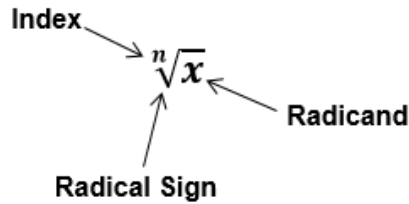# Lesson 2.3: Radicals

Specific Outcome: 2.2 – Determine an approximate value of a given irrational number.   2.7 – Explain, using examples, the meaning of the index of a radical. 3.5 – Solve a problem that involves radicals.

RADICALS (terminology)

- Any expression of the form $\sqrt[n]{x}$ where $n \in N$.

- If the index is not written, it is assumed to be 2

Practice: Identify the index and the radicand in each of the following radicals.

a) $\sqrt{56}$ b) $\sqrt[4]{123}$ c) $\sqrt[3]{-\frac{1}{3}}$ d) $\sqrt[5]{8.91}$ e) $2\sqrt[7]{8003}$

PERFECT SQUARES and their roots

- Example: 36 is a **perfect square** because its square root is a **rational** number: $\sqrt{\mathbf{36}}$ = 6
- Other examples:

PERFECT CUBES and their roots

- Example: 8 is a **perfect cube** because its cubed root is a **rational** number: $\sqrt[3]{\mathbf{8}} = 2$
- Other examples:

Fill in the tables with perfect squares and perfect cubes.

Perfect Squares	Perfect Cubes
$1^2 =$	$1^3 =$
$2^2 =$	

Perfect Squares	Perfect Cubes
$9^2 =$	$9^3 =$
$10^2 =$	

**You will be using this chart for the lessons that follow.
Have it ready for tomorrow's lesson!!!

USING PERFECT SQUARES/CUBES TO ESTIMATE *IRRATIONAL* RADICALS

Estimate $\sqrt{17}$:
1. Identify the perfect square just before and after $\sqrt{17}$:

$$\sqrt{16} \qquad \sqrt{17} \qquad \sqrt{25}$$

2. Write the square root below these perfect squares.
3. Find the difference between 17 and the two other perfect squares.
4. Make your estimation to the nearest tenth.

Estimate $\sqrt[3]{20}$:   Use perfect cubes and follow the same steps:

PROPERTY OF RADICALS   NOTE: These properties do NOT apply to adding and subtracting or radicals!!

Multiplication: $\sqrt{ab} = \sqrt{a} \cdot \sqrt{b}$

Division: $\sqrt{\dfrac{a}{b}} = \dfrac{\sqrt{a}}{\sqrt{b}}$ $where\ b \neq 0$

Examples: $\sqrt{24} =$

$\sqrt{\dfrac{10}{25}} =$

Practice
1. Write the following as a single radical.

a) $\sqrt{8} \times \sqrt{5}$ b) $\sqrt{9} \times \sqrt{2}$ c) $\dfrac{\sqrt{20}}{\sqrt{5}}$ d) $\sqrt[3]{11} \times \sqrt[3]{-2}$ e) $\dfrac{\sqrt{50}}{\sqrt{10}}$ f) $\dfrac{\sqrt[3]{56}}{\sqrt[3]{7}}$

2. Express each single radical as a product of two radicals, one of which is a perfect square/cube.

a) $\sqrt{45}$ b) $\sqrt{48}$ c) $\sqrt{50}$ d) $\sqrt{108}$ e) $\sqrt[3]{24}$ f) $\sqrt[3]{54}$

HOMEWORK

8. Determine whether each statement is true or false.

a) $\sqrt{30} = \sqrt{5}\sqrt{6}$

b) $\sqrt{6-4} = \sqrt{6} - \sqrt{4}$

c) $\sqrt{3} = \dfrac{\sqrt{45}}{\sqrt{15}}$

d) $\dfrac{\sqrt{20}}{\sqrt{10}} = \sqrt{10}$

e) $\sqrt{2} + \sqrt{2} = \sqrt{4}$

f) $\sqrt{2} \times \sqrt{2} = \sqrt{4}$

g) $\sqrt{\dfrac{1}{2} \times 30} = \sqrt{15}$

h) $\dfrac{1}{2}\sqrt{30} = \sqrt{15}$

13. To the nearest hundredth, the value of $\sqrt[5]{-\dfrac{7}{8}} + 2\sqrt[4]{\dfrac{7}{8}}$ is _____ .

(Record your answer in the numerical response box from left to right)

KEY

8. a) true   b) false   c) true   d) false   e) false   f) true   g) true   h) false

13.

0	.	9	6