PREPARATORY MATH SKILLS LAB

Lab PMS 12

MATH ACTIVITY

Identifying Names or Symbols to Indicate Power-of-ten Prefixes

MATH SKILLS LAB OBJECTIVE

When you complete this activity, you should be able to express a numerical value and unit, such as 3.4×10^{-3} meters, in prefix notation (3.4 millimeters).

The prefixes given in Table 1 are defined for numbers given in powers of ten. In the table, the most important prefixes are indicated by asterisks (*). Begin by learning the most important ones first. Then review the others often until you recognize them.

Example: Use Table 1 to see that the SI prefix and unit for the numbers given below are correct.

100×10^{-2} meters = 100 *centimeters*

1×10^{3} meters = 1 *kilometer*

5×10^{-3} meters = 5 *millimeters*

1.8×10^{-6} seconds = 1.8 *microseconds*

2×10^{12} watts = 2 *terawatts*

3×10^{3} cal = 3 *kilocalories*

TABLE 1: SI PREFIXES

Factor by Which the Unit Is Multiplied	Prefix Name	Prefix Symbol
10^{12}	tera	T
* 10^{9}	giga	G
* 10^{6}	mega	M
* 10^{3}	kilo	k
10^{2}	hecto	h
$10^{1} = 10$	deca	da
10^{-1}	deci	d
* 10^{-2}	centi	c
* 10^{-3}	milli	m
* 10^{-6}	micro	μ
* 10^{-9}	nano	n
10^{-12}	pico	p
10^{-15}	femto	f
10^{-18}	atto	a

* Most commonly used

PRACTICE EXERCISES

Problem 1: Place the names and symbols for the following factors in the spaces provided. The answer to the first one is provided.

Factor	Name	Symbol
10^{3}	kilo	k
10^{-3}		
10^{6}		
10^{-6}		
10^{-2}		
10^{9}		
10^{-9}		
10^{-12}		

Check answers by comparing to Table 1.

Problem 2: For the values given below, change the power-of-ten notation to a number. Then add the correct prefix symbol to the unit.

5.6×10^{3} meters	=	5.6 kilometers
6.8×10^{3} calories	=	
1.3×10^{-3} meters	=	
10×10^{-2} meters	=	
5×10^{-3} meters	=	
3.14×10^{-9} seconds	=	

Problem 3: Use Table 1 to identify the correct prefixes for the power-of-ten numbers given below.

10^{-3} meters	=	
10^{-3} seconds	=	
10^{-3} grams	=	
10^{-6} calories	=	
10^{-2} meters	=	

Problem 4: Rewrite 15,600 grams in power-of-ten notation and unit prefix name that involves kilograms.

Before working Problem 5, study Table 2. Table 2 gives examples of certain physical quantities expressed as numbers with units. These are listed in Column 1. In the next column, these numbers are restated in power-of-ten units. In the final column, these same numbers are written with correct prefixes.

Let's take a look at the first entry in Table 2 on the following page. You can see that 12,000 N can be written as follows:

$$12{,}000\ \text{N} = 12 \times 10^3\ \text{N} = 12\ \text{kilonewtons or } 12\ \text{kN}$$

TABLE 2. USE OF SI PREFIXES

Physical Quantity	Quantity Restated in Power-of-ten Notation	Quantity Expressed with Prefix Notation
12,000 newtons (N)	12×10^3 N	12 kN
0.000325 meter (m)	0.325×10^{-3} m or 325×10^{-6} m	0.325 mm 325 μm
1401 volts (V)	1.401×10^3 V	1.401 kV
34,200 watts (W)	34.2×10^3 W	34.2 kW
1.87×10^{-7} seconds (sec)	0.187×10^{-6} sec or 187×10^{-9} sec	0.187 μsec 187 nsec
3.28×10^7 joules (J)	32.8×10^6 J	32.8 MJ
9,500 grams	9.5×10^3 gm	9.5 kg

The other examples in Table 2 are completed in the same way. Now complete Problem 5.

Problem 5: Complete the following exercises by expressing the physical quantity given below in power-of-ten units and prefix units. Follow the examples given in Table 2.

Physical Quantity		*Power-of-ten Units*	*Prefix Units*
18.6×10^7 joules		_____ $\times 10^3$ J	_____
	or,	_____ $\times 10^6$ J	_____
1000 volts		_____	_____
1.91×10^{-7} seconds		_____ $\times 10^{-6}$ sec	_____
	or,	_____ $\times 10^{-9}$ sec	_____
3200 grams		_____	_____