Unit 4: Radical Expressions & Equations
4.1 Rational Exponents & The Real Number System

Connecting Rational Exponents and Radicals

We can use our exponent laws to deal with rational exponents, but what do they mean?

$\left(25^{\frac{1}{2}}\right)\left(25^{\frac{1}{2}}\right) =$ $25^{1/2 + 1/2} = 25^1$

What else when multiplied by itself gives a product of 25? $5 \cdot 5$

What is the relationship between $25^{\frac{1}{2}}$ and 5? $25^{1/2} = 5$ $\sqrt{25} = 5$

$\therefore 25^{1/2} = \sqrt{25}$

index

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

radicand $\sqrt[2]{25^1}$

Rational Exponent Law:

$b^{m/n} = \sqrt[n]{b^m}$

OR

$(\sqrt[n]{b})^m$

Ex. Express each power as an equivalent radical. Evaluate where possible.

a) $64^{\frac{1}{2}}$

$\sqrt[2]{64^1}$

8

b) $16^{\frac{3}{4}}$

$(\sqrt[4]{16})^3$

$2^3 = 8$

c) $(8x^2)^{\frac{1}{3}}$

$\sqrt[3]{8x^2}$

$2\sqrt[3]{x^2}$

Ex. Express each radical as a power with a rational exponent.

a) $\sqrt[4]{5^3}$

$5^{3/4}$

b) $\left(\sqrt[n]{27^2}\right)$

$27^{2/n}$

c) $\left(\sqrt[2]{s^3}\right)$

$s^{3/2}$

Ex. Simplify and evaluate where possible.

a) $(27x^6)^{\frac{2}{3}}$

b) $\left[\left(x^{\frac{4}{3}}\right)\left(x^{\frac{1}{3}}\right)\right]^9$

c) $\left(\frac{x^3}{64}\right)^{-\frac{2}{3}}$

a) $27^{2/3}\left(x^{6/1}\right)^{2/3}$

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

3^2

$\boxed{9x^4}$

b) $x^{5/3 \cdot 9/1}$

x^{15}

c) $\left(\frac{64}{x^3}\right)^{2/3}$

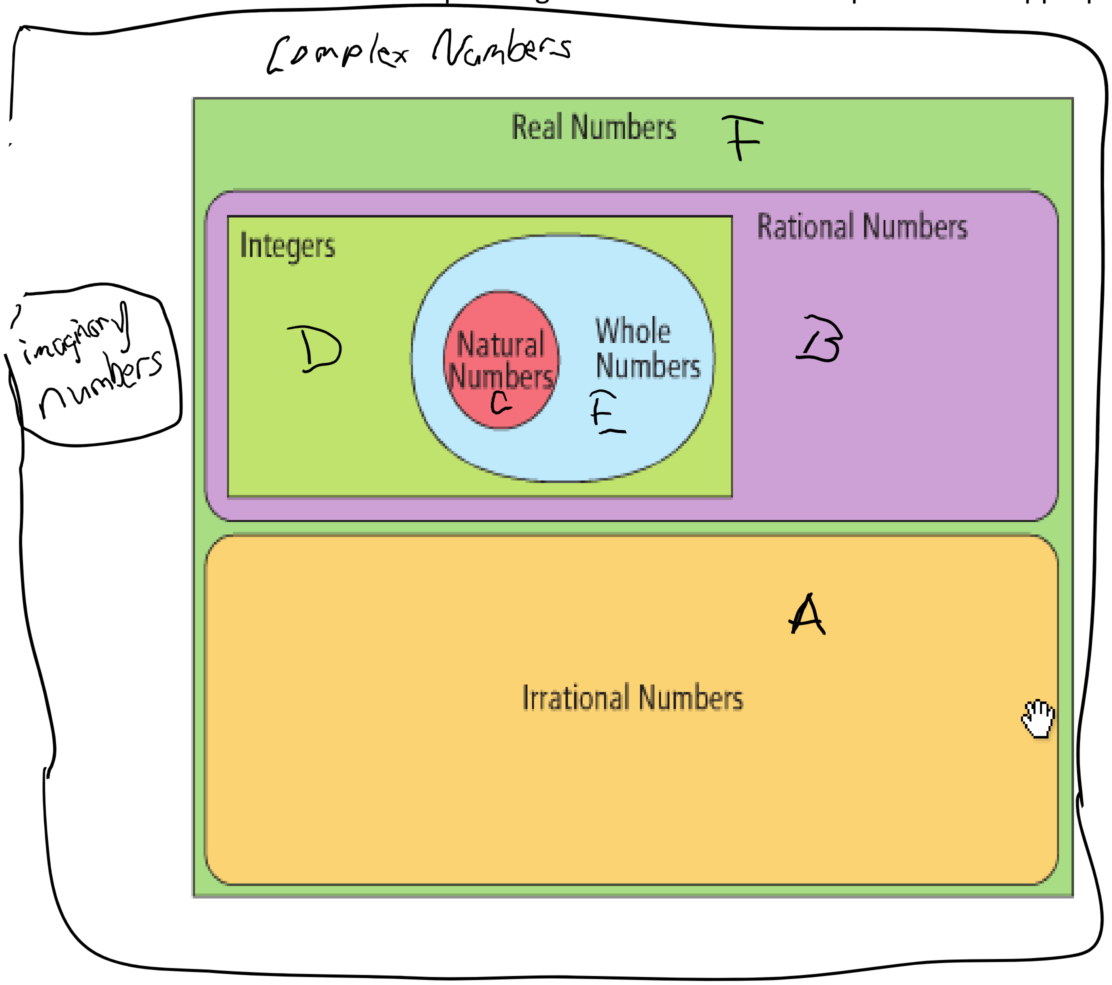
$\left(\sqrt[3]{\frac{64}{x^3}}\right)^2$

$\left(\frac{4}{x}\right)^2$

$\frac{16}{x^2}$

Number Sets:

Place the letter corresponding with the correct description in the appropriate area on the diagram.



A.

Examples include π & $\sqrt{2}$

B.

Examples include

$0.3, \frac{4}{5}, \& \sqrt{25}$

C.

1, 2, 3,...

D.

...-3, -2, -1, 0, 1, 2, 3...

E.

0, 1, 2, 3,...

F.

All rational & irrational numbers

<u>Practice:</u> Worksheet (Connecting Rationals and Radicals)