Unit 5 Lesson 12: Reasoning about Exponential Graphs (Part 1)

1 Spending Gift Money (Warm up)

Student Task Statement

Jada received a gift of $180. In the first week, she spent a third of the gift money. She continues spending a third of what is left each week thereafter. Which equation best represents the amount of gift money g, in dollars, she has after t weeks? Be prepared to explain your reasoning.

1. $g = 180 - \frac{1}{3}t$
2. $g = 180 \cdot \left(\frac{1}{3}\right)^t$
3. $g = \frac{1}{3} \cdot 180^t$
4. $g = 180 \cdot \left(\frac{2}{3}\right)^t$

2 Equations and Their Graphs

Student Task Statement

1. Each of the following functions f, g, h, and j represents the amount of money in a bank account, in dollars, as a function of time x, in years. They are each written in form $m(x) = a \cdot b^x$.
   $f(x) = 50 \cdot 2^x$
   $g(x) = 50 \cdot 3^x$
   $h(x) = 50 \cdot \left(\frac{3}{2}\right)^x$
   $j(x) = 50 \cdot (0.5)^x$

   a. Use graphing technology to graph each function on the same coordinate plane.

   b. Explain how changing the value of b changes the graph.

2. Here are equations defining functions p, q, and r. They are also written in the form $m(x) = a \cdot b^x$.
   $p(x) = 10 \cdot 4^x$
   $q(x) = 40 \cdot 4^x$
   $r(x) = 100 \cdot 4^x$

   a. Use graphing technology to graph each function and check your prediction.

   b. Explain how changing the value of a changes the graph.

3 Graphs Representing Exponential Decay

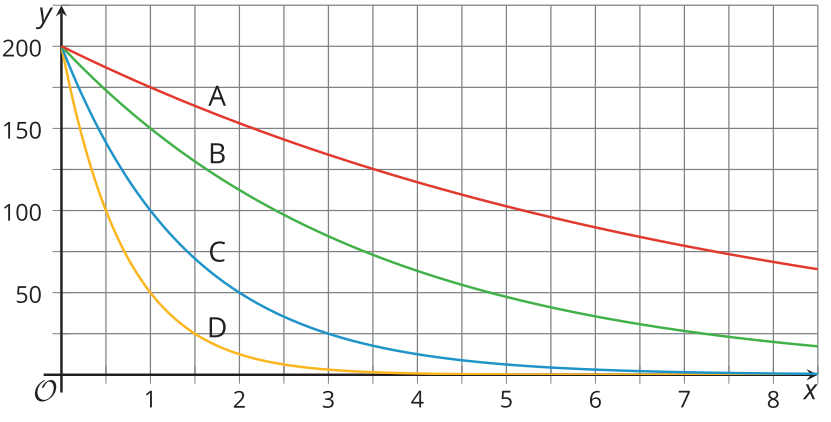
Student Task Statement

$$m(x) = 200 \cdot \left(\frac{1}{4}\right)^x$$

$$n(x) = 200 \cdot \left(\frac{1}{2}\right)^x$$

$$p(x) = 200 \cdot \left(\frac{3}{4}\right)^x$$

$$q(x) = 200 \cdot \left(\frac{7}{8}\right)^x$$



1. Match each equation with a graph. Be prepared to explain your reasoning.

2. Functions f and g are defined by these two equations: $f(x) = 1{,}000 \cdot \left(\frac{1}{10}\right)^x$ and $g(x) = 1{,}000 \cdot \left(\frac{9}{10}\right)^x$.

   a. Which function is decaying more quickly? Explain your reasoning.

   b. Use graphing technology to verify your response.