

CALCULATIONS USING SCIENTIFIC NOTATION

SCIENTIFIC NOTATION AND STANDARD FORM

Scientific notation is a way of writing numbers using powers of 10. You write a number in scientific notation using the product of two factors. The first factor is a number greater than one and less than 10 and the second factor is a power of 10.

$$1,650,000,000 = 1.65 \cdot 10^9$$

$$0.00067 = 6.7 \cdot 10^{-4}$$

The numbers on the left side and not in scientific notation are in **standard form**. Notice that the exponent shows the number of places that the decimal has moved. Also in scientific notation, numbers greater than one have positive exponents and numbers greater than zero and less than one have negative exponents.

Scientific notation is also how our calculators display extremely large numbers. When your calculator shows 1.3^{03} it means $1.3 \cdot 10^3 = 1,300$.

Example 1

Convert to scientific notation.

a. 17,000: Move the decimal between the 1 and 7 (4 places) and since the number was greater than one, the exponent is positive.
 $17,000 = 1.7 \cdot 10^4$

b. 0.000000345: Move the decimal between the 3 and 4 (7 places) and since the number was between zero and one, the exponent is negative.
 $0.000000345 = 3.45 \cdot 10^{-7}$

Example 2

Convert to standard form.

a. $1.77 \cdot 10^{-3}$: The number is between zero and one so move the decimal 3 places to the left.

$$1.77 \cdot 10^{-3} = 0.00177$$

b. $2.345 \cdot 10^6$: The number is greater than one so move the decimal 6 places to the right.

$$2.345 \cdot 10^6 = 2,345,000$$

Problems

Convert each number to scientific notation.

1. 12,500

2. 0.000345

3. 34,000,000

4. 0.007

5. 0.0000368

6. 7