

$$\frac{1}{10} = \frac{10}{100}$$

$$0.1 = 0.10$$

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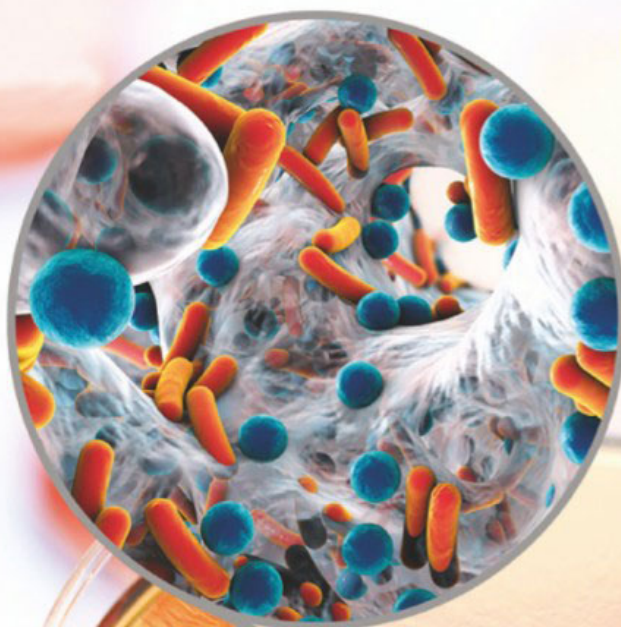
$$\frac{1}{10} = \frac{10}{100}$$



The Hidden World of

BACTERIA

Multiplying Mixed Numbers



Georgia Beth

A Microscopic Mystery

Bacteria are invisible to the human eye. But, they are all around! The world is crawling with over five nonillion (noh-NIL-yuhn) of them. What does that number look like? It is the digit 5 followed by 30 zeros! There's no question that these microscopic creatures have taken over Earth.

Bacteria are one-celled organisms. They are found everywhere. They live underground. They live in human bodies. Bacteria are even strong enough to live deep in the sea. Some types of bacteria have **adapted** to cold temperatures. They can be found in the frozen tundra.

Every person on Earth is covered with bacteria. They can be found on skin and on hair. They live in people's digestive systems, too. They can even affect a person's mood or weight.

Bacteria were first discovered in the late 1600s by Antonie van Leeuwenhoek (AN-tuh-nee vahn LAY-vuhn-huhk). He observed bacteria under a microscope. He took notes about what he saw. He recorded their sizes and shapes. But, he was only just beginning to understand their secrets.

A portrait of Antonie van Leeuwenhoek, a Dutch scientist, seated at a desk. He is wearing a brown robe and a white cravat. He holds a small object in his right hand. On the desk are a globe, a quill, and some papers. The background is dark. The image is framed by a red border. At the bottom, there are blue, abstract, biological-looking shapes and a network diagram with a hexagon containing the number 5.

Antonie van Leeuwenhoek

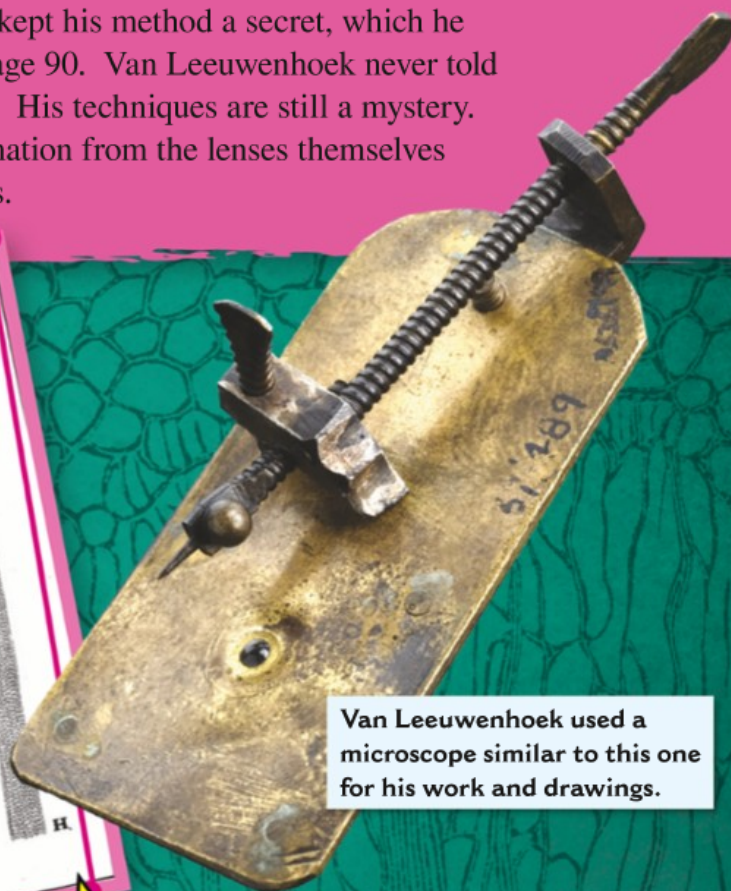
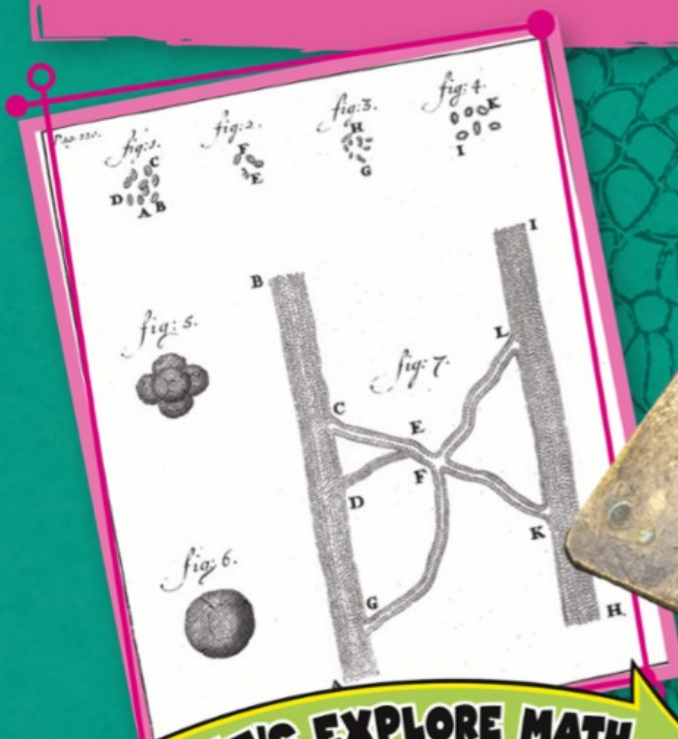


These illustrations by van Leeuwenhoek show the animalcules he observed.

Van Leeuwenhoek did not know what he had found. He called them “very little animalcules.” He compared samples of **microbes** from rainwater, saliva, and other sources.

Today, people know that bacteria are 0.2 to 10 microns wide. That means they are less than $\frac{1}{100}$ th of an inch (0.2 millimeters)! They can only be seen with certain magnifying glasses. The lenses magnify bacteria 300 to 1,000 times their actual size. This makes a cell that is smaller than a dot look as big as a word on this page!

The lenses van Leeuwenhoek used have confused experts. He did not have the powerful lenses that scientists have today. They believe that his lenses would have enhanced **cells** only 50 to 300 times their size. So, experts think he used something else. But, they are not exactly sure what that was. He kept his method a secret, which he took with him when he died at age 90. Van Leeuwenhoek never told anyone how he made his lenses. His techniques are still a mystery. But, scientists can gather information from the lenses themselves and through his written journals.



Van Leeuwenhoek used a microscope similar to this one for his work and drawings.

LET'S EXPLORE MATH

Van Leeuwenhoek's microscope was about 8 centimeters long. A modern microscope for students is about $4\frac{1}{4}$ times as tall. Which of the following is the best estimate for the height of a modern microscope? Explain your reasoning.

- A. a little less than 32 centimeters
- B. exactly 32 centimeters
- C. a little more than 32 centimeters

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