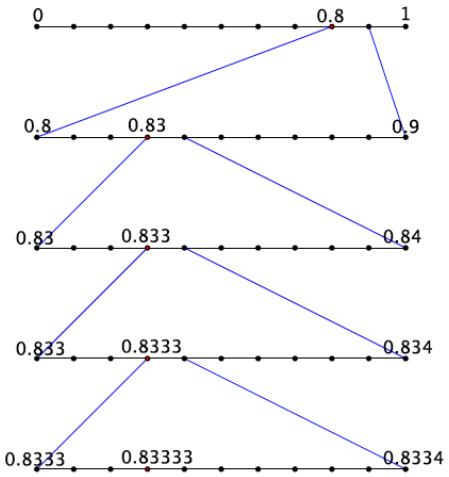
Lesson Summary

An infinite decimal is a decimal whose expanded form is infinite.

Example:
The expanded form of the decimal $0.8\overline{3} = 0.83333\ldots$ is $\frac{8}{10} + \frac{3}{10^2} + \frac{3}{10^3} + \frac{3}{10^4} + \cdots$.

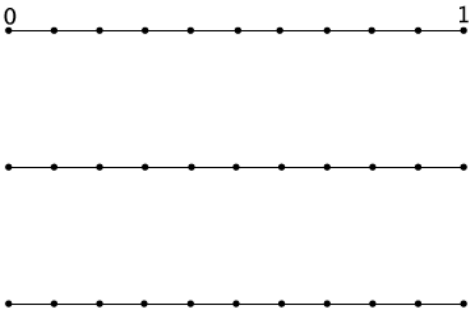
To pin down the placement of an infinite decimal on the number line, we first identify within which tenth it lies, then within which hundredth it lies, then within which thousandth, and so on. These intervals have widths getting closer and closer to a width of zero.



This reasoning allows us to deduce that the infinite decimal $0.9999\ldots$ and 1 have the same location on the number line. Consequently, $0.\overline{9} = 1$.

Problem Set

1.



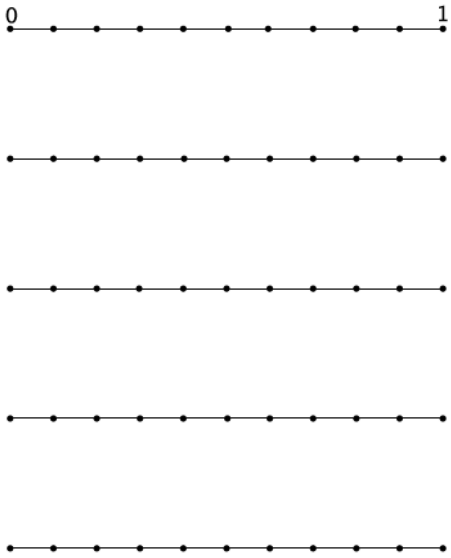
a. Write the expanded form of the decimal 0.625 using powers of 10.

b. Place the decimal 0.625 on the number line.

2.

a. Write the expanded form of the decimal $0.\overline{370}$ using powers of 10.

b. Show the first few stages of placing the decimal $0.370370\ldots$ on the number line.



3. Which is a more accurate representation of the fraction $\frac{2}{3}$: 0.6666 or $0.\overline{6}$? Explain. Which would you prefer to compute with?

4. Explain why we shorten infinite decimals to finite decimals to perform operations. Explain the effect of shortening an infinite decimal on our answers.

5. A classmate missed the discussion about why $0.\overline{9} = 1$. Convince your classmate that this equality is true.

6. Explain why $0.3333 < 0.33333$.