

APES ~ BACTERIA BOTTLES ACTIVITY

(Taken from Earth Matters, 2nd edition, ZPB, Washington D.C.)

This puzzle illustrates the concept of exponential growth using bacteria. Bacteria multiply by 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 bacterium in a bottle at 11:00 PM, by midnight the entire bottle will be full.

1. When would the bottle be half-full? How do you know?
2. Suppose you could be a bacterium in this bottle. At what time would you first realize that you were running out of space?
3. 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. 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? Explain why the bacteria are still in trouble. Since their space resources have quadrupled, how long can their growth continue?
4. Does what you have learned about bacteria suggest something about human population growth?