## Unit 3 Lesson 4: Positive Rational Exponents

### 1 Math Talk: Regrouping Fractions (Warm up)

#### Student Task Statement

Find the value of each expression mentally.

$\frac{1}{2}⋅5⋅4$

$\frac{5}{2}⋅4$

$\frac{2}{3}⋅7⋅\frac{3}{2}$

$7⋅\frac{5}{3}⋅\frac{3}{7}$

### 2 You Can Use Any Fraction As an Exponent

#### Student Task Statement

1. Use exponent rules to explain why these expressions are equal to each other:

|  |  |
| --- | --- |
| * $\left(5^{\frac{1}{3}}\right)^{2}$
 | * $\left(5^{2}\right)^{\frac{1}{3}}$
 |

*
1. Write $5^{\frac{2}{3}}$ using radicals.
2. Write $5^{\frac{4}{3}}$ using radicals. Show your reasoning using exponent rules.

### 3 Fractional Powers Are Just Numbers

#### Student Task Statement

1. Complete the table as much as you can without using a calculator. (You should be able to fill in three spaces.)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| * $x$
 | * 0
 | * $\frac{1}{3}$
 | * $\frac{2}{3}$
 | * 1
 | * $\frac{4}{3}$
 | * $\frac{5}{3}$
 | * 2
 |
| * $2^{x}$ (using exponents)
 | * $2^{0}$
 | * $2^{\frac{1}{3}}$
 | * $2^{\frac{2}{3}}$
 | * $2^{1}$
 | * $2^{\frac{4}{3}}$
 | * $2^{\frac{5}{3}}$
 | * $2^{2}$
 |
| * $2^{x}$ (decimal approximation)
 | *
 | *
 | *
 | *
 | *
 | *
 | *
 |

* 1. Plot the points that you filled in.
	+ 
	1. Connect the points as smoothly as you can.
	2. Use this graph of $y=2^{x}$ to estimate the value of the other powers in the table, and write your estimates in the table.
1. Let’s investigate $2^{\frac{1}{3}}$:
	1. Write $2^{\frac{1}{3}}$ using radical notation.
	2. What is $\left(2^{\frac{1}{3}}\right)^{3}$?
	3. Raise your estimate from the table of $2^{\frac{1}{3}}$ to the third power. What should it be? How close did you get?
2. Let’s investigate $2^{\frac{2}{3}}$:
	1. Write $2^{\frac{2}{3}}$ using radical notation.
	2. What is the value of $\left(2^{\frac{2}{3}}\right)^{3}$?
	3. Raise your estimate from the table of $2^{\frac{2}{3}}$ to the third power. What should it be? How close did you get?



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