Unit 5: Exponential Functions
Day 2: Radicals

SWBAT simplify, multiply, and divide radicals, and rationalize fractions involving square roots.

Assignments:

HW38

What is a radical?

- A square root

Technically, cube roots, fourth roots, etc. can also be called radicals and can be manipulated in very similar ways

- $\sqrt{139}$
- $\sqrt{x}$
- $\sqrt{8x}$
- $4x^3\sqrt{7x}$

The expression inside a radical is called the **radicand**

Radicals as Exponents

- All radicals can be written as fractional exponents.
- $\sqrt{x} = x^{\frac{1}{2}}$
- Example: $\sqrt{19}$
- Example: $\sqrt[3]{34x}$

- Write the radicals as exponents.

1. $\sqrt{24}$
2. $\sqrt{m}$
3. $\sqrt{5}$
4. $\sqrt[3]{41}$
5. $\sqrt[3]{m}$
6. $\sqrt[4]{5x}$

Simplifying Square Roots

- A square root is in simplest form when the radicand:
  - cannot be divided by a perfect square
  - is not a fraction
- Example: $\sqrt{384}$

- Example: $\sqrt{32n^7}$

1. $\sqrt{96x}$
2. $\sqrt{8k^4}$
3. $\sqrt{150x^3}$
4. $\sqrt{448n^3}$
5. $\sqrt{32b^3}$
6. $\sqrt{75n^4}$
7. $\sqrt{28x}$
8. $\sqrt{64b^2}$

Multiplying Square Roots

- Step 1: Multiply the radicands
- Step 2: Multiply the coefficients
- Step 3: Simplify.
- Example: $\sqrt{3x} * \sqrt{2x^3}$

- Example: $-5n\sqrt{15} * \sqrt{15n}$

- Multiply the radicals.

1. $-\sqrt{15x} * \sqrt{9}$
2. $\sqrt{15y} * \sqrt{15y}$
3. $9\sqrt{10n^4} * 2\sqrt{5n}$
4. $\sqrt{8x^3} * \sqrt{8x^2}$
5. $-3\sqrt{10} * -3\sqrt{10}$
6. $\sqrt{20x} * \sqrt{5}$
7. $2r\sqrt{5} * \sqrt{2r}$

Rationalizing Square Roots

- A fraction is **rationalized** when the denominator does not include a square root.
- Step 1: Multiply numerator and denominator by square root.
- Step 2: Simplify and reduce if necessary.
- Example: $-\frac{2}{\sqrt{5x}}$

- Rationalize.

1. $\frac{4}{\sqrt{3}}$
2. $\frac{5}{\sqrt{2x}}$
3. $\frac{6}{\sqrt{7}}$
4. $\frac{8}{\sqrt{6}}$

Dividing Square Roots

- Step 1: If possible, simplify the radicals.
- Step 2: Split into parts: coefficients and radicands.
- Step 3: Reduce fractions from step 2 and put them back together.
- Step 4: Rationalize if necessary.
- Example: $\frac{4x\sqrt{3x}}{2\sqrt{6x}}$

- Divide.

1. $\frac{\sqrt{3x^3}}{\sqrt{2x^7}}$
2. $\frac{3\sqrt{4}}{18x\sqrt{3}}$
3. $\frac{\sqrt{5y^3}}{\sqrt{3y}}$
4. $\frac{3x\sqrt{9}}{2x\sqrt{15}}$
5. $\frac{\sqrt{15}}{\sqrt{10}}$
6. $\frac{\sqrt{2}}{\sqrt{3}}$