number root.

d. $\sqrt[3]{125}$

$\boxed{5}$

e. $-\sqrt{81}$

$\boxed{-9}$

f. $\sqrt[4]{-625}$ $\boxed{\text{Not Real}}$

4. Simplify each radical expression.

a. $\sqrt{9x^{10}}$

$3x^{\frac{10}{2}}$

$\boxed{3x^5}$

$\begin{array}{c} 1\cdot 54 \\ \boxed{2\cdot 27} \\ 3\cdot 18 \\ 6\cdot 9 \end{array}$

b. $\sqrt[3]{54a^4b^{11}}$

$\sqrt[3]{27\cdot 2 \cdot a^3 \cdot a \cdot b^9 \cdot b^2}$

$a^{\frac{3}{3}} b^{\frac{9}{3}}$

$\boxed{3ab^3 \sqrt[3]{2ab^2}}$

c. $\sqrt[3]{-8x^3z^5}$

$\sqrt[3]{-8x^3 z^3 z^2}$

$-2xz\sqrt[3]{z^2}$

4. Simplify each radical expression.

d. $\sqrt{16y^9}$

$\sqrt{16y^8 \cdot y}$

$4y^{\frac{8}{2}}\sqrt{\cdot y} = 4y^4\sqrt{y}$

e. $\sqrt{108x^7y^{14}}$

$\sqrt{36 \cdot 3x^6 \cdot x \cdot y^{14}}$

$6x^3y^7\sqrt{3x}$

5. The weight of an orange is related to its diameter by the formula $w = \dfrac{d^3}{4}$, where d is the diameter in inches and w is the weight in ounces. Find the diameter of each orange to the nearest hundredth of an inch.

a. 3 oz.

$$w = \frac{d^3}{4}$$

$$(4)\,3 = \frac{d^3}{4}\,(4)$$

$$\sqrt[3]{12} = \sqrt[3]{d^3}$$

$$d = \sqrt[3]{12} \approx 2.3 \text{ in}$$

b. 5.5 oz

$$(4)\,5.5 = \frac{d^3}{4}\,(4)$$

$$\sqrt[3]{d^3} = \sqrt[3]{22}$$

$$d \approx 2.8 \text{ in}$$

c. 6.25 oz.

Quick Check:

Find each real-number root.

1. $\sqrt[3]{-27}$

2. $\sqrt{49}$

Quick Check:

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

3. $\sqrt{4x^2 y^{13}}$

4. $\sqrt[4]{x^{17} y^{12}}$

Quick Check:

5. The formula for the volume of a cone with a base of radius r and height r is $V = \dfrac{1}{3}\pi\left(r^3\right)$. Find the radius to the nearest hundredth of a centimeter if the volume is $40\, cm^3$.

Assignment:

pgs 372-373 13-28 all,

39-54 all