Unit 5 Lesson 7: Using Negative Exponents

1 Exponent Rules (Warm up)

Student Task Statement

How would you rewrite each of the following as an equivalent expression with a single exponent?

- $2^4 \cdot 2^0$

- $2^4 \cdot 2^{-1}$

- $2^4 \cdot 2^{-3}$

- $2^4 \cdot 2^{-4}$

2 Coral in the Sea

Student Task Statement

A marine biologist estimates that a structure of coral has a volume of 1,200 cubic centimeters and that its volume doubles each year.


1. Write an equation of the form $y = a \cdot b^t$ representing the relationship, where t is time in years since the coral was measured and y is volume of coral in cubic centimeters. (You need to figure out what numbers a and b are in this situation.)

2. Find the volume of the coral when t is 5, 1, 0, -1, and -2.

3. What does it mean, in this situation, when t is -2?

4. In a certain year, the volume of the coral is 37.5 cubic centimeters. Which year is this? Explain your reasoning.
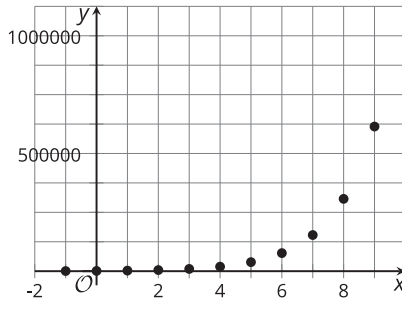
3 Windows of Graphs (Optional)

Student Task Statement

The volume, y, of coral in cubic centimeters is modeled by the equation $y = 1{,}200 \cdot 2^x$ where x is the number of years since the coral was measured. Three students used graphing technology to graph the equation that represents the volume of coral as a function of time.
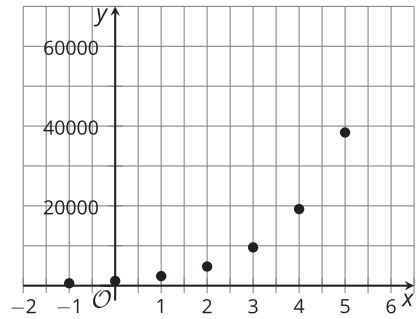
A
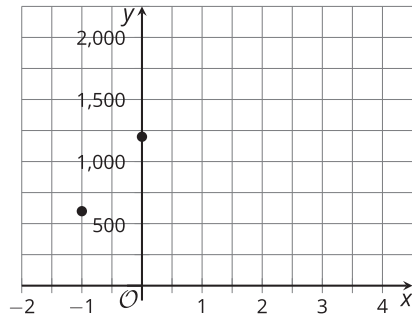
B

C

For each graph:

1. Describe how well each graphing window does, or does not, show the behavior of the function.

2. For each graphing window you think does not show the behavior of the function well, describe how you would change it.

3. Make the change(s) you suggested, and sketch the revised graph using graphing technology.

4 Measuring Meds

Student Task Statement

A person took some medicine but does not remember how much. Concerned that she took too much, she has a blood test every hour for several hours.

1. a. Time t is measured in hours since the first blood test and amount of medicine in her body, m, is measured in milligrams. What is the growth factor? That is, what is b in an equation of the form $m = a \cdot b^t$? What is a?

    b. Find the amounts of medicine in the patient's body when t is -1 and -3. Record them in the table.

t, time (hours)	m, medicine (mg)
0	100
1	50
2	25

2. What do $t = 0$ and $t = $ -3 mean in this context?

3. The medicine was taken when t is -5. Assuming the person did not have any of the medication in her body beforehand, how much medicine did the patient take?

4. Plot the points whose coordinates are shown in the table. Make sure to draw and label tick marks on the axes.
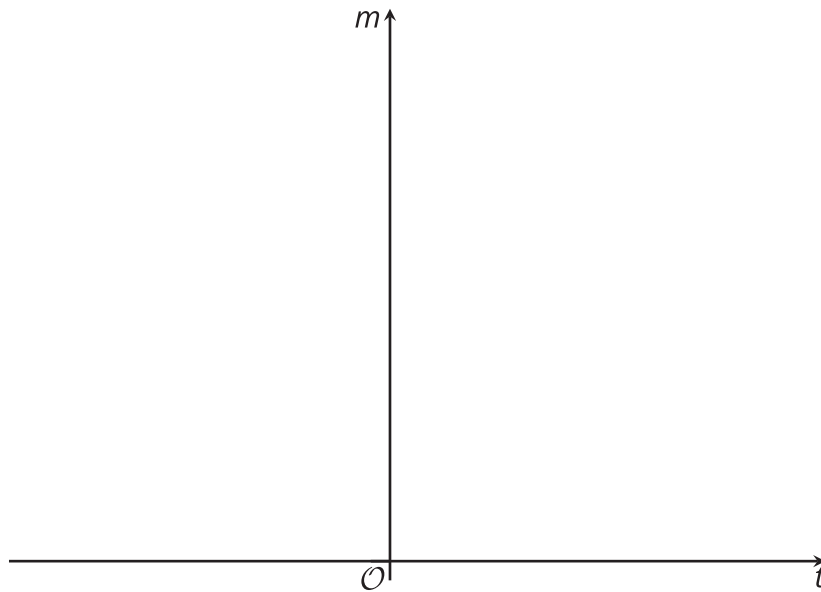
5. Based on your graph, when do you think the patient will have:

   a. 500 mg of medicine remaining in the body

   b. no medicine remaining in the body

Activity Synthesis