

Complete the following "Logical Arithmetic" problems based on your knowledge of exponent facts.

1. Logical Arithmetic: If $5^x = 125$, then $x = \underline{3}$.
2. Logical Arithmetic: If $10^x = 1$, then $x = \underline{0}$.
3. Logical Arithmetic: If $11^x = 121$, then $x = \underline{2}$.

Logical Arithmetic can be shortened into the word: LogArithm!

EXPLANATION:

LogArithm: base 2, (8)

IS ASKING ... With base 2, what exponent gives you 8? So the answer to this question would be 3 (since $2^3 = 8$).

Use the above information to complete the following

4. LogArithm: base 6, (1) = 0
5. LogArithm: base 2, (16) = 4
6. LogArithm: base 3, (81) = 4
7. LogArithm: base 5, $\frac{1}{25} = \underline{-2}$

Complete the following:

8. A house that costs \$200,000 will appreciate in value by 3% each year.

Write a function that models the cost of the house over time. Use x for years, and y for the value of the house, in dollars.

$$y = 200,000(1.03)^x$$

Find the value of the house at the end of ten years.

$$\text{\$ } 268,783.28$$

9. The most recent virus that is making people ill is a fast moving one. Ten people are sick to begin, however, the virus is compounding continuously.

Write a function that models the virus's growth over time.

$$A = 10e^{rt}$$

If 30 people are sick on day 5, find the rate of growth.

$$r = .2197$$

or 21.97%

10. Tobias ate half a banana in his room and forgot to throw the rest away. That night, two gnats came to visit the banana. Each night after, there were four times as many gnats hanging around the banana.

Write a function that models the gnats' growth over time. Use x for nights, and y for the number of gnats.

$$y = 2(4)^{x-1}$$

Tobias' mom said that he will be grounded if the gnats number more than 120. On what night will Tobias be in trouble, if he doesn't step in and solve his gnat problem?

night 4

11. You have a bad cough and have to attend your little sister's choir concert. You take cough drops that contain 100 mg of menthol in each drop. Every minute, the amount of menthol in your body is cut in half.

Write a function that models the amount of menthol in your body over time. Use x for minutes and y for the amount of menthol, in mg, remaining in your body

$$y = 100\left(\frac{1}{2}\right)^x$$

It is safe to take a new cough drop after the level of menthol in your body is less than 5 mg. How long will it be before you can take another cough drop?

4.32 minutes

(assuming 100 mg of menthol in your system immediately).