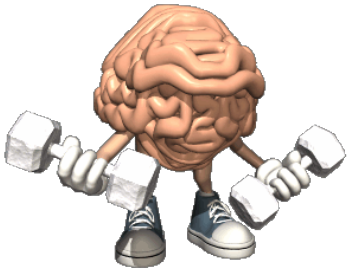
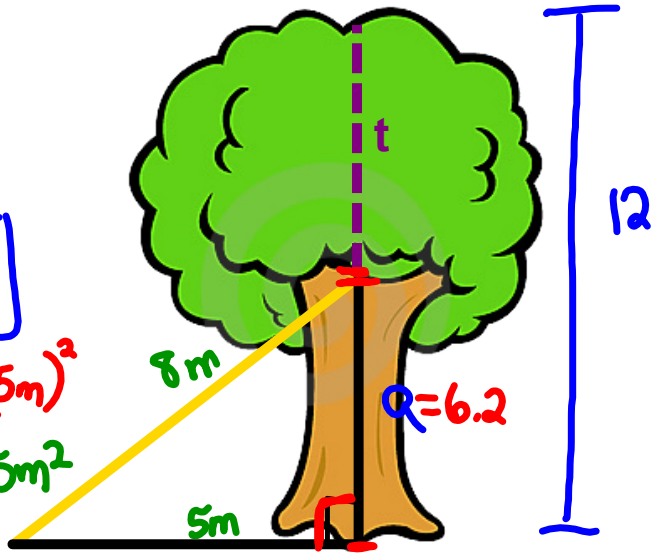


Warm Up

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 "t" to the nearest tenth of a metre.



Step 1

$c^2 = a^2 + b^2$

$a^2 = c^2 - b^2$

$a^2 = (8m)^2 - (5m)^2$

$a^2 = 64m^2 - 25m^2$

$a^2 = 39m^2$

$\sqrt{a^2} = \sqrt{39m^2}$

$a \approx 6.2m$

Step 2

$t = 12 - a$

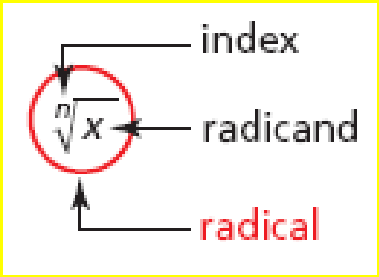
$= 12 - 6.2$

$t = 5.8$

What do you know???

$$\sqrt[2]{\frac{144}{196}} = \frac{\sqrt{144}}{\sqrt{196}} = \frac{12}{14} \overset{\text{Reduce}}{=} \frac{6}{7}$$

$$\sqrt[3]{\frac{125}{1000}} = \frac{\sqrt[3]{125}}{\sqrt[3]{1000}} = \frac{5}{10} \overset{\text{Reduce}}{=} \frac{1}{2}$$



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

$8^{1/3}$

Radicals

Write a fraction that is equivalent to:

$\frac{9}{12}$ (3x, 3x) $\frac{3}{4}$ (x2, x2) $\frac{6}{8}$

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":

$\sqrt[3]{8 \cdot 27} = \quad = \quad =$ or $\sqrt[3]{8 \cdot 27} = \quad =$

a^n

POWERS

From last week

x^t

$1^0 = 1$
$1^1 = 1$
$1^2 = 1$
$1^3 = 1$
$1^4 = 1$
$1^5 = 1$

$2^0 = 1$
$2^1 = 2$
$2^2 = 4$
$2^3 = 8$
$2^4 = 16$
$2^5 = 32$

$3^0 = 1$
$3^1 = 3$
$3^2 = 9$
$3^3 = 27$
$3^4 = 81$
$3^5 = 243$

$4^0 = 1$
$4^1 = 4$
$4^2 = 16$
$4^3 = 64$
$4^4 = 256$
$4^5 = 1024$

$5^0 = 1$
$5^1 = 5$
$5^2 = 25$
$5^3 = 125$
$5^4 = 625$
$5^5 = 3125$

$6^0 = 1$
$6^1 = 6$
$6^2 = 36$
$6^3 = 216$
$6^4 = 1296$
$6^5 = 7776$

$7^0 = 1$
$7^1 = 7$
$7^2 = 49$
$7^3 = 343$
$7^4 = 2401$
$7^5 = 16807$

$8^0 = 1$
$8^1 = 8$
$8^2 = 64$
$8^3 = 512$
$8^4 = 4096$
$8^5 = 32\ 768$

$9^0 = 1$
$9^1 = 9$
$9^2 = 81$
$9^3 = 729$
$9^4 = 6561$
$9^5 = 59049$

$10^0 = 1$
$10^1 = 10$
$10^2 = 100$
$10^3 = 1000$
$10^4 = 10000$
$10^5 = 100000$

51^7

$(2x)^n$

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

Same works if we change the "index":

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

$= 2 \cdot 3$

$= 6$

or

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

$= 6$

NEED in front of you perfect squares, cubes

Evaluate each radical. Justify you answer

a) $\sqrt{64}$

$= \sqrt{16 \cdot 4}$ Separate

$= \sqrt{16} \cdot \sqrt{4}$

$= 4 \cdot 2$

$= 8$

b) $\sqrt[4]{81} = 3$ Simplified

c) $\sqrt[3]{27}$ Simplify

$= 3$

Estimate to one decimal

a) $\sqrt{9}$

$\sqrt[3]{8}$ $\sqrt[3]{27}$

$\Downarrow$ $\Downarrow$

2 3

≈ 2.1

b) $\sqrt[5]{1562}$

$\sqrt[5]{1024}$ $\sqrt[5]{3125}$

$\Downarrow$ $\Downarrow$

4 5

≈ 4.2

Remember

Rational numbers are numbers that can be written as a fraction or is a decimal that repeats or terminates. Ex) $\sqrt[4]{\frac{1296}{10000}}$ Ex) $\sqrt[3]{\frac{8}{27}}$

Irrational numbers are numbers that cannot be written as a fraction and its decimal neither terminates or repeats. $\sqrt{28}$

estimate or is a mixed radical

Radicals

Study

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

know difference b/t two

ex: $3\sqrt{5}$ OR $\frac{2\sqrt{26}}{3}$ OR $-3\sqrt{3}$

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 a radical, you must find the largest "nth" number that will divide into the radicand

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

Greatest perfect nth

Must Know list of perfect nth

1
4
9
16
25
36
49
64
81
100
121
144
169
196
...

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

$\sqrt{125} = \sqrt{25 \times 5}$

Not in 125 list →

write perfect square # first

Separate

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

can't take √ of 5 so leave

$= 5\sqrt{5}$

$$\sqrt[3]{16} = \sqrt[3]{8 \times 2}$$

$$= \sqrt[3]{8} \times \sqrt[3]{2}$$

$$2 \quad \sqrt[3]{2}$$

$\frac{4}{3} = 1\frac{1}{3}$

Improper Mixed

are equal

$1.\overline{3}$

133%

Entire to Mixed

continued

Reducing Radicals

Prime Factorization

- Use Prime factorization tree

  Prime # 2,3,5,7,11,13,17,19,23,29,31,37, 41, 43, 47...

- Then group the same prime factors in groups of index size (see example

- Take the required root of each mini group (see examples)

a) $\sqrt{125}$

$= \sqrt{(5\times5)\times5}$

$= \sqrt{5\times5}\ \sqrt{5}$

$= 5\sqrt{5}$

125 → 5, 25 → 5, 5

b) $\sqrt{54}$

$= \sqrt{(3\times3)\times(3\times2)}$

$= \sqrt{3\times3}\times\sqrt{3\times2}$

$= 3\sqrt{6}$

54 → 2, 27 → 3, 9 → 3, 3

c) $\sqrt[3]{192}$

$= \sqrt[3]{(2\times2\times2)\times(2\times2\times2)\times(3)}$

$= \sqrt[3]{2\times2\times2}\times\sqrt[3]{2\times2\times2}\times\sqrt[3]{3}$

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

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

192 → 2, 96 → 2, 48 → 2, 24 → 2, 12 → 2, 6 → 3, 2

4
9
16
25
36
49
64
81
100
121

Try these:

a) $\sqrt{12}$

b) $\sqrt{72}$

c) $\sqrt{54}$

d) $\sqrt{81}$

e) $7\sqrt{128}$

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

Maybe

@ ⓕ first

Finish previous slide and

Page 206 #2adeg

#3abef

page 211 #3

Friday Justanswer

$\sqrt{36} = 6$

Page 221 #9 ab

Entire to mix (today's class)