Write in radical form.

$c^{3.1}$

change 3.1 into an improper fraction:

$3.1 = 3\frac{1}{10} = \frac{31}{10}$

$c^{3.1} = c^{31/10} = \sqrt[10]{c^{31}}$

Explain why the following is true:

$\sqrt[5]{x^3} = (\sqrt[5]{x})^3$

$(x^3)^{1/5}$ $\qquad$ $(x^{1/5})^3$

$= x^{3 \cdot 1/5}$ $\qquad$ $= x^{1/5 \cdot 3}$

$= x^{3/5}$ $\qquad$ $= x^{3/5}$

both of the original expressions simplify into
the same power of x, therefore, they are equivalent expressions.

Without a calculator simplify each.

1. $25^{\frac{3}{2}}$

$\sqrt{25^3}$ or $(\sqrt{25})^3$

$(5)^3$

$= 125$

2. $4^{\frac{2}{3}}$

$\sqrt[3]{4^2}$ or $(\sqrt[3]{4})^2$

$\sqrt[3]{16}$

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

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

Without a calculator simplify each.

1. $\sqrt[4]{9^2}$

$= \sqrt[4]{81} = 3$

$3^4 = 81$

2. $\sqrt[3]{8^5} = (\sqrt[3]{8})^5$

$= (2)^5$

$= 32$

Find the sixth root of 5000 without using the $\sqrt[x]{\ }$ option on the calculator. Round to the nearest hundredth.

Without using a radical we can find the sixth root of a number by using a fractional exponent.

$\sqrt[6]{5000} = 5000^{\frac{1}{6}}$

≈ 4.14

Answer "Habits of Mind" on bottom of page 113 in the Student Companion.

How is $\sqrt[6]{5}$ related to $\sqrt[3]{5}$?

$\sqrt[6]{5} = 5^{\frac{1}{6}}$ $\qquad \sqrt[3]{5} = 5^{\frac{1}{3}}$

$\left(5^{\frac{1}{6}}\right)^2 = 5^{\frac{2}{6}} = 5^{\frac{1}{3}}$

$\sqrt[3]{5}$ is the square of $\sqrt[6]{5}$

What "kind" of answer will come from each?

1. x^{12} = POS
2. x^{15} = pos or neg
3. x^{8} = POS
4. x^{7} = pos or neg

A real number raised to an even power is ALWAYS POSITIVE.

A real number raised to an odd power can either be negative or positive.

The answer will have the same sign as the base.

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What "kind" of answer will come from each radical?

1. $\sqrt[4]{\square}$ = POS
2. $\sqrt[5]{\square}$ = pos or neg
3. $\sqrt[9]{\square}$ = pos or neg
4. $\sqrt[8]{\square}$ = POS

The answer from an even radical must be POSITIVE. "Principal Root"

The answer from an odd radical can be anything.

Answer will have the same sign as the radicand.

What do you do to find a root of a variable with an exponent?

For example: $\sqrt[3]{w^{12}}$

$= w^{\frac{12}{3}} = w^4$

To find the answer you divide the exponent by the index.

Simplify.

1. $\sqrt{a^2} \rightarrow$ An even root without any sign in front means the Principal Root (Pos Root).

$\sqrt{a^2} = \cancel{a} = |a|$

since the variable a could be a negative quantity we must assure that the result of this square root is positive by using Absolute Value symbols.

2. $\sqrt[3]{x^3} = x$ The answer to an odd radical will have the same sign as the radicand which means the answer can be either positive OR negative. DON'T use Absolute Value symbols!