Unit 4 Lesson 17: Logarithmic Functions

1 Which One Doesn't Belong: Functions (Warm up)

Student Task Statement

Which one doesn't belong? Be prepared to explain your reasoning.

$f(x) = 4 \cdot (0.75)^x$

$g(x) = 4 \cdot e^{(0.75x)}$

$h(x) = (0.75) \cdot 4^x$

$j(x) = 4 \cdot \log x$

2 How Long Will It Take?

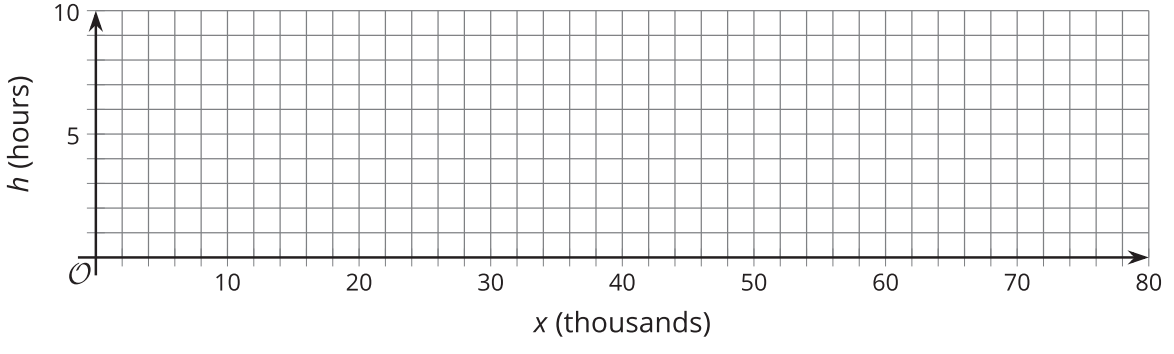
Student Task Statement

A colony of 1,000 bacteria doubles in population every hour.

1. Explain why we can write $h = \log_2 x$ to represent the number of hours, h, it takes for the one thousand bacteria to reach a population of x thousand.
2. Complete the table with the corresponding values of h.

x (thousands)	1	2	4	8	16	50	80
h (hours)							

3. Plot the pairs of values on the coordinate plane. Make two observations about the graph.



4. Use the graph to estimate the missing values in the table.

x (thousands)	10	24	72
h (hours)			

3 Another Logarithmic Function

Student Task Statement

Earlier we saw that $h = \log_2 x$ represents the number of hours for 1 thousand bacteria, doubling every hour, to reach a population of x, in thousands.

1. Suppose the function d, defined by $d(x) = \log_{10} x$, represents the number of days it takes 1 thousand of another species of bacteria to reach a population of x, in thousands. How is this population of bacteria growing?
2. Graph d using graphing technology. Make two observations about the graph.
3. Use your graph to estimate the values of $d(50)$ and $d(20{,}000)$. (Adjust your graphing window as needed.) Explain what each value means in this situation.
4. Estimate or find the population after 5 days.