Task 3.3 – I'm Fluent in Exponents

Today's goal is to practice with rational exponents and strengthen your mathematical fluency, the same way you might grow more fluent in a spoken language.

1. Without using a calculator, determine the value of each of the following (your answers should be whole numbers):

$4^{5/2} =$ $(2^2)^{5/2}$ $2^5 = 32$

$9^{3/2} =$ $(3^2)^{3/2}$ $3^3 = 27$

$8^{2/3} =$ $(2^3)^{2/3}$ $2^2 = 4$

$16^{3/4} =$ $(2^4)^{3/4}$ $2^3 = 8$

2. It is often useful to be able to think of mathematical expressions in different forms. Rewrite each of the following exponential expressions in their matching radical forms:

$$Ex:\ 7^{3/5} \rightarrow \sqrt[5]{7^3}\ \ or\ \ (\sqrt[5]{7})^3$$

$8^{4/9} = \sqrt[9]{8^4}$

$x^{7/2} = \sqrt[2]{x^7}$

$(7y)^{4/9} = \sqrt[9]{(7y)^4}$

$5^{3b/2d} = \sqrt[2d]{5^{3b}}$

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3. Now try going the other way:

$\sqrt[11]{a^3} = a^{3/11}$

$\sqrt[h]{3^8} = 3^{\frac{8}{h}}$

$\sqrt[20]{2x} = (2x)^{\frac{1}{20}}$

4. How might you change these to exponential form?

$\sqrt[4]{a^3 b^8} = a^{\frac{3}{4}} b^{\frac{8}{4}} = a^{\frac{3}{4}} b^2$

$\sqrt[2]{x^1 y^7 z^3} = x^{\frac{1}{2}} y^{\frac{7}{2}} z^{\frac{3}{2}}$

5. All of the exponent rules we learned apply to rational exponents the same way they applied to integer exponents. Use exponent properties to simplify each of the following:

$x^{1/7} \cdot x^{3/7} = x^{\frac{1}{7}+\frac{3}{7}} = x^{\frac{4}{7}}$

$x^{1/2} \cdot x^{2/3} = x^{\frac{1}{2}+\frac{2}{3}} = x^{\frac{7}{6}}$

$\frac{3}{6}+\frac{4}{6}$

$(x^{1/7})^{3/2} = x^{\frac{1}{7}\cdot\frac{3}{2}} = x^{\frac{3}{14}}$

$(x^{2/5})^{5/2} = x^{\frac{2}{5}\cdot\frac{5}{2}} = x^{\frac{10}{10}} = x^1$

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Learning Objective: Students will practice using rational exponents and exponent properties.

	Notes
What are the first 15 square numbers?	1·1=1 36 121 2·2=4 49 144 9 64 169 16 81 196 25 100 225
What are the first 10 cube numbers?	1·1·1=1 216 2·2·2=8 343 27 512 64 729 125 1000

Reflection: Are there any part of simplifying rational exponents that you have questions about?