

## Circle

$$\text{Circumference} = 2 \pi r$$

$$\text{Area} = \pi r^2$$

## Sphere

$$\text{Volume} = \frac{4}{3} \pi r^3$$

$$\text{Surface Area} = 4 \pi r^2$$

## Triangle

$$\text{Area} = \frac{1}{2} bh$$

$$a^2 = b^2 + c^2 - 2bc \cos \angle A$$

$$b^2 = a^2 + c^2 - 2ac \cos \angle B$$

$$c^2 = a^2 + b^2 - 2ab \cos \angle C$$

## Conversions

### Mass/Weight

1 kg	= 2.205 lb <sub>m</sub>
1 slug	= 32.2 lb <sub>m</sub>
1 ton	= 2000 lb
1 lb	= 16 oz

### Length

1 m	= 3.28 ft
1 km	= 0.621 mi
1 in.	= 2.54 cm
1 mi	= 5280 ft
1 yd	= 3 ft

### Time

1 d	= 24 h
1 h	= 60 min
1 min	= 60 s
1 yr	= 365 d

### Area

1 acre	= 4047 m <sup>2</sup>
	= 43,560 ft <sup>2</sup>
	= 0.00156 mi <sup>2</sup>

### Volume

1 L	= 0.264 gal
	= 0.0353 ft <sup>3</sup>
	= 33.8 fl oz
1 mL	= 1 cm <sup>3</sup> = 1 cc

### Temperature Unit Equivalents

\*Use equation in section 9.8 to convert

Δ1 K	= Δ1 °C
	= Δ1.8 °F
	= Δ1.8 °R

### Force

1 N	= 0.225 lb
1 kip	= 1,000 lb

### Pressure

1 atm	= 1.01325 bar
	= 33.9 ft H <sub>2</sub> O
	= 29.92 in. Hg
	= 760 mm Hg
	= 101,325 Pa
	= 14.7 psi
1 psi	= 2.31 ft of H <sub>2</sub> O

### Power

1 W	= 3.412 Btu/h
	= 0.00134 hp
	= 14.34 cal/min
	= 0.7376 ft-lb/s
1 hp	= 550 ft-lb/sec

### Energy

1 J	= 0.239 cal
	= 9.48 x 10 <sup>-4</sup> Btu
	= 0.7376 ft-lb
1 kWh	= 3,600,000 J

### Rotational Speed

1 Hz	= 60 rpm
	= 2π rad/sec

### Defined Units

1 J	= 1 N·m
1 N	= 1 kg·m / s <sup>2</sup>
1 Pa	= 1 N / m <sup>2</sup>
1 V	= 1 W / A
1 W	= 1 J / s
1 W	= 1 V·A
1 Hz	= 1 s <sup>-1</sup>
1 F	= 1 A·s / V
1 H	= 1 V·s / A



### Temperature

$$T_K = T_C + 273$$

$$T_K = T_F + 493$$

$$T_F = \frac{9}{5} T_C + 32$$

$$T_C = \frac{T_F - 32}{1.8}$$

T<sub>K</sub> = temperature in Kelvin

T<sub>C</sub> = temperature in Celsius

T<sub>F</sub> = temperature in Rankine

T<sub>F</sub> = temperature in Fahrenheit

### Numbers Less Than One

Power of 10	Decimal Equivalent
10 <sup>-1</sup>	0.1
10 <sup>-2</sup>	0.01
10 <sup>-3</sup>	0.001
10 <sup>-4</sup>	0.00001
10 <sup>-5</sup>	0.000000001
10 <sup>-12</sup>	
10 <sup>-15</sup>	
10 <sup>-18</sup>	
10 <sup>-21</sup>	
10 <sup>-24</sup>	

### Numbers Greater Than One

Power of 10	Whole Number Equivalent	Prefix
10 <sup>1</sup>	10	deca-
10 <sup>2</sup>	100	hecto-
10 <sup>3</sup>	1000	kilo-
10 <sup>6</sup>	1,000,000	Mega-
10 <sup>9</sup>	1,000,000,000	Giga-
10 <sup>12</sup>		Tera-
10 <sup>15</sup>		Peta-
10 <sup>18</sup>		Exa-
10 <sup>21</sup>		Zetta-
10 <sup>24</sup>		Yotta-

## Resistor Color Code

1 <sup>st</sup> Band	2 <sup>nd</sup> Band	Multiplier	Tolerance
NO CODE			20%
Silver		0.1	10%
Gold		0.1	5%
Black	0	1	
Brown	1	10	
Red	2	100	
Orange	3	1000	
Yellow	4	10000	
Green	5	100000	
Blue	6	1000000	
Violet	7	10000000	
Gray	8	100000000	
White	9	1000000000	

## Speeds and Feeds

$$N = \frac{CS \left( \frac{1}{12} \right)^2}{\pi f}$$

$$f_m = f_r \cdot N$$

$$\text{Plunge Rate} = \frac{1}{4} f_r$$

$$N = \text{spindle speed (rpm)}$$

$$CS = \text{cutting speed (ft/min)}$$

$$d = \text{diameter (in.)}$$

$$f_r = \text{feed rate (in./min)}$$

$$f_t = \text{feed (in./tooth/rev)}$$

$$n_s = \text{number of teeth}$$