Scientific Notation

What is it? Scientific notation is used to represent very large and very small numbers. In scientific notation, a number is written as a number between 1 and 10 multiplied by a power of 10. Here is a table of the powers of 10 to help you see how to select your exponent for writing a number in scientific notation.

Powers of Ten			
$10^1 = 10$	$10^6 = 1,000,000$	$10^0 = 1$	$10^{-5} = 0.00001$
$10^2 = 100$	$10^7 = 10,000,000$	$10^{-1} = 0.1$	$10^{-6} = 0.000001$
$10^3 = 1,000$	$10^8 = 100,000,000$	$10^{-2} = 0.01$	$10^{-7} = 0.0000001$
$10^4 = 10,000$	$10^9 = 1,000,000,000$	$10^{-3} = 0.001$	$10^{-8} = 0.00000001$
$10^5 = 100,000$	$10^{10} = 10,000,000,000$	$10^{-4} = 0.0001$	$10^{-9} = 0.000000001$

How to do it (Part 1). Follow these steps to change a number from standard form to scientific notation.

For a large number.

Step 1: Move the decimal point to the left until you have a number greater than or equal to 1 and less than 10.

Step 2: Count the number of decimal places you moved the decimal point to the left and use that number as the positive power of 10.

Step 3: Multiply the decimal (in Step 1) by the power of 10 (in Step 2).

For a small number.

Step 1: Move the decimal point to the right until you have a number greater than or equal to 1 and less than 10.

Step 2: Count the number of decimal places you moved the decimal point to the right and use that number as the negative power of 10.

Step 3: Multiply the decimal (in Step 1) by the power of 10 (in Step 2).

Examples

Write 782,000 in scientific notation.

Move the decimal point 5 places to the left.

   7.82000

Since the decimal point is moved 5 places to the left, multiply by 10^5.

   7.82×10^5

So, $782,000 = 7.82 \times 10^5$

Write 0.0000006534 in scientific notation.

Move the decimal point 7 places to the right.

   6.534

Since the decimal point is moved 7 places to the right, multiply by 10^{-7}.

   6.534×10^{-7}

So, $0.0000006534 = 6.534 \times 10^{-7}$

How to do it (Part 2).

To change a number written in scientific notation with a **positive** power of 10 to standard form, move the decimal point to the **right**. To change a number written in scientific notation with a **negative** power of 10 to standard form, move the decimal point to the **left**. The exponent tells you the number of places to move the decimal point. Remember to add zeros as placeholders when necessary.

Scientific Notation Cheat Sheet
- Take the number and rewrite it as a decimal that is between 1 and 10.
- Multiply the decimal times 10 to the number of places you moved the decimal point.
- If decimal number is smaller than the original number, use a positive exponent. If the decimal is bigger, use a negative exponent.
- If you are rewriting a number in scientific notation back to standard form, move the decimal place the number of places the exponent is. Only add zeros if you are missing numbers to move the decimal past.
- If the scientific notation number has a negative exponent, the new number will be smaller than the decimal as you move the decimal to the left.
- If the scientific notation number has a positive exponent, the new number will be bigger than the decimal as you move the decimal to the right.

Examples

Write 6.351×10^7

Since you are multiplying by the positive 7th power of 10, move the decimal point 7 places to the right.

      63510000.

So, $6.531 \times 10^7 = 63,510,000$.

Write 4.806×10^{-4}

Since you are multiplying by the negative 4th power of 10, move the decimal point 4 places to the left.

      0.0004806

So, $4.806 \times 10^{-4} = 0.0004806$.

Practice

Write the numbers in scientific notation.

    1. 0.0003605 _____

    2. 228,000 _____

    3. 6,004,700 _____

    4. 0.0003200 _____

Write the numbers in standard form.

    5. 8.5×10^{-8} _____

    6. 5.19×10^6 _____

    7. 3.354×10^5 _____

    8. 4.002×10^{-3} _____

Name _____ Period _____

Scientific Notation Quiz
Check your skills!

Write the number using scientific notation.

1. 590,000 _____

2. 0.00312 _____

Write the number using standard form.

3. 6.37 x 10^{-6}_____

4. 9.402 x 10^{4} _____

5. What place value is 10^{4}?

     a. Hundreds
     b. Thousands
     c. Ten Thousands
     d. Tens

6. Express 2,479.80 in scientific notation.

     a. 24.7980 x 10^{4}
     b. 2.4798 x 10^{3}
     c. 0.24798 x 10^{4}
     d. 24,798 x 10^{1}

7. What is the equivalent value for 4.7 x10^{-3}?

     a. 0.0047
     b. 47,000
     c. 4.73
     d. 0.047