



## YOU TRY IT! #2

In Biology class, a sample of bacteria was contaminated. After approximately 7 hours, the sample had reduced to approximately 2,000 bacteria. The students wanted to find out how many bacteria were included in the sample before the contamination. They found a function that models a declining population,  $t(x) = \frac{1}{0.25}(\ln x - \ln(2000))$  where  $t(x)$  is the time in hours that the bacteria declined, the rate of decline is 0.25, and  $x$  is the original population size of the sample of bacteria. Write an equation related to the function that would show the original population size seven hours after the contamination. Then use a table of function values to estimate how many bacteria were in the original sample.



## PRACTICE/HOMEWORK

Use the scenario below to complete questions 1 – 7.



### SCIENCE

The acidity of a liquid is called the pH of the liquid. This is based on the concentration of hydrogen ions,  $x$ , in the liquid. The formula for calculating the pH of a liquid,  $p(x)$ , is shown.

$$p(x) = -\log x$$

The table shows the pH of various liquids.

LIQUID	pH
LEMON JUICE	1.8
LIME JUICE	1.7
VINEGAR	2.4

1. Write an equation that can be used to determine the concentration of hydrogen ions,  $x$ , in lemon juice.
2. Use graphing technology to plot the pH function,  $p(x)$ , and  $y = 1.8$ . Use the intersection feature to determine the concentration of hydrogen ions,  $x$ , in lemon juice.
3. Write an equation that can be used to determine the concentration of hydrogen ions,  $x$ , in lime juice.
4. Use graphing technology to plot the pH function,  $p(x)$ , and  $y = 1.7$ . Use the intersection feature to determine the concentration of hydrogen ions,  $x$ , in lime juice.

- Write an equation that can be used to determine the concentration of hydrogen ions,  $x$ , in vinegar.
- Use a graphing calculator to plot the pH function,  $p(x)$ , and  $y = 2.4$ . Use the intersection feature to determine the concentration of hydrogen ions,  $x$ , in vinegar.
- Use your answers to previous questions to determine how many times greater the concentration of hydrogen ions present in lime juice is than the hydrogen ions present in lemon juice.

Use the scenario below to complete questions 8 – 14.



## SCIENCE

The loudness of a sound is measured in decibels (dB). One bel is the unit of measure for the loudness of a sound wave. One decibel is one-tenth of a bel (the prefix *deci-* means “one-tenth”). The loudness of a sound is a function of the pressure generated by the sound wave producing it. For sounds produced in air, the loudness,  $L(p)$ , can be written as the following function, where  $p$  represents the pressure of a sound wave in micropascals and  $L(p)$  is in decibels.

$$L(p) = 20\log\left(\frac{p}{20}\right)$$

SOUND	LOUDNESS (DECIBELS) $L(p)$
GARBAGE DISPOSAL	80
GARBAGE TRUCK	100
POWER SAW	104

The table shows the estimated loudness, in decibels, of some common sounds.

The table below shows the loudness in decibels,  $L(p)$ , based on the pressure generated by the sound wave producing it.

$p$	200,000	355,656	632,456	1,124,683	2,000,000	3,556,559
$L(p)$	80	85	90	95	100	105

- Write an equation that could be used to determine  $p$ , the sound pressure generated by the sound wave of a garbage disposal.
- Use the table to approximate a solution to your equation for the sound generated by a garbage disposal.
- Write an equation that could be used to determine  $p$ , the sound pressure generated by the sound wave of a garbage truck.
- Use the table to approximate a solution to your equation for the sound generated by a garbage truck.

12. Write an equation that could be used to determine  $p$ , the sound pressure generated by the sound wave of a power saw.
13. Enter the function  $L(p)$  into graphing technology. Use the table feature to approximate a solution to your equation for the sound generated by a power saw.
14. How many times greater is the sound pressure created by a garbage truck than the sound pressure created by a garbage disposal?

Use the scenario below to complete questions 15 – 20.



### TECHNOLOGY

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Internet search engines use a page rank algorithm to describe how important a web page is compared to other web pages. The algorithm is based on a logarithmic function and ranks pages from 0 to 10 based on the number of pages that link to the given web page. One search engine uses the function shown below where  $x$  is the number of pages linked to the given web page, to determine a page rank.

$$r(x) = \log(1.2x)$$

15. Kevin has a webpage for his band, Orion, Arise. After 6 months, the webpage had a page rank of 3.1. Write an equation that could be used to determine the number of pages linked to his band's webpage.
16. Graph both  $r(x)$  and  $y = 3.1$  using graphing technology. Use the intersection feature to determine an approximation of pages linked to Kevin's webpage.
17. About 1 year after creating the webpage for his band, the page rank is 3.8. Use a graphing calculator and its intersection feature to determine an approximation of pages linked to Kevin's webpage.
18. What was the difference in his page rank from 6 months after creating the webpage to 1 year after creating the webpage?
19. Which statement describes the relationship between the number of pages linked to Kevin's webpage at 6 months and again at 1 year?
  - A. The number of pages linked to his webpage after 1 year is about 5 times the number of pages linked to his webpage after 6 months.
  - B. The number of pages linked to his webpage after 6 months is about 5 times the number of pages linked to his webpage after 1 year.
20. How many more webpages were linked to Kevin's webpage at 1 year than at 6 months?