

Note Booklet #1:

Physics Skills

Scientific method

A hypothesis is a possible explanation for some phenomenon. The difference between a hypothesis and a guess is that a hypothesis must make a testable prediction. There must be some experiment we could perform to test our hypothesis.

Example: A ball is rolled away from someone, but it then rolls back to the experimenter.

Hypothesis #1: I put backspin on it

Predication: IF ~~thrown~~^{rolled} without backspin
it will not come back

Hypothesis #2: The floor is slanted

Predication: IF rolled the other direction
it will ~~not~~ roll normally

Hypothesis #3: It bounced off a wall

Predication: IF rolled without a wall it
will keep going.

Positive and Negative Powers of 10

Exponential Form	As a multiplication	Standard Form
10^5	$10 \times 10 \times 10 \times 10 \times 10$	100,000
10^4	$10 \times 10 \times 10 \times 10$	10,000
10^3	$10 \times 10 \times 10$	1000
10^2	10×10	100
10^1	10	10
10^0	1	1
10^{-1}	$1 \div 10$	0.1
10^{-2}	$1 \div 10^2 = 1 \div 100$	0.01
10^{-3}	$1 \div 10^3 = 1 \div 1000$	0.001
10^{-4}	$1 \div 10^4 = 1 \div 10000$	0.0001
10^{-5}	$1 \div 10^5 = 1 \div 100000$	0.00001

Scientific Notation

We use scientific notation to simplify the writing of very large or very small numbers. As a rule of thumb in this class you should use scientific notation for all numbers greater than 1000 and less than 0.01.

Scientific notation consists of a number between 1 and 10 that is multiplied by a power of 10.

Which of the following are written in scientific notation?

5×6

54×10^3

5×10^3

5.3×10^{-3}

0.26×10^{19}

1.996235×10^3

Write "0.00045 grams" in scientific notation

$$4.5 \times 10^{-4} \text{ grams}$$

Write "2 562 000 seconds" in scientific notation

$$2.562 \times 10^6 \text{ seconds}$$

Write "260.9 mL" in scientific notation

$$2.609 \times 10^2 \text{ mL}$$

Write " 4.355×10^6 mL" in standard notation

4.3550000000

4355000 mL

Write " 9.46×10^{-5} seconds" in standard notation

0000009.46

0.0000946 seconds

Write " 4.1×10^{-4} litres" in standard notation

0000004.1

0.00041 litres

Operations with scientific notation

The easiest method to work with numbers in scientific notation is to use your calculator. Most calculators have a button such as "Exp" which means $\times 10$ to the power of.

For example, on my calculator $9 [Exp] 3 = 9000$.

Use your calculator to determine the solution to the following and express it in scientific notation:

$$(5.34 \times 10^4)(2.63 \times 10^9) = 1.40 \times 10^{14}$$

$$(5.1 \times 10^{-5})(2.9 \times 10^9) = 147900 \approx 1.48 \times 10^5$$

$$\frac{5.36 \times 10^{-3}}{19} = 0.000282$$

$$\approx 2.82 \times 10^{-4}$$

$$3.5 \times 10^4 + 9.52 \times 10^3 = 44520$$

$$\approx 4.45 \times 10^4$$

$$7.5 \times 10^9 - 1.532 \times 10^{10} = -7820000000$$

$$\approx -7.82 \times 10^9$$