

1 Scientific Notation 5.7

By the end of this section, you should be able to solve the following problems.

1. Write the given number in scientific notation.

$$-819,000,000$$

2. Write the given number in scientific notation.

$$0.0037 \times 10^{-3}$$

3. Write the given number in standard form.

$$32.9 \times 10^4$$

4. Write the given number in standard form.

$$-3.456 \times 10^{-3}$$

2 Concepts

When a number is written in scientific notation, the decimal point is always placed to the right of the first non-zero significant digit as we read the number from left to right. Then the number of decimal places we have moved the

decimal point is written as an integer power of 10. The n in 10^n will be negative if we move the decimal point to the right and it will be positive if we move the decimal point to the left.

2.1 Examples

Put the following numbers in scientific notation.

1.

$$9,476,000,000 = 9.476 \times 10^9$$

Notice that all the zeros to the right of the decimal point were dropped because they are not significant digits. That is they hold no place value when they are to the right of the decimal point.

2.

$$0.00007304 = 7.304 \times 10^{-5}$$

3 Concepts

In your text book, a number in scientific notation is defined to have the form $(1 \leq |a| < 10) \times 10^n$. What this definition says is that any number is in

scientific notation if it is written as a number greater than or equal to 1 but strictly less than 10 and it is multiplied by an integer power of 10. In your text book, you are required to put numbers in scientific notation that look like they already are, but they are not.

3.1 Examples

Write the number in scientific notation.

$$\begin{aligned} 81.3 \times 10^4 &= 8.13 \times 10^1 \times 10^4 = \\ &= \\ &8.13 \times 10^5 \end{aligned}$$

Notice that 81.3 is not a number strictly less than 10.

In our next example, we take a number that is already in scientific notation and restore the original number. Whenever we do this, we put the number back into standard form.

3.2 Example

Put the number back into standard form.

$$4.1702 \times 10^{-8} = 0.000000041702$$

4 Facts

1. Whenever we put a number in scientific notation, we always put the decimal point to the right of the first non-zero significant digit of the number as we read the number from left to right.
2. A number in scientific notation is written in the form

$$(1 \leq |a| < 10) \times 10^n$$

5 Exercises

1. Write the given number in scientific notation.

$$-819,000,000$$

2. Write the given number in scientific notation.

$$0.0037 \times 10^{-3}$$

3. Write the given number in standard notation.

$$32.9 \times 10^4$$

4. Write the given number in standard notation.

$$-3.456 \times 10^{-3}$$

6 Solutions

1. Write the given number in scientific notation.

$$-819,000,000 = -8.19 \times 10^8$$

2. Write the given number in scientific notation.

$$0.0037 \times 10^{-3} = 3.7 \times 10^{-3} \times 10^{-3}$$

=

$$3.7 \times 10^{-6}$$

3. Write the given number in standard notation.

$$32.9 \times 10^4 = 329,000$$

4. Write the given number in standard notation.

$$-3.456 \times 10^{-3} = -0.003456$$