

Name: \_\_\_\_\_

Date: \_\_\_\_\_

## Problem Solving: Scientific Notation

### Learning goals

After completing this activity, you will be able to ...

- Rewrite a number using scientific notation.
- Convert from scientific notation to standard number format.

### Scientific notation for numbers greater than 1

When writing very large numbers, it is often convenient to use a type of shorthand called *scientific notation*. In scientific notation, a number is converted to the product of a number between 1 and 10 and a power of 10. Here are some examples:

Number	Scientific notation
8,300,000	$8.3 \times 10^6$
460,000,000	$4.6 \times 10^8$
67,800,000,000,000	$6.78 \times 10^{13}$

1. To begin, fill in the empty spaces in the chart below:

$10^0$	$10^1$	$10^2$			$10^5$	$10^6$	$10^7$	$10^8$
1	10	100	1,000	10,000				

2. What is the relationship between the power of 10 and the number of zeros after the 1?

\_\_\_\_\_

To convert a large number to scientific notation, place a decimal point between the first and second digits of the number. Then count the digits between the new decimal point and the end of the number. That is the power of 10 you will multiply by.

<u>Original number</u>	→	<u>Place new decimal point</u>	→	<u>Count digits</u>	→	<u>Scientific notation</u>
83,500,000		8.3 500 000		$\begin{matrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 \\ 8 & 3 & 5 & 0 & 0 & 0 & 0 \end{matrix}$	$8.35 \times 10^7$	

3. Convert the following numbers to scientific notation.

1,300	_____	604,000,000	_____
234,000	_____	58,000,000,000,000,000	_____

4. Convert the following numbers from scientific notation to standard format.

$$1.9 \times 10^6 \quad \underline{\hspace{2cm}} \qquad 8.006 \times 10^{14} \quad \underline{\hspace{2cm}}$$

$$9.52 \times 10^0 \quad \underline{\hspace{2cm}} \qquad 7.0 \times 10^{19} \quad \underline{\hspace{2cm}}$$

**Scientific notation for numbers greater than 1**

Scientific notation is also used for very small numbers as well. Here are some examples:

Number	Scientific notation
0.000 35	$3.5 \times 10^{-4}$
0.000 000 505	$5.05 \times 10^{-7}$

1. To begin, fill in the empty spaces in the chart below:

<b>Power</b>	$10^{-1}$	$10^{-2}$	$10^{-3}$	$10^{-4}$		$10^{-6}$	$10^{-7}$
<b>Fraction</b>	$\frac{1}{10}$	$\frac{1}{100}$	$\frac{1}{1,000}$				
<b>Decimal</b>	0.1	0.01	0.001		0.000 01		

2. What is the relationship between the negative power of 10 and the number of zeros to the right of the decimal point? \_\_\_\_\_

To convert a decimal to scientific notation, place a decimal point to the right of the first non-zero digit. Count the digits between the original decimal point and the new decimal point—this is the negative power of 10 you will use.

<u>Original number</u>	→	<u>Place new decimal point</u>	→	<u>Count digits</u>	→	<u>Scientific notation</u>
0.000 007 9		0.000 007.9		$\begin{matrix} 1 & 2 & 3 & 4 & 5 & 6 \\ 0.000 & 007.9 \end{matrix}$		$7.9 \times 10^{-6}$

3. Convert the following numbers to scientific notation.

$$0.001 2 \quad \underline{\hspace{2cm}} \qquad 0.000 000 000 000 045 \quad \underline{\hspace{2cm}}$$

$$0.000 005 01 \quad \underline{\hspace{2cm}} \qquad 0.000 000 000 000 000 001 \quad \underline{\hspace{2cm}}$$

4. Convert the following numbers from scientific notation to standard format.

$$7.6 \times 10^{-4} \quad \underline{\hspace{2cm}} \qquad 4.003 \times 10^{-8} \quad \underline{\hspace{2cm}}$$

$$9 \times 10^{-1} \quad \underline{\hspace{2cm}} \qquad 6.07 \times 10^{-14} \quad \underline{\hspace{2cm}}$$