

Making Connections



$$100(0.87)^{1/2}$$

Coffee, Tea, and Hot Chocolate contain caffeine.

The expression $100(0.87)^{1/2}$

**represents the percent of caffeine
left in your body 1/2 hour after you
drink a caffeine beverage**

How can you estimate the value of $0.87^{1/2}$

Let's Take a Closer Look!!

Fill in the chart. (You can use your calculator!!)

x	$x^{\frac{1}{2}}$
1	$1^{\frac{1}{2}} = 1$
4	$4^{\frac{1}{2}} = 2$
9	$9^{\frac{1}{2}} = 3$
16	$16^{\frac{1}{2}} = 4$
25	$25^{\frac{1}{2}} = 5$

x	$x^{\frac{1}{3}}$
1	$1^{\frac{1}{3}} = 1$
8	$8^{\frac{1}{3}} = 2$
27	$27^{\frac{1}{3}} = 3$
64	$64^{\frac{1}{3}} = 4$
125	$125^{\frac{1}{3}} = 5$

What do you notice?

Our Conclusion

- Raising a number to an exponent of **1/2** is equivalent to taking the **square root**!
- Raising a number to an exponent of **1/3** is equivalent to taking the **cube root**!

$$x^{1/n} = \sqrt[n]{x}$$

index

Practice Questions

Calculate each of the following without using a calculator:

$$27^{1/3}$$

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

$$100^{1/2}$$

$$\sqrt{100}$$
$$= 10$$

$$16^{1/4}$$

$$\sqrt[4]{16}$$
$$= 2$$



Calculate each of the following without using a calculator:

$$36^{0.5}$$

$$36^{\frac{5}{10}}$$

$$36^{\frac{1}{2}}$$

$$\sqrt{36}$$

$$= 6$$

$$32^{0.2}$$

$$32^{\frac{2}{10}}$$

$$32^{\frac{1}{5}}$$

$$\sqrt[5]{32}$$

$$= 2$$

$$625^{0.25}$$

$$625^{\frac{25}{100}}$$

$$625^{\frac{1}{4}}$$

$$\sqrt[4]{625}$$

$$= 5$$

Calculate each of the following
without using a calculator:

$$4^{3/2} \leftarrow \begin{matrix} \text{EXP} \\ \text{root} \end{matrix}$$

$$(\sqrt{4})^3$$

$$(2)^3$$

$$= 8$$



$$27^{2/3} \leftarrow \begin{matrix} \text{EXP} \\ \text{1st Root} \end{matrix}$$

$$(\sqrt[3]{27})^2$$

$$= 3^2$$

$$= 9$$

Therefore:

$$x^{m/n} \leftarrow \begin{matrix} \text{2nd EXP} \\ \text{1st root} \end{matrix} = \left(\sqrt[n]{x} \right)^m$$

Write as a power:



1. $(\sqrt[4]{625})^9$

$625^{\frac{9}{4}}$

2. $(\sqrt[3]{27})^4$ $27^{\frac{4}{3}}$

exponent
root (index)

Calculate each of the following
without using a calculator:

$144^{1/2}$ $(\sqrt{144})^1$ $= (12)^1$ $= 12$	$343^{2/3}$ $(\sqrt[3]{343})^2$ $= (7)^2$ $= 49$
$64^{2/3}$ $(\sqrt[3]{64})^2$ $= (4)^2$ $= 16$	$256^{3/4}$ $(\sqrt[4]{256})^3$ $= (4)^3$ $= 64$



Stop....

Check out page 227.

3, 4, 10, 11, 12