LESSON 13: Rational Numbers as Exponents
☐ Definition and properties of integer exponents
☐ Rational exponents: $a^{1/n} = \sqrt[n]{a}$
☐ Positive rational exponents
☐ Negative rational exponents
☐ Laws of exponents for real number exponents
☐ To simplify radical expressions

1. List the Laws of Exponents

Exponent notation: $b^n$  
Negative exponent: $b^{-n}$

One as an exponent: $b^1$  
Product Rule: $b^n \cdot b^m$

Zero as an exponent: $b^0$  
Quotient Rule: $\frac{b^n}{b^m}$
The Power Rule: \((b^n)^m\)

Factors and Negative Exponents: \((a \cdot b)^{-n}\)

Raising a product to a power: \((a \cdot b)^n\)

Reciprocals and Negative Exponents: \(\frac{b^{-n}}{b^{-m}}\)

Raising a quotient to a power: \(\left(\frac{a}{b}\right)^n\)
Use the rules of exponents to solve each of the following problems

4. \(x^{\frac{1}{2}} \cdot x^{\frac{1}{2}}\)

5. \((x^{\frac{1}{5}})^{5}\)

Use what you know about radicals to solve each of the following problems

6. \(\sqrt{x} \cdot \sqrt{x}\)

7. \((\sqrt[3]{x})^{5}\)
Identify the connection between radicals and exponential notation?

\[ b = \frac{1}{n} \]

Rewrite using radical notation:

8. \[ x^{\frac{1}{5}} \]
9. \[ w^{\frac{2}{3}} \]

Rewrite using exponent notation:

10. \[ \sqrt[5]{y} \]
11. \[ \sqrt[7]{x^3} \]
Use your calculator to evaluate following mathematical expressions (with 6 digits after the decimal):

12. \( \sqrt{8} \approx \)
13. \( \frac{2\sqrt{18}}{3} \approx \)
14. \( \sqrt[4]{64} \approx \)

Revisit the radicals above. Simplify use the strategies we discussed last time.

15. \( \sqrt{8} \)
16. \( \frac{2\sqrt{18}}{3} \)
17. \( \sqrt[4]{64} \)
Use rational exponents to simplify each of the following radical expressions.

24. \( \sqrt[5]{\sqrt[2]{x}} \)

25. \( \sqrt[6]{(12x)^3} \)