

EQ: What to negative and rational exponents mean in context?

SECONDARY MATH II // MODULE 3
SOLVING QUADRATIC & OTHER EQUATIONS – 3.2



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Lesson 2 Going Back in Time

A Solidify Understanding Task

Yesterday Travis and Miriam were learning how to deal with fractional exponents. Now Travis is curious if there were 300 bacteria when they first started measuring, how many were there an hour ago?

1. If the bacteria is doubling, reverse this pattern to fill out the table below going back in time.

x	-3	-2	-1	0	1	2	3	4
$f(x) = 300 \cdot 2^x$	37.5	75	150	300	600	1200	2400	4800

2. Evaluate the function for $x = -3$, and compare this answer with the number of bacteria in your table. What do you notice?

$$f(-3) = 300 \cdot 2^{-3} = \frac{300}{2^3} = 300 \div 2 \div 2 \div 2$$

3. Examine the expressions below.

$$300 \cdot 2^{-2} \quad \frac{300}{2^2} \quad 300 \div 2 \div 2$$

Do all of them simplify to the same number of bacteria? Describe how each of them represents the context of negative time in this situation.

4. Miriam wrote down some other calculations that she wanted to know about the number of bacteria. Help her explain what each of her expressions means in context.

a. $300 \cdot 2^{-1/4} \approx 252.27$ bacteria

The number of bacteria 15 minutes ago.

b. $300 \cdot (2^{1/3})^3 = 300(2)^1 = 600$ bacteria

The number of bacteria after 1 hour has passed (3 20 minutes intervals)

c. $300 \cdot 2^{24} = 5033164800$ bacteria

The number of bacteria after 24 hours

d. $300 \cdot 2^{1/10} \cdot 2^{1/10} = 300 \cdot 2^{\frac{2}{10}}$

The number of bacteria after 2, 6 minute intervals

e. $300 \cdot 2^4 \cdot 2^{1/2} =$

The number of bacteria after $4\frac{1}{2}$ hours $2^{2/3}$

f. $\frac{300(2)^3}{(2)^{1/3}} = 300(2)^{3-\frac{1}{3}} = 300(2)$

The number of bacteria $2\frac{2}{3}$ hours ago.

g. Use $[2^{1/3}]^3 = 2$ to explain why $2^{1/3} = \sqrt[3]{2}$

$$\sqrt[3]{[2^{1/3}]^3} = \sqrt[3]{2}$$

$$2^{1/3} = \sqrt[3]{2}$$