

# Math Path to 7 Billion

Adapted from [https://www.worldof7billion.org/wp-content/uploads/2014/08/Math\\_Path\\_to\\_7\\_Billion.pdf](https://www.worldof7billion.org/wp-content/uploads/2014/08/Math_Path_to_7_Billion.pdf)

## Part 1: Population Riddles

The significance of large numbers can be hard to understand. The world's population is over 7.5 billion, and the population of the United States is 321 million. Is that a little or a lot? This exercise will help you appreciate the difference between millions and billions.

### Riddle #1: Millions and Billions

Your rich uncle has just died and left you one billion dollars. **If you accept the money you must count it for eight hours a day at a rate of one dollar per second.** When you are finished counting, the billion dollars will be yours and only then may you begin to spend it.

How long do you think it would it take you to count to <b>one million</b> dollars at that rate?	
How long do you think would it take you to count to <b>one billion</b> dollars at that rate?	
Would you take your uncle's offer?	
Why or why not?	

### Riddle #2: Bacteria Bottles

**Doubling time** is the time it takes a population to double at a constant rate of growth. Bacteria, for instance, multiply by cellular division. One bacterium becomes two. Then two divide into four; the four divide into eight, and so on. For a certain strain of bacteria, the time for this division process is one minute.

If you put one of these bacterium in a bottle at 11:00 pm, the entire bottle will be full by midnight.

When would the bottle be half full?	
How do you know?	

### BONUS question for Riddle #2

Suppose you could be a bacterium in this bottle. At what time would you first realize that you were running out of space? Suppose that at 11:58 some bacteria realize that they are running out of space in the bottle. So they launch a search for new bottles. They look far and wide, and finally, offshore in the Arctic Ocean, they find three new empty bottles. Great sighs of relief come from all the bacteria. This is three times the number of bottles they've known. Surely, they think, their space problems are over. Is that so?

Since their space resources have quadrupled, how long can their growth continue?	
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### Riddle #3: Calendar Riddle

**Exponential growth** is a constant rate of growth applied to an increasing base. Doubling a small number over and over soon means doubling every-larger numbers.

A father complained that his son's allowance of \$5 per week was too much. The son replied, "Okay, Dad. How about this? You give me a penny for the first day of the month, 2 cents for the second, 4 cents for the next, 8 cents for the next, and so on for every day of the month." The father readily consented. Who was right?

Here is a calendar to use if needed. The numbers are the dates of the month.

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

What would the son's allowance be on day 31?	
Who was more clever (son or dad)?	

Now it's time to check your answers  
using the Keynote on Schoology!