INFORMATION SHEET

The table below shows the most common metric prefixes, their number value and their power of 10.

VALUE	PREFIX	POWER OF 10
1,000,000,000,000	tera (T)	10^{12}
1,000,000,000	giga (G)	10^{9}
1,000,000	mega (M)	10^{6}
1,000	kilo (k)	10^{3}
100	hecto	10^{2}
10	deka	10^{1}
.1	deci	10^{-1}
.01	centi	10^{-2}
.001	milli (m)	10^{-3}
.000,001	micro (μ)	10^{-6}
.000,000,001	nano (n)	10^{-9}
.000,000,000,001	pico (p)	10^{-12}

Metric Prefixes

When converting from prefixed numbers to whole numbers, the prefixed number is multiplied by the value shown in the table. When converting from whole numbers to prefixed numbers, the whole number is divided by the value of the prefix. When converting from one prefixed number to another, you multiply the number by the value of the first prefix, then divide that value by the prefix to which you are converting. Some examples are shown below.

VALUE	CALCULATION	CONVERSION TO
12 KV	12 × 1,000	12,000 V
1 MV	1 × 1,000,000 ÷ 1,000	1,000 KV
10 ma	10 × .001	.01 A
500 ns	500 × .000,000,001 ÷ .000,001	.5 μs
1,000 ms	1,000 × .001	1 s
.0001 μf	.000,1 × .000,001 ÷ .000,000,000,001	100 pf

Powers of 10

When numbers are expressed as a power of ten, each expression contains two components. The left component, called the number, always has a value greater than or equal to 1, but less than 10. The number may contain a decimal fraction but it cannot be less than 1. The right component is the power of 10, which when multiplied by the left component (the number), the original value will be produced. Following are some examples.

650 Same as 6.5×10^{2} or $6.5 \times 10 \times 10$

15,000 Same as 1.5×10^{4} or $1.5 \times 10 \times 10 \times 10 \times 10$

.012 Same as 1.2×10^{-2} or $1.2 \div 10 \div 10$

The procedure for conversions using powers of ten is similar to that used with metric prefixes. Some simplifying basic rules and procedures to follow when using powers of ten are shown below.

First, reduce the numbers to one digit numbers and raise the powers of 10 accordingly. The following examples show numbers written in powers of 10.

$1 \times 10^{0} = 1^{*}$ Same as 1×1
$1 \times 10^{1} = 10$ Same as 1×10
$1 \times 10^{2} = 100$ Same as $1 \times 10 \times 10$
$1 \times 10^{3} = 1{,}000$ Same as $1 \times 10 \times 10 \times 10$
$1 \times 10^{4} = 10{,}000$ Same as $1 \times 10 \times 10 \times 10 \times 10$

*NOTE: Any number to the ZERO power (ie. 1×10^{0}) is equal to ONE.

The following examples show how powers of ten can be used to express numbers with values less than 1.

$1 \times 10^{-1} = .1$ Same as $1 \div 10$
$1 \times 10^{-2} = .01$ Same as $1 \div 10 \div 10$
$1 \times 10^{-3} = .001$ Same as $1 \div 10 \div 10 \div 10$
$1 \times 10^{-4} = .0001$ Same as $1 \div 10 \div 10 \div 10 \div 10$

When working with negative powers of ten, simply move the decimal point the number of places indicated by the power of ten. Move the decimal to the left for negative numbers and to the right for positive numbers.

Multiplication Using Powers of 10

When multiplying using powers of ten, you do not have to deal with large numbers of zeros which can be cumbersome and increase the chances for error. With powers of ten, you simply multiply the number (left component) and add the power of ten (right component). This greatly reduces the chance of error. Following is an example showing a comparison of these two methods.

Conventional Method	Powers of Ten Method
10,000 × 15,000	10,000 × 15,000
10,000	$10{,}000 = 1 \times 10^{4}$
× 15,000	$15{,}000 = 1.5 \times 10^{4}$
00 000	
000 00	$1 \times 1.5 = 1.5$
0 000 0	$10^{4+4} = 10^{8}$
50 000	
100 00	Answer = 1.5×10^{8}
Answer = 150,000,000	

The same rules apply regardless of how many numbers you are multiplying together. The following example shows the original numbers, those numbers written in powers of ten and the solution.

EXAMPLE:

$3{,}500 \times 80 \times 900$	Numbers
$(3.5 \times 10^3) \times (8 \times 10^1) \times (9 \times 10^2)$	Powers of 10
$252 \times 10^{3+1+2}$	Solution
252×10^6 or 252,000,000 (or 2.52×10^8)	

Division Using Powers of 10

The procedure for division using powers of ten is similar to that used in multiplication. In division you divide the denominator's left component into the numerator's left component. Then subtract the denominator's power of ten from the numerator's power of ten. The following examples show this procedure.

EXAMPLE:

$5{,}000{,}000 \div 2{,}000$	Numbers
$(5 \times 10^6) \div (2 \times 10^3)$	Powers of 10
$(5/2) \times 10^{6-3}$	Solution
2.5×10^3 or 2,500	

EXAMPLE:

$4{,}500{,}000{,}000 \div .005$	Numbers
$(4.5 \times 10^9) \div (5 \times 10^{-3})$	Powers of 10
$(4.5/5) \times (10^{9-(-3)})$	Solution
$.9 \times 10^{12}$	
9×10^{11} or 900,000,000,000	

Addition and Subtraction Using Powers of 10

When adding or subtracting powers of ten, the right component (power of ten) must be the same. The left components are then added or subtracted normally. Following are some examples.

ADDITION EXAMPLE:

$(150 \times 10^4) + (34 \times 10^3)$	Numbers (Powers of 10)
$(150 \times 10^4) + (3.4 \times 10^4)$	Correct Form
$(150 + 3.4) \times 10^4$	Solution
153.4×10^4 or 1,534,000	

SUBTRACTION EXAMPLE:

$(7.2 \times 10^2) - (1.5 \times 10^1)$	Numbers (Powers of 10)
$(7.2 \times 10^2) - (.15 \times 10^2)$	Correct Form
$(7.2 - .15) \times 10^2$	Solution
7.05×10^2 or 705	