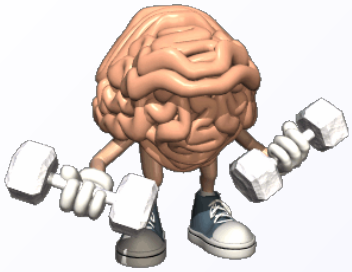
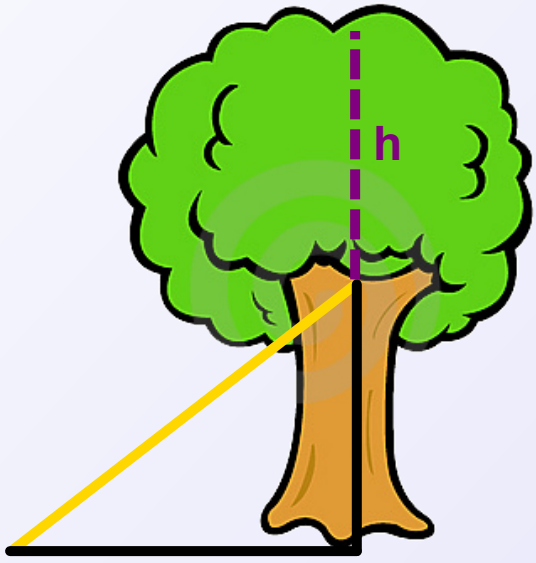
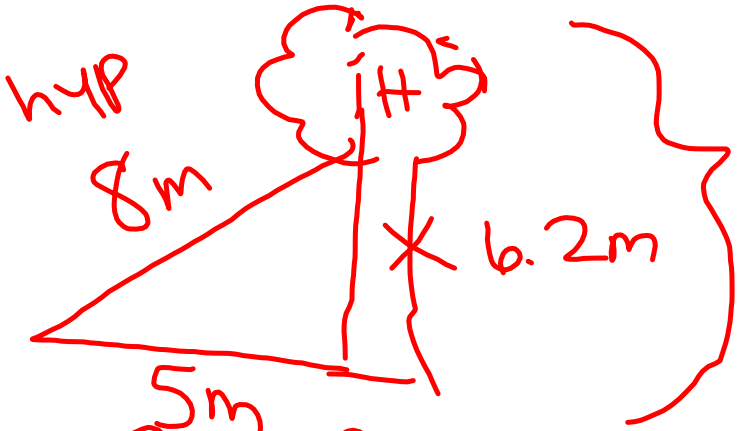


Warm Up

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.





$A^2 + B^2 = C^2$ $H = 5.8m$

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

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

$64 - 25 = B^2$

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

$6.2 = B$

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 $\frac{3}{12}$?

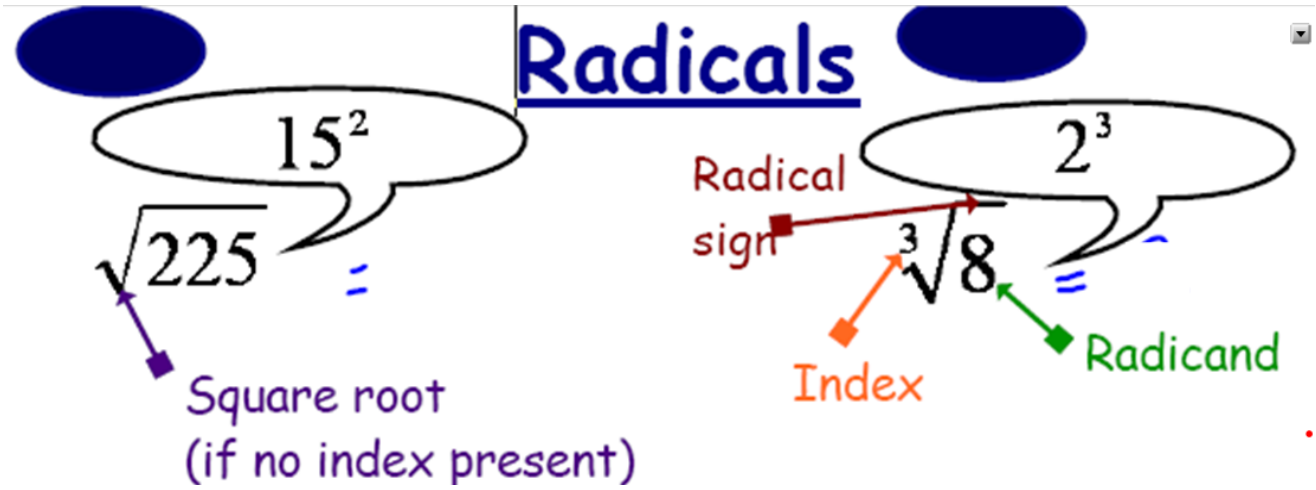
16

4

144

100

9


Radicals
15^2
$\sqrt{225}$
=
Square root
(if no index present)
2^3
Radical
sign
$\sqrt[3]{8}$
=
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 $\frac{2\sqrt{26}}{3}$ 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 $-\sqrt{45}$

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

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 n^{th}

$\sqrt{125}$

$\sqrt{25 \cdot 5}$

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

$5\sqrt{5}$

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

$$\sqrt{125}$$

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

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

$$= 5\sqrt{5}$$

Ent.

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

Mix

~ 11.18

≈ 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) $\sqrt{12}$

$\sqrt{4 \cdot 3}$

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

$2\sqrt{3}$

b) $\sqrt{72}$

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

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

$6\sqrt{2}$

c) $\sqrt{54}$

$\sqrt{9 \times 6}$

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

$3\sqrt{6}$

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

d) $\sqrt{81}$

9

e) $7\sqrt{128}$

$7\sqrt{64 \cdot 2}$

$7 \times 8 \cdot \sqrt{2}$

$56\sqrt{2}$

Warm Up

$\sqrt[3]{24}$

$\sqrt[3]{108}$

$\sqrt[3]{8 \times 3}$

$\sqrt[3]{8}$ $\sqrt[3]{3}$

$2\sqrt[3]{3}$

$$\sqrt[3]{108} =$$

$$\sqrt[3]{(27 \cdot 4)}$$

$$\sqrt[3]{27} \quad \sqrt[3]{4}$$

$$\boxed{3\sqrt[3]{4}}$$

We can also use prime factorization to simplify a radical.

Example 1 Simplifying Radicals Using Prime Factorization

Simplify each radical.

a) $\sqrt{80}$ b) $\sqrt[3]{144}$ c) $\sqrt[4]{162}$

SOLUTION

CHECK YOUR UNDERSTANDING

a) $\sqrt{80} = \sqrt{16 \cdot 5} = \sqrt{16} \times \sqrt{5}$

$= 4\sqrt{5}$

b) $\sqrt[3]{144} = \sqrt[3]{8 \cdot 18} = \sqrt[3]{8} \cdot \sqrt[3]{18}$

$= 2\sqrt[3]{18}$

4.3 Mixed and Entire Radicals

c) $\sqrt[4]{162} = \sqrt[4]{81 \cdot 2} = \sqrt[4]{81} \ \sqrt[4]{2}$

$= 3\sqrt[4]{2}$

Homework

Page: 218-219

Questions:

10 a d g

11 a c e

17

Worksheet