4.3 Working with Rational Exponents

- What is $\sqrt{9}$ as an exponent: $9^{?}$

- Why does $\sqrt{x^6} = x^3$?

$x^{6/2} = x^3$

- How can you evaluate $4^{\frac{3}{2}}$?

First a note:

$\sqrt[3]{x}$ = cubic root ex: $\sqrt[3]{27} = \sqrt[3]{3^3} = 3$

$\sqrt[4]{x}$ = 4th root ex: $\sqrt[4]{16} = 2$ because $2^4 = 16$.

$\sqrt[n]{x}$ = n^{th} root

Note: $\sqrt[n]{x}$ $\sqrt[n]{x}$

Try on your calc: $9^{1/2}$ (do $9 \wedge (1/2)$ or $9 \wedge 0.5$)

$9^{1/2} = 3$ $\quad \sqrt{9} = 3$

Try $4^{3/2} = 8$

$\left(\sqrt{4}\right)^3 = 2^3 = 8$

$\sqrt{4^3} = \sqrt{64} = 8$

$4 \wedge (3/2)$ or $4 \wedge 1.5$

So, the law:

$$\sqrt[n]{a^m} = a^{\frac{m}{n}} \Longleftarrow \left(\sqrt[n]{a}\right)^m$$

$$\sqrt[10]{6^9} = 6^{\frac{9}{10}}$$

$$7^{\frac{5}{3}} = \sqrt[3]{7^5}$$

ex: $81^{0.25} = 81^{1/4} = \sqrt[4]{81} = 3$

$$\left(3^{2/3}\right)\left(3^{1/3}\right) = 3^{2/3 + 1/3} = 3^1 = 3$$

$$\frac{64^{4/3}}{64^{3/3}} = 64^{4/3 - 3/3} = 64^{1/3} = \sqrt[3]{64} = 4$$