

The Case of the Smelly Sandwich

Sometimes Athena and Rick receive non-serious requests. One such e-mail reported that a rotting sandwich had been removed (with tongs) from a school locker and was swarming with the bacteria *malodorous fictitious*. The e-mail also claimed:

- This particular bacteria is found in food at a concentration of 10 bacteria per cubic centimeter.
- There were 1,000 of the bacteria per cubic centimeter in the sandwich.
- The bacteria reproduces rapidly, doubling every week.



The e-mail challenged the duo to figure out how long the sandwich had been in the locker. Rick and Athena got to work. “Maybe we could use the growth formula,” Rick suggested. “The growth formula works like the formula for compound interest: $y = a(1 + r)^n$, where y = the ending number of bacteria, a = the starting number of bacteria, r = the growth rate, and n = the number of time periods.” Since the number of bacteria doubles every week, Rick further determined that the growth rate was 100% per week. Expressed as a decimal, Rick determined that r would equal 1.

WORK THE MATH

Show your work—use separate paper as needed.

1 What is the growth rate (r) of the bacteria?

4 In what unit of time (days, weeks, months, etc.) is the growth rate recorded?

2 What is the starting number of bacteria?

5 Was the sandwich in the locker at least a month? How do you know?

3 What is the ending number of bacteria?

6 Approximately how long was the sandwich in the locker?