

Math 114
Scientific Notation

Powers of Ten

$$10^0 = 1$$

$$10^1 = 10$$

$$10^2 = 100$$

$$10^3 = 1000$$

$$10^4 = 10000$$

Negative powers

$$10^{-1} = \frac{1}{10} = .1$$

$$10^{-2} = \frac{1}{10^2} = \frac{1}{100} = .01$$

$$10^{-3} = \frac{1}{10^3} = \frac{1}{1000} = .001$$

$$10^{-4} = \frac{1}{10^4} = \frac{1}{10000} = .0001$$

Standard Scientific Notation

$$N \times 10^n$$

where

$$1 \leq N < 10$$

n is an integer

Examples of Scientific Notation

Avogadro's Number 6.022×10^{23} atoms/mole

Distance from the earth to the sun

Distance from Pluto to the sun 5.95×10^{13} m

Planck's constant 6.626×10^{-34} J · s

Using Scientific Notation

Example 1

The population of Mexico City is about 23,000,000

To change the number into scientific notation you move the decimal place seven places to get: 2.3×10^7

Example 2

The speed the speed of light is 30,000,000,000 m/s. Write this number in scientific notation.

Answer: 3.0×10^{10}

Example 3

Convert .00000079 to scientific notation

Answer: 7.9×10^{-7}

Example 4

Convert .0000000000043

Answer: 4.3×10^{-12}

Multiplication with scientific notation

Example 5

Simplify

$$(6.1 \times 10^6)(7.8 \times 10^7)$$

$$(6.1)(7.8) \times 10^{6+7}$$

$$47.58 \times 10^{13}$$

$$4.758 \times 10^{14}$$

Example 6

Simplify

$$(3 \times 10^{10})(7 \times 10^7)$$

$$(3)(7) \times 10^{10+7}$$

$$21 \times 10^{17}$$

$$2.1 \times 10^{18}$$

Example 7

Simplify

$$(5 \times 10^{10})(4 \times 10^{-6})$$

$$(5)(4) \times 10^{10-6}$$

$$20 \times 10^4$$

$$2.0 \times 10^5$$

Division

Example 8

Simplify

$$\frac{4.2 \times 10^{12}}{2.1 \times 10^8} = \frac{4.2}{2.1} \times 10^{12-8} = 2 \times 10^4$$

Example 9

Simplify

$$\frac{5.8 \times 10^9}{3.5 \times 10^3}$$
$$\frac{5.8}{3.4} \times 10^{9-3}$$
$$1.66 \times 10^6$$

Example 10

Simplify

$$\frac{(4.2 \times 10^{10})(3.4 \times 10^4)}{2 \times 10^8}$$
$$\frac{14.28 \times 10^{14}}{2 \times 10^8}$$
$$7.14 \times 10^6$$
