Understanding Rational Exponents (HSN.RN.A.1)

An **exponent** tells how many times a number called the **base** is used as a factor. A **rational exponent** is an exponent that is a fraction.

If your students…

Confuse bases and exponents:

Draw attention to the similarity between the words *base* and *bottom.* The *base* of a building or a statue is at the *bottom*. So, too, the base of an exponential expression is at the bottom:

base is at the bottom $\rightarrow 2^5$

Apply rules for raising an expression with an exponent to a power incorrectly:

Show why the rule for raising an expression with an exponent to a power makes sense.

$(2^3)^4 = (2 \cdot 2 \cdot 2) \cdot (2 \cdot 2 \cdot 2) \cdot (2 \cdot 2 \cdot 2) \cdot (2 \cdot 2 \cdot 2)$ 2^3 equals $2 \cdot 2 \cdot 2$

$= 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2$ Remove parentheses.

$= 2^{12}$ There are twelve 2's in the product.

$= 2^{3 \cdot 4}$ $12 = 3 \cdot 4$

Don't see the connection between roots and rational exponents with 1 in the numerator:

$64^{\frac{1}{2}}$ = the square root of 64 = 8, because $8 \cdot 8 = 64$.

$8^{\frac{1}{3}}$ = the cube root of 8 = 2, because $2 \cdot 2 \cdot 2 = 8$.

$81^{\frac{1}{4}}$ = the fourth root of 81 = 3, because $3 \cdot 3 \cdot 3 \cdot 3 = 81$.

$1024^{\frac{1}{5}}$ = the fifth root of 1024 = 4, because $4 \cdot 4 \cdot 4 \cdot 4 \cdot 4 = 1024$.

$64^{\frac{1}{6}}$ = the sixth root of 64 = 2, because $2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 = 64$.

This additional resource will be of use to you; it is intended for teachers and provides additional context for presenting the material to students:

https://www.illustrativemathematics.org/content-standards/HSN/RN/A/1/tasks/385