

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

$$\text{Area} = \frac{1}{2} bh$$
$$a^2 = b^2 + c^2 - 2bc \cos A$$
$$b^2 = a^2 + c^2 - 2ac \cos B$$
$$c^2 = a^2 + b^2 - 2ab \cos C$$

Conversions

Mass/Weight

1 kg	= 2.205 lb _m
1 slug	= 32.2 lb _m
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 ²
	= 43,560 ft ²
	= 0.00156 mi ²

Volume

1 L	= 0.264 gal
	= 0.0353 ft ³
	= 33.8 fl oz
1 mL	= 1 cm ³ = 1 cc

Temperature Unit Equivalents

*Use equation in section 9.0 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 ₂ O
	= 29.92 in. Hg
	= 760 mm Hg
	= 101,325 Pa
	= 14.7 psi
1 psi	= 2.31 ft of H ₂ 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

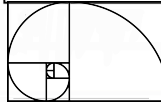
1 J	= 0.239 cal
	= 9.48 x 10 ⁻⁴ Btu
	= 0.7376 ft·lb _f
1 kWh	= 3,600,000 J

Rotational Speed

1 Hz	= 60 rpm
	= 2π rad/sec

Defined Units

1 J	= 1 N·m
1 N	= 1 kg·m / s ²
1 Pa	= 1 N / m ²
1 V	= 1 W / A
1 W	= 1 J / s
1 W	= 1 V·A
1 Hz	= 1 s ⁻¹
1 F	= 1 A·s / V
1 H	= 1 V·s / A



Temperature

$$T_K = T_C + 273$$

$$T_R = T_F + 460$$

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

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

T_K = temperature in Kelvin
T_C = temperature in Celsius
T_R = temperature in Rankine
T_F = temperature in Fahrenheit

Numbers Less Than One

Power of 10	Decimal Equivalent	Prefix
10 ⁻¹	0.1	deci-
10 ⁻²	0.01	centi-
10 ⁻³	0.001	milli-
10 ⁻⁶	0.000001	micro-
10 ⁻⁹	0.000000001	nano-
10 ⁻¹²		pico-
10 ⁻¹⁵		femto-
10 ⁻¹⁸		atto-
10 ⁻²¹		zepto-
10 ⁻²⁴		yocto-

Numbers Greater Than One

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

Resistor Color Code

1 st Band	2 nd Band	Multiplier	Tolerance
NONE			20%
Silver		0.01	10%
Gold		0.1	5%
Black	0	1	
Brown	1	10	
Red	2	100	
Orange	3	1K	
Yellow	4	10K	
Green	5	100K	
Blue	6	1M	
Violet	7	10M	
Gray	8	100M	
White	9	1000M	

Speeds and Feeds

$$N = \frac{CS(12 \frac{in}{ft})}{\pi d}$$
$$f_m = f_r \cdot n \cdot N$$
$$\text{Plunge Rate} = \frac{1}{2} f_m$$
$$N = \text{spindle speed (rpm)}$$
$$CS = \text{cutting speed (ft/min)}$$
$$d = \text{diameter (in.)}$$
$$f_m = \text{feed rate (in./min)}$$
$$f_r = \text{feed (in./tooth/rev)}$$
$$n = \text{number of teeth}$$