

Roots and Powers

Key Ideas:

1. Estimating roots / Irrational numbers

2. Mixed / Entire radicals

- (squares and cubes)

3. Gr. 9 Exponent Laws:

- when multiplying common bases, **ADD** exponents
- when dividing common bases, **SUBTRACT** exponents
- when you have a power of a power, **MULTIPLY** exponents
- anything to the power of zero is "1"

4. Negative Exponent Law

- "flip and fly"

5. Fractional Exponent Law

- change to a radical

***Note: Watch your positive and negative signs!! Always simplify!**

Irrational Numbers/Mixed and Entire Radicals

1. Estimate the value of each radical below.

a) $\sqrt[3]{90}$

b) $\sqrt{30}$

c) Order the following numbers from least to greatest.

$$\sqrt[3]{90} \quad \sqrt{30} \quad -8 \quad -\frac{3}{4}$$



2. Change to a ***mixed radical***:

a) $\sqrt{80}$

b) $2\sqrt[3]{54}$

c) $\sqrt[4]{32x^6y^9}$

3. Change to an **entire radical**:

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

b) $2\sqrt{5}$

4. Determine whether each number is rational or irrational. Then determine the smallest number family each number belongs to.

a) -12

b) 0

c) π

d) 150

e) $\frac{4}{5}$

f) $13.\overline{23}$

Exponent Laws

5. Simplify:

a) $(x^4x^{-9})^{-3}x^0$

b) $\left(\frac{x^{-5}y^3}{x^{-8}y}\right)^2$

6. Evaluate:

a) 3^{-4}

b) $\frac{1}{4^{-2}}$

7. Simplify:

a) $\left(\frac{4x}{6y}\right)^{-2}$

b) $(2x^2y^{-4})^{-3}$

8. Evaluate:

a) $4^{\frac{1}{2}}$

b) $64^{\frac{5}{6}}$

c) $\left(\frac{8}{27}\right)^{\frac{1}{3}}$

d) $(25x^3y^6)^{\frac{1}{2}}$

9. Evaluate:

a) $\left(\frac{4x^6}{6x^{-2}}\right)^{-3}$

b) $(3x^{-4}y^2)^{-2}$

c) $\left(\frac{25x^{-2}y^3}{16^{-4}y^{-1}}\right)^{\frac{-3}{2}}$

d) $(4x^{-2}y)^2(2x^3y^{-2})^{-3}$