

# **Conversion Factors**

<b>COMMONLY USED CONVERSION FACTORS</b>		
<b>Multiply</b>	<b>By</b>	<b>To Obtain</b>
Acres . . . . .	43,560	Square feet
Acres . . . . .	$1.562 \times 10^{-3}$	Square miles
Acre-Feet . . . . .	43,560	Cubic feet
Amperes per sq. cm. . . . .	6.452	Amperes per sq. in.
Amperes per sq. in. . . . .	0.1550	Amperes per sq. cm.
Ampere-Turns . . . . .	1.257	Gilberts
Ampere-Turns per cm. . . . .	2.540	Ampere-turns per in.
Ampere-Turns per in. . . . .	0.3937	Ampere-turns per cm.
Atmospheres . . . . .	76.0	Cm. of mercury
Atmospheres . . . . .	29.92	Inches of mercury
Atmospheres . . . . .	33.90	Feet of water
Atmospheres . . . . .	14.70	Pounds per sq. in.
British thermal units . . . . .	252.0	Calories
British thermal units . . . . .	778.2	Foot-pounds
British thermal units . . . . .	$3.960 \times 10^{-4}$	Horsepower-hours
British thermal units . . . . .	0.2520	Kilogram-calories
British thermal units . . . . .	107.6	Kilogram-meters
British thermal units . . . . .	$2.931 \times 10^{-4}$	Kilowatt-hours
British thermal units . . . . .	1,055	Watt-seconds
B.t.u. per hour . . . . .	$2.931 \times 10^{-4}$	Kilowatts
B.t.u. per minute . . . . .	$2.359 \times 10^{-2}$	Horsepower
B.t.u. per minute . . . . .	$1.759 \times 10^{-2}$	Kilowatts
Bushels . . . . .	1.244	Cubic feet
Centimeters . . . . .	0.3937	Inches
Circular mils . . . . .	$5.067 \times 10^{-6}$	Square centimeters
Circular mils . . . . .	$0.7854 \times 10^{-6}$	Square inches
Circular mils . . . . .	0.7854	Square mils
Cords . . . . .	128	Cubic feet
Cubic centimeters . . . . .	$6.102 \times 10^{-6}$	Cubic inches

## COMMONLY USED CONVERSION FACTORS *(cont.)*

Multiply	By	To Obtain
Cubic feet . . . . .	0.02832	Cubic meters
Cubic feet . . . . .	7.481	Gallons
Cubic feet . . . . .	28.32	Liters
Cubic inches . . . . .	16.39	Cubic centimeters
Cubic meters . . . . .	35.31	Cubic feet
Cubic meters . . . . .	1.308	Cubic yards
Cubic yards . . . . .	0.7646	Cubic meters
Degrees (angle) . . . . .	0.01745	Radians
Dynes . . . . .	$2.248 \times 10^{-6}$	Pounds
Ergs. . . . .	1	Dyne-centimeters
Ergs. . . . .	$7.37 \times 10^{-6}$	Foot-pounds
Ergs. . . . .	$10^{-7}$	Joules
Farads. . . . .	$10^6$	Microfarads
Fathoms . . . . .	6	Feet
Feet. . . . .	30.48	Centimeters
Feet of water . . . . .	.08826	Inches of mercury
Feet of water . . . . .	304.8	Kg. per square meter
Feet of water . . . . .	62.43	Pounds per square ft.
Feet of water . . . . .	0.4335	Pounds per square in.
Foot-pounds. . . . .	$1.285 \times 10^{-2}$	British thermal units
Foot-pounds. . . . .	$5.050 \times 10^{-7}$	Horsepower-hours
Foot-pounds. . . . .	1.356	Joules
Foot-pounds. . . . .	0.1383	Kilogram-meters
Foot-pounds. . . . .	$3.766 \times 10^{-7}$	Kilowatt-hours
Gallons . . . . .	0.1337	Cubic feet
Gallons . . . . .	231	Cubic inches
Gallons . . . . .	$3.785 \times 10^{-3}$	Cubic meters
Gallons . . . . .	3.785	Liters
Gallons per minute . . . . .	$2.228 \times 10^{-3}$	Cubic feet per sec.
Gausses . . . . .	6.452	Lines per square in.
Gilberts . . . . .	0.7958	Ampere-turns
Henries . . . . .	$10^3$	Millihenries
Horsepower . . . . .	42.41	B.t.u. per min.
Horsepower . . . . .	2,544	B.t.u. per hour

## COMMONLY USED CONVERSION FACTORS *(cont.)*

Multiply	By	To Obtain
Horsepower . . . . .	550	Foot-pounds per sec.
Horsepower . . . . .	33,000	Foot-pounds per min.
Horsepower . . . . .	1.014	Horsepower (metric)
Horsepower . . . . .	10.70	Kg. calories per min.
Horsepower . . . . .	0.7457	Kilowatts
Horsepower (boiler) . . . . .	33,520	B.t.u. per hour
Horsepower-hours . . . . .	2,544	British thermal units
Horsepower-hours . . . . .	$1.98 \times 10^6$	Foot-pounds
Horsepower-hours . . . . .	$2.737 \times 10^5$	Kilogram-meters
Horsepower-hours . . . . .	0.7457	Kilowatt-hours
Inches . . . . .	2.540	Centimeters
Inches of mercury . . . . .	1.133	Feet of water
Inches of mercury . . . . .	70.73	Pounds per square ft.
Inches of mercury . . . . .	0.4912	Pounds per square in.
Inches of water . . . . .	25.40	Kg. per square meter
Inches of water . . . . .	0.5781	Ounces per square in.
Inches of water . . . . .	5.204	Pounds per square ft
Joules . . . . .	$9.478 \times 10^{-4}$	British thermal units
Joules . . . . .	0.2388	Calories
Joules . . . . .	$10^7$	Ergs
Joules . . . . .	0.7376	Foot-pounds
Joules . . . . .	$2.778 \times 10^{-7}$	Kilowatt-hours
Joules . . . . .	0.1020	Kilogram-meters
Joules . . . . .	1	Watt-seconds
Kilograms . . . . .	2.205	Pounds
Kilogram-calories . . . . .	3.968	British thermal units
Kilogram meters . . . . .	7.233	Foot-pounds
Kg per square meter . . . . .	$3.281 \times 10^{-3}$	Feet of water
Kg per square meter . . . . .	0.2048	Pounds per square ft.
Kg per square meter . . . . .	$1.422 \times 10^{-3}$	Pounds per square in.
Kilolines . . . . .	$10^3$	Maxwells
Kilometers . . . . .	3.281	Feet
Kilometers . . . . .	0.6214	Miles
Kilowatts . . . . .	56.87	B.t.u. per min.

## COMMONLY USED CONVERSION FACTORS *(cont.)*

Multiply	By	To Obtain
Kilowatts . . . . .	737.6	Foot-pounds per sec.
Kilowatts . . . . .	1.341	Horsepower
Kilowatts-hours . . . . .	3409.5	British thermal units
Kilowatts-hours . . . . .	$2.655 \times 10^6$	Foot-pounds
Knots . . . . .	1.152	Miles
Liters . . . . .	0.03531	Cubic feet
Liters . . . . .	61.02	Cubic inches
Liters . . . . .	0.2642	Gallons
Log $N_e$ or in N . . . . .	0.4343	Log <sub>10</sub> N
Log N . . . . .	2.303	Log <sub>e</sub> N or in N
Lumens per square ft. . . . .	1	Footcandles
Maxwells . . . . .	$10^{-3}$	Kilolines
Megalines . . . . .	$10^6$	Maxwells
Megaohms . . . . .	$10^6$	Ohms
Meters . . . . .	3.281	Feet
Meters . . . . .	39.37	Inches
Meter-kilograms . . . . .	7.233	Pound-feet
Microfarads . . . . .	$10^{-6}$	Farads
Microhms . . . . .	$10^{-6}$	Ohms
Microhms per cm. cube . . . . .	0.3937	Microhms per in. cube
Microhms per cm. cube . . . . .	6.015	Ohms per mil. foot
Miles . . . . .	5,280	Feet
Miles . . . . .	1.609	Kilometers
Miner's inches . . . . .	1.5	Cubic feet per min.
Ohms . . . . .	$10^{-6}$	Megohms
Ohms . . . . .	$10^6$	Microhms
Ohms per mil foot . . . . .	0.1662	Microhms per cm. cube
Ohms per mil foot . . . . .	0.06524	Microhms per in. cube
Poundals . . . . .	0.03108	Pounds
Pounds . . . . .	32.17	Poundals
Pound-feet . . . . .	0.1383	Meter-Kilograms
Pounds of water . . . . .	0.01602	Cubic feet
Pounds of water . . . . .	0.1198	Gallons
Pounds per cubic foot . . . . .	16.02	Kg. per cubic meter
Pounds per cubic foot . . . . .	$5.787 \times 10^{-4}$	Pounds per cubic in.

## COMMONLY USED CONVERSION FACTORS *(cont.)*

Multiply	By	To Obtain
Pounds per cubic inch . . .	27.68	Grams per cubic cm.
Pounds per cubic inch . . .	$2.768 \times 10^{-4}$	Kg. per cubic meter
Pounds per cubic inch . . .	1.728	Pounds per cubic ft.
Pounds per square foot . .	0.01602	Feet of water
Pounds per square foot . .	4.882	Kg. per square meter
Pounds per square foot . .	$6.944 \times 10^{-3}$	Pounds per sq. in.
Pounds per square inch . .	2.307	Feet of water
Pounds per square inch . .	2.036	Inches of mercury
Pounds per square inch . .	703.1	Kg. per square meter
Radians . . . . .	57.30	Degrees
Square centimeters . . . . .	$1.973 \times 10^5$	Circular mils
Square Feet . . . . .	$2.296 \times 10^{-5}$	Acres
Square Feet . . . . .	0.09290	Square meters
Square inches . . . . .	$1.273 \times 10^6$	Circular mils
Square inches . . . . .	6.452	Square centimeters
Square Kilometers . . . . .	0.3861	Square miles
Square meters . . . . .	10.76	Square feet
Square miles . . . . .	640	Acres
Square miles . . . . .	2.590	Square kilometers
Square Millimeters . . . . .	$1.973 \times 10^3$	Circular mils
Square mils . . . . .	1.273	Circular mils
Tons (long) . . . . .	2,240	Pounds
Tons (metric) . . . . .	2,205	Pounds
Tons (short) . . . . .	2,000	Pounds
Watts . . . . .	0.05686	B.t.u. per minute
Watts . . . . .	$10^7$	Ergs per sec.
Watts . . . . .	44.26	Foot-pounds per min.
Watts . . . . .	$1.341 \times 10^{-3}$	Horsepower
Watts . . . . .	14.34	Calories per min.
Watts-hours . . . . .	3.412	British thermal units
Watts-hours . . . . .	2,655	Footpounds
Watts-hours . . . . .	$1.341 \times 10^{-3}$	Horsepower-hours
Watts-hours . . . . .	0.8605	Kilogram-calories
Watts-hours . . . . .	376.1	Kilogram-meters
Webers . . . . .	$10^8$	Maxwells

## CONVERSION TABLE FOR TEMPERATURE – °F / °C

°F	°C	°F	°C	°F	°C	°F	°C	°F	°C
-459.4	.....-273	-22.0	.....-30	35.6	......2	93.2	......34	150.8	......66
-418.0	.....-250	-18.4	.....-28	39.2	......4	96	......36	154.4	......68
-328.0	.....-200	-14.8	.....-26	42.8	......6	100.4	......38	158.0	......70
-238.0	.....-150	-11.2	.....-24	46.4	......8	104.0	......40	161.6	......72
-193.0	.....-125	-7.6	.....-22	50.0	......10	107.6	......42	165.2	......74
-148.0	.....-100	-4.0	.....-20	53.6	......12	111.2	......44	168.8	......76
-130.0	.....-90	-0.4	.....-18	57.2	......14	114.8	......46	172.4	......78
-112.0	.....-80	3.2	.....-16	60.8	......16	118.4	......48	176.0	......80
-94.0	.....-70	6.8	.....-14	64.4	......18	122.0	......50	179.6	......82
-76.0	.....-60	10.4	.....-12	68.0	......20	125.6	......52	183.2	......84
-58.0	.....-50	14.0	.....-10	71.6	......22	129.2	......54	186.8	......86
-40.0	.....-40	17.6	.....-8	75.2	......24	132.8	......56	190.4	......88
-36.4	.....-38	21.2	.....-6	78.8	......26	136.4	......58	194.0	......90
-32.8	.....-36	24.8	.....-4	82.4	......28	140.0	......60	197.6	......92
-29.2	.....-34	28.4	.....-2	86.0	......30	143.6	......62	201.2	......94
-25.6	.....-32	32.0	......0	89.6	......32	147.2	......64	204.8	......96

208.4 .....98	347.0 .....175	590 .....310	1004 .....540	6332 .....3500
212.0 .....100	356.0 .....180	608 .....320	1040 .....560	7232 .....4000
221.0 .....105	365.0 .....185	626 .....330	1076 .....580	4500 .....8132
230.0 .....110	374.0 .....190	644 .....340	1112 .....600	9032 .....5000
239.0 .....115	383.0 .....195	662 .....350	1202 .....650	9932 .....5500
248.0 .....120	392.0 .....200	680 .....360	1292 .....700	10832 .....6000
257.0 .....125	410 .....210	698 .....370	1382 .....750	11732 .....6500
266.0 .....130	428 .....220	716 .....380	1472 .....800	12632 .....7000
275.0 .....135	446 .....230	734 .....390	1562 .....850	13532 .....7500
284.0 .....140	464 .....240	752 .....400	1652 .....900	14432 .....8000
293.0 .....145	482 .....250	788 .....420	1742 .....950	15332 .....8500
302.0 .....150	500 .....260	824 .....440	1832 .....1000	16232 .....9000
311.0 .....155	518 .....270	860 .....460	2732 .....1500	17132 .....9500
320.0 .....160	536 .....280	896 .....480	3632 .....2000	18032 .....10000
329.0 .....165	554 .....290	932 .....500	4532 .....2500	
338.0 .....170	572 .....300	968 .....520	5432 .....3000	

1 degree F is 1/180 of the difference between the temperature of melting ice and boiling water.  
1 degree C is 1/100 of the difference between the temperature of melting ice and boiling water.  
Absolute Zero = 273.16° C = -459.69° F

## DECIBEL LEVELS OF SOUNDS

The definition of sound intensity is energy (erg) transmitted per 1 second over a square centimeter surface. Sounds are measured in decibels. A decibel (db) change of 1 is the smallest change detected by humans.

<b>Hearing Intensity</b>	<b>Decibel Level</b>	<b>Examples of Sounds</b>
Barely Audible	0	Dead silence
(Very Light)	10	Audible hearing threshold
	20	Room (sound proof)
		Empty auditorium
		Ticking of a stopwatch
Audible Light	30	Soft whispering
	40	People talking quietly
		Quiet street noise without autos
Medium Loud	45	Telephone operator
	50	Fax machine in office
	60	Close conversation
Loud	70	Stereo system
		Computer printer
	80	Fire truck/ambulance siren
		Cat/dog fight
Extremely Loud	90	Industrial machinery
		High school marching band
Damage Possible	100	Heavy duty grinder in a machine/welding shop
Damaging	100+	Begins ear damage
	110	Diesel engine of a train
	120	Lightning strike (thunderstorm)
		60 ton metal forming factory press
	130	60" fan in a bus vacuum system
	140	Commercial/military jet engine
Ear Drum Shattering	194	Space shuttle engines
	225	16" guns on a battleship

## **SOUND AWARENESS AND SAFETY**

### **Sound Awareness Changes**

The typical range of human hearing is 30 hertz - 15,000 hertz. Human hearing recognizes an increase of 20 decibels, such as a stereo sound level increase, as being four times as loud at the higher level than it was at the lower level.

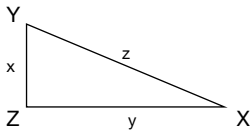
<b>Awareness in Human Hearing</b>	<b>Decibel Change</b>
<b>Noticeably Louder</b>	<b>10</b>
<b>Easily Audible</b>	<b>5</b>
<b>Faintly Audible</b>	<b>3</b>

### **HEARING PROTECTION LEVELS**

Because of the Occupational Safety and Health Act of 1970, hearing protection is mandatory if the following time exposures to decibel levels are exceeded because of possible damage to human hearing.

<b>Decibel Level</b>	<b>Time Exposure Per Day</b>
115	15 minutes
110	30 minutes
105	1 hour
102	1½ hours
100	2 hours
97	3 hours
95	4 hours
92	6 hours
90	8 hours

## TRIGONOMETRIC FORMULAS – RIGHT TRIANGLE



Angles = X, Y, Z  
 Distances = x, y, z  
 Area =  $\frac{x y}{2}$

Pythagorean Theorem states

That  $x^2 + y^2 = z^2$

Thus  $x = \sqrt{z^2 - y^2}$

$\sin X = \frac{x}{z}$      $\cos X = \frac{y}{z}$

Thus  $y = \sqrt{z^2 - x^2}$

$\tan X = \frac{x}{y}$      $\cot X = \frac{y}{x}$

Thus  $z = \sqrt{x^2 + y^2}$

Given X and z, find Y, x and y

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$Y = 90^\circ - X$ ,  $x = z \sin X$ ,  $y = z \cos X$

Given x and z, find X, Y and y

---

$\sin X = \frac{x}{z} = \cos Y$ ,  $y = \sqrt{(z^2 - x^2)} = z \sqrt{1 - \frac{x^2}{z^2}}$

Given X and z, find Y, x and z

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$Y = 90^\circ - X$ ,  $x = y \tan X$ ,  $z = \frac{y}{\cos X}$

Given x and y, find X, Y and z

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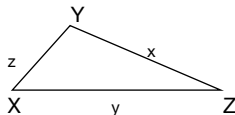
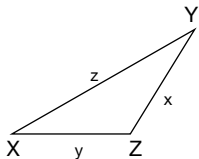
$\tan X = \frac{x}{y} = \cot Y$ ,  $z = \sqrt{x^2 + y^2} = x \sqrt{1 + \frac{y^2}{x^2}}$

Given X and x, find Y, y and z

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$Y = 90^\circ - X$ ,  $y = x \cot X$ ,  $z = \frac{x}{\sin X}$

## TRIGONOMETRIC FORMULAS – OBLIQUE TRIANGLES



Given  $x, y$  and  $z$ , Find  $X, Y$  and  $Z$

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$$s = \frac{x + y + z}{2}, \sin \frac{1}{2} X = \sqrt{\frac{(s-y)(s-z)}{yz}}$$

$$\sin \frac{1}{2} Y = \sqrt{\frac{(s-x)(s-z)}{xz}}, C = 180^\circ - (X + Y)$$

Given  $x, y$  and  $z$ , find the Area

---

$$s = \frac{x + y + z}{2}, \text{Area} = \sqrt{S(s-x)(s-y)(s-z)}$$

$$\text{Area} = \frac{yz \sin X}{2}, \text{Area} = \frac{x^2 \sin Y \sin Z}{2 \sin X}$$

Given  $x, y$ , and  $Z$ , find  $X, Y$  and  $z$

---

$$X + Y = 180^\circ - Z, z = \frac{x \sin Z}{\sin X}, \tan X = \frac{x \sin Z}{y - (x \cos Z)}$$

Given  $X, x$  and  $y$ , Find  $Y, Z$  and  $z$

---

$$\sin Y = \frac{y \sin X}{x}, Z = 180^\circ - (X + Y), z = \frac{x \sin Z}{\sin X}$$

Given  $X, Y$  and  $x$ , Find  $y, Z$  and  $z$

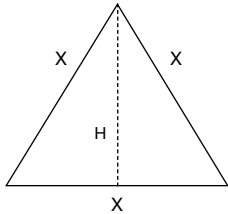
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$$y = \frac{x \sin Y}{\sin X}, Z = 180^\circ - (X + Y), z = \frac{x \sin Z}{\sin X}$$

## TRIGONOMETRIC FORMULAS – SHAPES

### Equilateral Triangle

X = Sides (Equal Lengths)



$$\text{Area} = X^2 \frac{\sqrt{3}}{4} = .433 X^2$$

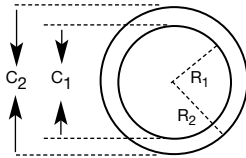
$$\text{Perimeter} = 3 X$$

$$H = \frac{X}{2} \sqrt{3} = .866 X$$

### Annulus

$C_1$  and  $R_1$  = Inside Circle

$C_2$  and  $R_2$  = Outside Circle



$C$  = Circumference

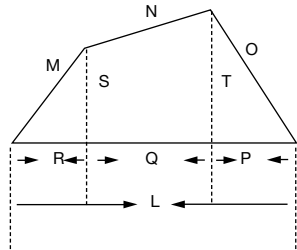
$R$  = Radius

$$\text{Area} = \pi (R_1 + R_2) (R_2 - R_1)$$

$$\text{Area} = \left( (C_2)^2 - (C_1)^2 \right) .7854$$

### Trapezium

Perimeter is the  
Sum of L, M, N and O

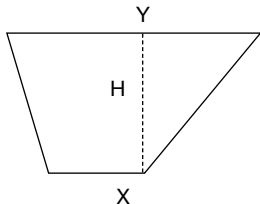


$$\text{Area} = \frac{(S + T) Q + RS + PT}{2}$$

### Trapezoid

Perimeter =  
The Sum of the  
lengths of all  
four sides

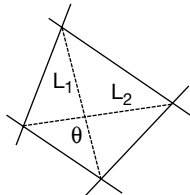
$$\text{Area} = \frac{(X + Y)}{2}$$



### Quadrilateral

$$\text{Area} = \frac{L_1 \cdot L_2 \cdot \sin \theta}{2}$$

Where  $\theta$  =  
Degrees  
of Angle

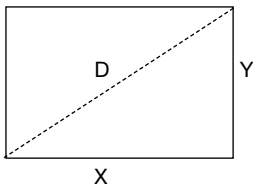


### Rectangle

Area = XY  
Diagonal Line (D)

$$= \sqrt{X^2 + Y^2}$$

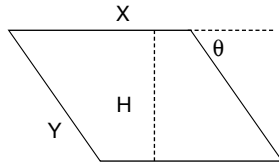
Perimeter =  
 $2(X + Y)$   
If a square  
then  $X = Y$



### Parallelogram

Where  $\theta$  =  
Degrees  
of Angle

Area =  
 $XH = XY \sin \theta$   
Perimeter =  
 $2(X + Y)$



## COMMON ENGINEERING UNITS AND THEIR RELATIONSHIP

Quantity	SI Metric Units/Symbols	Customary Units	Relationship of Units
Acceleration	meters per second squared (m/s <sup>2</sup> )	feet per second squared (ft/s <sup>2</sup> )	$m/s^2 = ft/s^2 \times 3.281$
Area	square meter (m <sup>2</sup> ) square millimeter (mm <sup>2</sup> )	square foot (ft <sup>2</sup> ) square inch (in <sup>2</sup> )	$m^2 = ft^2 \times 10.764$ $mm^2 = in^2 \times 0.00155$
Density	kilograms per cubic meter (kg/m <sup>3</sup> ) grams per cubic centimeter (g/cm <sup>3</sup> )	pounds per cubic foot (lb/ft <sup>3</sup> ) pounds per cubic inch (lb/in <sup>3</sup> )	$kg/m^3 = lb/ft^3 \times 16.02$ $g/cm^3 = lb/in^3 \times 0.036$
Work	Joule (J)	foot pound force (ft lbf or ft lb)	$J = ft\ lbf \times 1.356$
Heat	Joule (J)	British thermal unit (Btu) Calorie (Cal)	$J = Btu \times 1.055$ $J = cal \times 4.187$
Energy	kilowatt (kW)	Horsepower (HP)	$kW = HP \times 0.7457$

Force	Newton (N) Newton (N)	Pound-force (lbf, lb · f, or lb) kilogram-force (kgf, kg · f, or kp)	$N = \text{lbf} \times 4.448$ $N = \frac{\text{kgf}}{9.807}$
Length	meter (m) millimeter (mm)	foot (ft) inch (in)	$m = \text{ft} \times 3.281$ $\text{mm} = \frac{\text{in}}{25.4}$
Mass	kilogram (kg) gram (g)	pound (lb) ounce (oz)	$\text{kg} = \text{lb} \times 2.2$ $g = \frac{\text{oz}}{28.35}$
Stress	Pascal = Newton per second (Pa = N/s)	pounds per square inch (lb/in <sup>2</sup> or psi)	$\text{Pa} = \text{lb/in}^2 \times 6,895$
Temperature	degree Celsius (°C)	degree Fahrenheit (°F)	$^{\circ}\text{C} = \frac{^{\circ}\text{F} - 32}{1.8}$
Torque	Newton meter (N · m)	foot-pound (ft lb) inch-pound (in lb)	$N \cdot m = \text{ft lbf} \times 1.356$ $N \cdot m = \text{in lbf} \times 0.113$
Volume	cubic meter (m <sup>3</sup> ) cubic centimeter (cm <sup>3</sup> )	cubic foot (ft <sup>3</sup> ) cubic inch (in <sup>3</sup> )	$\text{m}^3 = \text{ft}^3 \times 35.314$ $\text{cm}^3 = \frac{\text{in}^3}{16.387}$

## DECIMAL EQUIVALENTS OF FRACTIONS

<u>8ths</u>	<u>32nds</u>	<u>64ths</u>	<u>64ths</u>
$\frac{1}{8} = .125$	$\frac{1}{32} = .03125$	$\frac{1}{64} = 0.15625$	$\frac{33}{64} = .515625$
$\frac{1}{4} = .250$	$\frac{3}{32} = .09375$	$\frac{3}{64} = .046875$	$\frac{35}{64} = .546875$
$\frac{3}{8} = .375$	$\frac{5}{32} = .15625$	$\frac{5}{64} = .078125$	$\frac{37}{64} = .57812$
$\frac{1}{2} = .500$	$\frac{7}{32} = .21875$	$\frac{7}{64} = .109375$	$\frac{39}{64} = .609375$
$\frac{5}{8} = .625$	$\frac{9}{32} = .28125$	$\frac{9}{64} = .140625$	$\frac{41}{64} = .640625$
$\frac{3}{4} = .750$	$\frac{11}{32} = .34375$	$\frac{11}{64} = .171875$	$\frac{43}{64} = .671875$
$\frac{7}{8} = .875$	$\frac{13}{32} = .40625$	$\frac{13}{64} = .203128$	$\frac{45}{64} = .703125$
<b><u>16ths</u></b>	$\frac{15}{32} = .46875$	$\frac{15}{64} = .234375$	$\frac{47}{64} = .734375$
$\frac{1}{16} = .0625$	$\frac{17}{32} = .53125$	$\frac{17}{64} = .265625$	$\frac{49}{64} = .765625$
$\frac{3}{16} = .1875$	$\frac{19}{32} = .59375$	$\frac{19}{64} = .296875$	$\frac{51}{64} = .796875$
$\frac{5}{16} = .3125$	$\frac{21}{32} = .65625$	$\frac{21}{64} = .328125$	$\frac{53}{64} = .828125$
$\frac{7}{16} = .4375$	$\frac{23}{32} = .71875$	$\frac{23}{64} = .359375$	$\frac{55}{64} = .859375$
$\frac{9}{16} = .5625$	$\frac{25}{32} = .78125$	$\frac{25}{64} = .390625$	$\frac{57}{64} = .890625$
$\frac{11}{16} = .6875$	$\frac{27}{32} = .84375$	$\frac{27}{64} = .421875$	$\frac{59}{64} = .921875$
$\frac{13}{16} = .8125$	$\frac{29}{32} = .90625$	$\frac{29}{64} = .453125$	$\frac{61}{64} = .953125$
$\frac{15}{16} = .9375$	$\frac{31}{32} = .96875$	$\frac{31}{64} = .484375$	$\frac{63}{64} = .984375$

## COMMONLY USED GEOMETRICAL RELATIONSHIPS

Diameter of a circle  $\times 3.1416 =$  Circumference.

Radius of a circle  $\times 6.283185 =$  Circumference.

Square of the radius of a circle  $\times 3.1416 =$  Area.

Square of the diameter of a circle  $\times 0.7854 =$  Area.

Square of the circumference of a circle  $\times 0.07958 =$  Area.

Half the circumference of a circle  $\times$  half its diameter  $=$  Area.

Circumference of a circle  $\times 0.159155 =$  Radius.

Square root of the area of a circle  $\times 0.56419 =$  Radius.

Circumference of a circle  $\times 0.31831 =$  Diameter.

Square root of the area of a circle  $\times 1.12838 =$  Diameter.

Diameter of a circle  $\times 0.866 =$  Side of an inscribed equilateral triangle.

Diameter of a circle  $\times 0.7071 =$  Side of an inscribed square.

Circumference of a circle  $\times 0.225 =$  Side of an inscribed square.

Circumference of a circle  $\times 0.282 =$  Side of an equal square.

Diameter of a circle  $\times 0.8862 =$  Side of an equal square.

Base of a triangle  $\times$  one-half the altitude  $=$  Area.

Multiplying both diameters and .7854 together  $=$  Area of an ellipse.

Surface of a sphere  $\times$  one-sixth of its diameter  $=$  Volume.

Circumference of a sphere  $\times$  its diameter  $=$  Surface.

Square of the diameter of a sphere  $\times 3.1416 =$  Surface.

Square of the circumference of a sphere  $\times 0.3183 =$  Surface.

Cube of the diameter of a sphere  $\times 0.5236 =$  Volume.

Cube of the circumference of a sphere  $\times 0.016887 =$  Volume.

Radius of a sphere  $\times 1.1547 =$  Side of an inscribed cube.

Diameter of a sphere divided by  $\sqrt{3} =$  Side of an inscribed cube.

Area of its base  $\times$  one-third of its altitude  $=$  Volume of a cone or pyramid whether round, square or triangular.

Area of one of its sides  $\times 6 =$  Surface of the cube.

Altitude of trapezoid  $\times$  one-half the sum of its parallel sides  $=$  Area.