Unit 4 Lesson 16: Using Graphs and Logarithms to Solve Problems (Part 2)

1 Two Bank Accounts (Warm up)

Student Task Statement

A business owner opened two different types of investment accounts at the start of the year. The functions f and g represent the values of the two accounts as a function of the number of months after the accounts were opened.
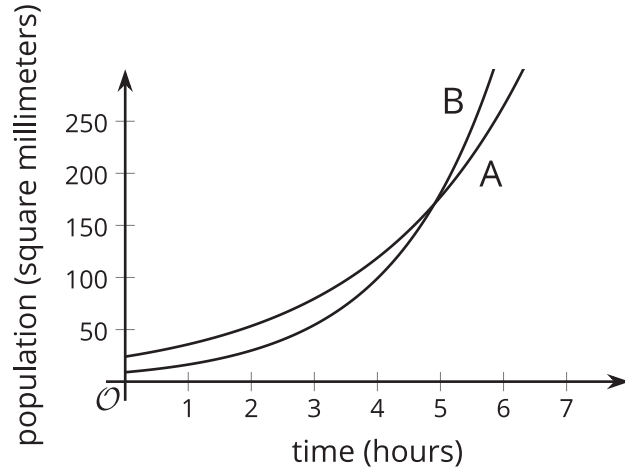
1. Here are some true statements about the investment accounts. What does each statement mean?

   a. $f(3) > g(3)$

   b. $f(6) < g(6)$

   c. $f(m) = g(m)$

2. If the two functions were graphed on the same coordinate plane, what might it look like? Sketch the two functions.

2 Bacteria in Different Conditions

Student Task Statement

To study the growth of bacteria in different conditions, a scientist measures the area, in square millimeters, occupied by two populations.

The growth of Population A, in square millimeters, can be modeled by $f(h) = 24 \cdot e^{(0.4h)}$ where h is the number of hours since the experiment began. The growth of Population B can be modeled by $g(h) = 9 \cdot e^{(0.6h)}$. Here are the graphs representing the two populations.

1. In this situation, what does the point of intersection of the two graphs tell us?

2. Suppose the population coordinate of the point of intersection is 171. Explain why we can find the corresponding time coordinate by:
   a. solving $f(h) = 171$ or $g(h) = 171$

   b. solving the equation $f(h) = g(h)$

3. Solve either $f(h) = 171$ or $g(h) = 171$. Show your reasoning.

4. Solve $f(h) = g(h)$. Show your reasoning.

3 Populations of Two Countries

Student Task Statement

The population, in millions, of Country C is given by the equation $f(t) = 16 \cdot e^{(0.02t)}$. The population of Country D is given by $g(t) = 17.5 \cdot e^{(0.025t)}$. In both equations, t is the number of years since 1980.

1. Will there be a time when the two populations are equal? Explain or show your reasoning.

2. At some point in time, the population of Country C reached 30 million. When does this happen? Explain or show your reasoning.