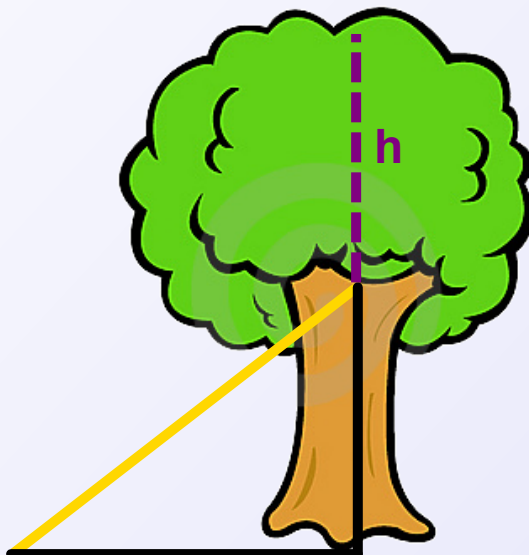To support the tree, a guy wire 8 m long is attached to the trunk and then secured in the ground 5 m from the base of the tree. The tree is 12 m in height. Find "h" to the nearest tenth of a metre.

hyp
8m

#

6.2m

} 12m

5m

$$A^2 + B^2 = C^2$$

$$\# = 5.8m$$

$$C^2 - A^2 = B^2$$

$$8^2 - 5^2 = B^2$$

$$64 - 25 = B^2$$

$$\sqrt{39} = \sqrt{B^2}$$

$$6.2 = B$$

4.3   Mixed and Entire Radicals

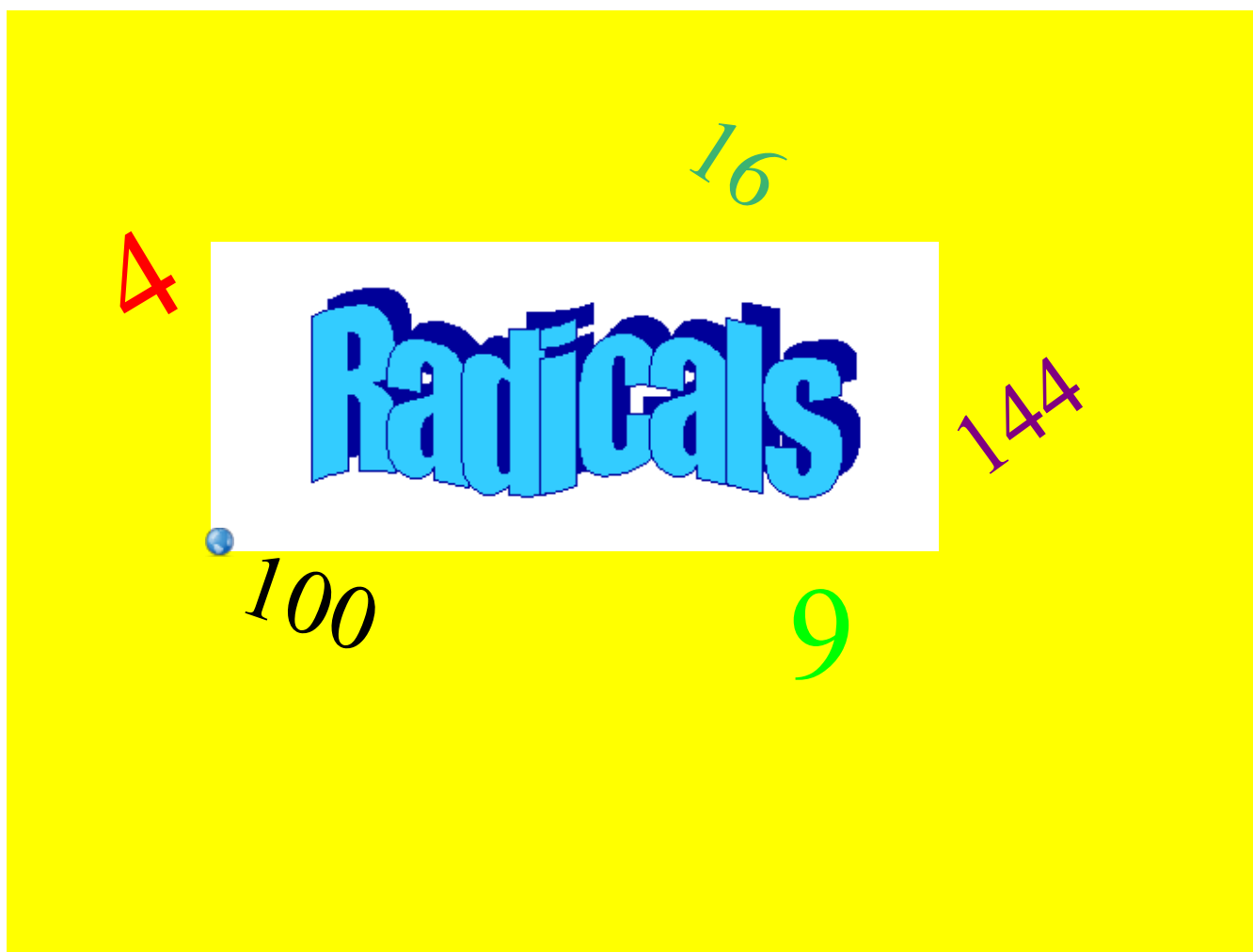**LESSON FOCUS**   Express an entire radical as a mixed radical, and vice versa.

Make Connections

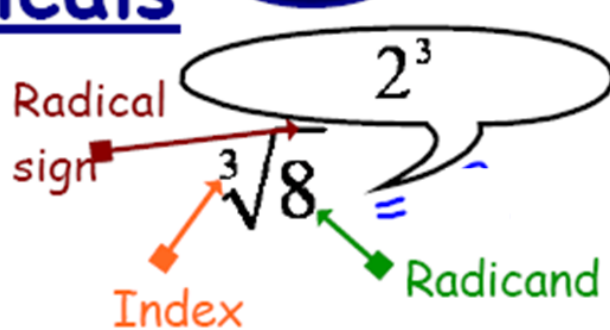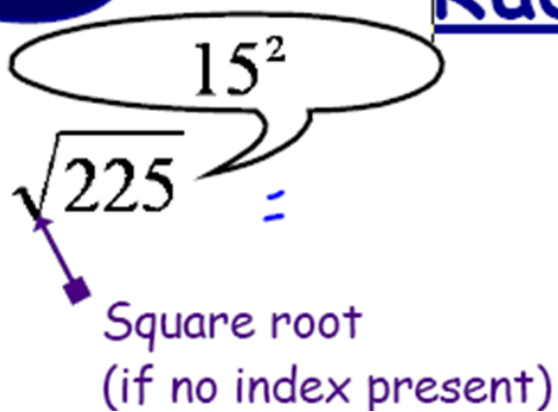We can name the fraction $\frac{3}{12}$ in many different ways:

$\frac{1}{4}$ $\frac{5}{20}$ $\frac{30}{120}$ $\frac{100}{400}$

How do you show that each fraction is equivalent to $\frac{3}{12}$?

Why is $\frac{1}{4}$ the simplest form of $\frac{3}{12}$?

16

4

Radicals

144

100

9

Radicals

$$15^2$$

$$\sqrt{225} \quad =$$

Square root
(if no index present)

Radical
sign

$$\sqrt[3]{8} \quad =$$
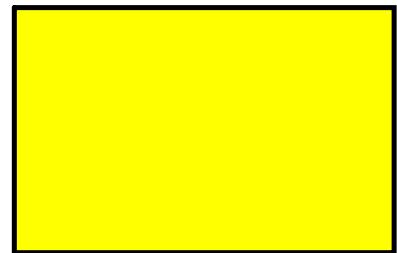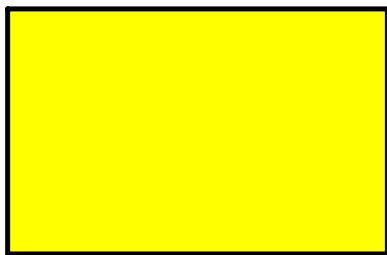
$$2^3$$

Index

Radicand

Write a fraction that is equivalent to:

$$\frac{3}{4}$$

Just as with fractions, Radicals expressions have equivalent expressions:

$$\sqrt{16 \cdot 9} = \sqrt{16} \cdot \sqrt{9}$$
$$= 4 \cdot 3$$
$$= 12$$

or

$$\sqrt{16 \cdot 9} = \sqrt{144}$$
$$= 12$$

Same works if we change the "index":

$$\sqrt[3]{8 \cdot 27} = \sqrt[3]{8} \cdot \sqrt[3]{27}$$
$$= 2 \cdot 3$$
$$= 6$$

or

$$\sqrt[3]{8 \cdot 27} = \sqrt[3]{216}$$
$$= 6$$
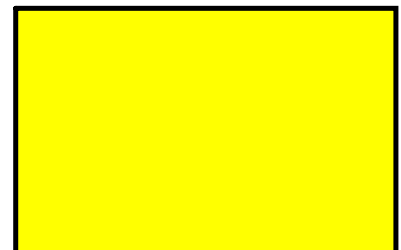
Reducing Radicals

Multiplication Property of Radicals

$$\sqrt[n]{ab} = \sqrt[n]{a} \cdot \sqrt[n]{b},$$

where n is a natural number, and a and b are real numbers

Radicals

Mixed Radical - has a coefficient in front of the radical sign.

ex: $3\sqrt{5}$ OR $\dfrac{2\sqrt{26}}{3}$ OR $-3\sqrt[3]{3}$.

Entire Radical - has a coefficient of 1 or -1 in front of the radical sign. Everything is entirely under the radical sign

ex: $\sqrt{12}$ OR $-\sqrt{45}$

$$\sqrt[3]{216} \qquad or \qquad -1\left(\sqrt[4]{72}\right)$$

Reducing Radicals

To reduce $\sqrt{125}$ you must find the **largest** square number that will divide into 125 evenly!

$$\sqrt[n]{a \cdot b} = \sqrt[n]{a} \cdot \sqrt[n]{b}$$

Greatest perfect nth

$\sqrt{125}$

$\sqrt{25 \cdot 5}$

$\sqrt{25} \cdot \sqrt{5}$

$5\sqrt{5}$

$$\sqrt[n]{ab} = \sqrt[n]{a}\ \sqrt[n]{b}$$

$$\sqrt[2]{125}$$

$$= \sqrt{(25)\cdot(5)}$$

$$= \sqrt{25}\cdot\sqrt{5}$$

$$= 5\sqrt{5}$$

Ent.   Mix

$$\sqrt{125} = 5\cdot\sqrt{5}$$

$$\sim 11.18 \qquad\qquad \approx 11.18$$

4
9
16
25
36
49
64
81
100
121

**Use your life line
to help you choose
the proper square number.**

$$25 \times 5 = 125$$

$$\sqrt{125}$$

$$\sqrt{25 \bullet 5}$$

$$5\sqrt{5}$$

4
9
16
25
36
49
64
81
100
121

Try these:

a) $\sqrt{12}$

$\sqrt{4 \cdot 3}$

$\sqrt{4}$ $\sqrt{3}$

$\boxed{2\sqrt{3}}$

d) $\sqrt{81}$

b) $\sqrt{72}$

$\sqrt{(36) \cdot (2)}$

$\sqrt{36}$ $\sqrt{2}$

$6\sqrt{2}$

e) $7\sqrt{128}$

c) $\sqrt{54}$

$\sqrt{9 \times 6}$

$\sqrt{9}$ $\sqrt{6}$

$3\sqrt{6}$

$\sqrt{54} = 3\sqrt{6}$