

8.5 Lesson

Round the number so that it contains exactly one nonzero digit.

One way to approximate a very large or a very small number is to round the number and write the result as the product of a single digit and a power of 10.

EXAMPLE 1 Approximating a Large Number



Earth contains about 332,500,000 cubic miles of water. The blue sphere represents all of the water on Earth, relative to the size of the planet.

Round the volume of water on Earth. Write the result as the product of a single digit and a power of 10.

$$\begin{aligned} 332,500,000 &\approx 300,000,000 && \text{Round to the nearest 100,000,000.} \\ &= 3 \times 100,000,000 && \text{Factor out 3.} \\ &= 3 \times 10^8 && \text{Write 100,000,000 as a power of 10.} \end{aligned}$$

▶ Earth contains about 3×10^8 cubic miles of water.

Try It Round the number. Write the result as the product of a single digit and a power of 10.

1. 8,031,426,100
2. 98,247,836,218

EXAMPLE 2 Approximating a Small Number

A blood vessel has a diameter of 0.0000924 meter. Round the diameter of the blood vessel. Write the result as the product of a single digit and a power of 10.

$$\begin{aligned} 0.0000924 &\approx 0.00009 && \text{Round to the nearest 0.00001.} \\ &= 9 \times 0.00001 && \text{Factor out 9.} \\ &= 9 \times 10^{-5} && \text{Write 0.00001 as a power of 10.} \end{aligned}$$

▶ The diameter of the blood vessel is about 9×10^{-5} meter.

Try It Round the number. Write the result as the product of a single digit and a power of 10.

3. 0.000384509
4. 0.00000726

EXAMPLE 3**Approximating a Quantity**

The distance from Saturn to Neptune is about 1,911,674,960 miles. The distance from Mercury to Neptune is about 1.5 times this distance. What is the approximate distance from Mercury to Neptune?

- A. 2×10^9 miles B. 3×10^9 miles
 C. 2×10^{10} miles D. 3×10^{10} miles

Round the distance from Saturn to Neptune. Write the result as the product of a single digit and a power of 10.

$$\begin{aligned}
 1,911,674,960 &\approx 2,000,000,000 && \text{Round to the nearest 1,000,000,000.} \\
 &= 2 \times 1,000,000,000 && \text{Factor out 2.} \\
 &= 2 \times 10^9 && \text{Write 1,000,000,000 as a power of 10.}
 \end{aligned}$$

Math Practice**Justify Conclusions**

Explain to a classmate why you do not use the Distributive Property to multiply 1.5 and (2×10^9) .

The distance from Mercury to Neptune is about 1.5 times the distance from Saturn to Neptune. So, the distance from Mercury to Neptune is about $1.5(2 \times 10^9)$, or 3×10^9 , miles.

▶ The correct answer is **B**.

Try It

5. The distance from Mercury to Mars is about 105,651,744 miles. The distance from Saturn to Jupiter is about 4 times this distance. What is the approximate distance from Saturn to Jupiter?

**Self-Assessment for Concepts & Skills**

Solve each exercise. Then rate your understanding of the success criteria in your journal.

APPROXIMATING A NUMBER Round the number. Write the result as the product of a single digit and a power of 10.

6. 899,032,878,300 7. 62,322,118,987
 8. 0.00000278101 9. 0.000013094

10. **APPROXIMATING A QUANTITY** Lake A has a volume of 21,150,427,000 cubic meters. Lake B has a volume that is 2.5 times the volume of Lake A. What is the approximate volume of Lake B?