



GENERAL ENGINEERING INFORMATION

ENGLISH STANDARD MEASURES

Long Measures

1 mile = 1760 yards = 5280 feet 1 yard = 3 feet = 36 inches 1 foot = 12 inches

Square Measure

1 square mile = 640 acres = 6400 square chains 1 acre = 10 square chains = 4840 square yards = 43,560 square feet 1 square rod = 30.25 square yards = 272.25 square feet = 625 square links 1 square yard = 9 square feet 1 square foot = 144 square inches

An acre is equal to a square, the side of which is 208.7 feet

Dry Measure

1 bushel (U.S. or Winchester struck bushel) = 1.2445 cubic foot = 2150.42 cubic inches

1 bushel = 4 pecks = 42 quarts = 64 pints

1 peck = 8 quarts = 16 pints

1 quart = 2 pints

1 heaped bushel = 1-1/4 struck bushel

1 cubic foot = 0.8036 struck bushel

1 British Imperial bushel = 8 Imperial gallons = 1.2837 cubic foot = 2218.19 cubic inches

Liquid Measure

1 U.S. gallon = 0.1337 cubic foot = 231 cubic inches = 4 quarts = 8 pints

1 quart = 2 pints = 8 gills

1 pint = 4 qills

1 British Imperial gallon = 1.2003 U.S. gallons = 277.27 cubic inches

1 cubic foot = 7.48 U.S. gallons

1 barrel = 31.5 U.S. gallons

METRIC SYSTEM OF MEASUREMENTS

The principle units are the meter for length, the liter for capacity, and the gram for weight. The following prefixes are used for sub-divisions and multiples: milli = 1/1000; centi = 1/100; deci = 1/10; deca = 10; hecto = 100; kilo = 1000.

Measure of Length

10 millimeters(mm) = 1 centimeter 10 decimeters = 1 meter(m) 10 centimeters = 1 decimeter(dm) 100 meters = 1 kilometer(km)

Measures of Weight

10 milligrams(mg) = 1 centigram(cg)
10 centigrams = 1 decigram(dg)
10 decigrams = 1 kilogram(Kg)
10 decigrams = 1 gram(g)
10 decigrams = 1 kilogram(Kg)
10 decigrams = 1 (metric) ton (T)
10 grams = 1 decagram(Dg)

Square Measure

100 sq. millimeters(mm²) = 1 centigram
10 sq. centimeters = 1 sq. decimeter(dm²)
100 sq. decimeters = 1 sq. meter(m²)
100 cu. millimeters(mm³) = 1 cu. centimeter(cm³)
1000 cu. centimeters = 1 cu. decimeter(dm³)
100 cu. decimeters = 1 cu. meter(m³)

Cubic Measure

Dry and Liquid Measure

10 millimeters(ml) = 1 centiliter(cl) 100 liters = 1 hectoliter(Hl)

10 centiliters = 1 deciliter(dl)

1 liter = 1 cu. decimeter = the volume of 1 Kg of pure

water at a temperature of 39.2 degrees F.

Length Conversion Constants for Metric and U.S. Units

Millimeters x .039370 = inches Inches x .039370 = inches Inches x .0254 = meters

Meters x 3.2808 = feet Feet x .30480 = meters

Meters x 1.09361 = yards Yards x .91440 = meters

Kilometers x 3280.8 feet Feet x .0003048 = kilometers

Kilometers x .62137 = statute miles Statute miles x 1.60935 kilometers

Kilometers x .53959 = nautical miles

Nautical miles x 1.85325 = kilometers

Engineering Info



Circular and Angular Measure

60 seconds(") = 1 minute (') 60 minutes = 1 degree (°) 360 degrees = 1 circumference (C)

57.3 degrees = 1 radian

2 p radians = 1 circumference (C)

Temperature

The following equations are useful for converting temperature from one system to another:

F = degrees Fahrenheit; C = degrees Centigrade

Deg. C = (Deg. F 32) x 5/9Deg. F = (Deg. C x 9/5) + 32

Avoirdupois or Commercial Weight

1 gross or long ton = 2240 pounds 1 net or short ton = 2000 pounds 1 pound = 16 ounces = 7000 grains 1 ounce = 16 drams = 437.5 grains

Cubic Measure

1 cubic yard = 27 cubic feet 1 cubic foot = 1728 cubic inches

The following measures are used for wood and masonry:

1 cord of wood = 4 x 4 x 8 feet = 128 cubic feet

1 perch of masonry = $16-1/2 \times 1-1/2 \times 1$ foot = 24-3/4 cubic feet

Shipping Measure

For measuring entire internal capacity of a vessel:

1 register ton = 100 cubic feet

For Measurement of Cargo:

1 U.S. shipping ton = 40 cubic feet = 32.143 U.S. bushels = 32.16 Imperial bushels
British shipping ton = 42 cubic feet = 33.75 U.S. bushels = 32.72 Imperial bushels

Weight Conversion Constants for Metric and U.S. Units

Grams x 981 = dynes Dynes x .0010193 = grams Grams x 15.432 = grainsGrains x.0648 = gramsGrams x .03527 = ounces (Avd.) Ounces (Avd.) x 28.35 = grams Grams x 0.33818 = fluid ounces (water) Fluid ounces (Water) x 29.57 = grams Kilograms x 35.27 ounces (Avd.) Ounces (Avd.) x .02835 = kilograms Pounds (Avd.) x .45359 = kilograms Kilograms x 2.20462 = pounds (Avd.) Metric Tons (1000 Kg)x 1.0231 = Net Net ton (2000 lbs) x .90719 = ton (2000 lbs.) metric tons (1000 Kg)

Metric tons (1000 Kg) x .98421 = Gross ton (2240 lbs)x 1.01605 = gross tons (2240 lbs) Metric tons (1000 Kg)

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Area Conversion Constants for Metric and U.S. Units

Square millimeters \times .00155 = sq. inches
Square centimeters \times .155 = sq. inches
Square meters \times .155 = sq. inches
Square meters \times .10.76387 = sq. feet
Square meters \times 10.76387 = sq. feet
Square feet \times .0929 = sq. meters
Square meters \times 1.19599 = sq. yards
Hectares \times 2.47104 = acres
Square kilometers \times 247.104 = acres
Square kilometers \times .3861 = sq. miles
Square miles \times 2.5899 = sq. kilometers
Square miles \times 2.5899 = sq. kilometers

Volume Conversion Constants for Metric and U.S. Units

Cubic centimeters x .033818 = fluid ounces Fluid ounces x 29.57 = cubic centimeters Cubic centimeters x .061023 = cubic inches Cubic inches x 16.387 = cubic centimeters Cubic centimeters x .271 = fluid drams Fluid drams x 3.69 = cubic centimetersLiters x 61.023 = cubic inches Cubic inches x .016387 = litersLiters x 1.05668 = quartsQuarts x.94636 = litesLiters x .26417 = gallons Gallons x 3.78543 = litersLiters x .035317 = cubic feet Cubic feet x 28.316 = liters Hectoliters x 26.417 = gallons Gallons x .0378543 = hectolitersHectoliters x 3.5317 = cubic feet Cubic feet x .28316 = hectoliters Hectoliters x 2.83794 = bushel Bushels x .352379 = hectoliters Hectoliters x .1308 cubic yards Cubic yards x 7.645 hectoliters Cubic meters x 264.17 = gallons Gallons x .00378543 = cubic meters Cubic meters x 35.317 = cubic feet Cubic feet x .028316 = cubic metes Cubic meters x 1.308 = cubic yards Cubic yards x .7645 = cubic meters

Engineering Info



Power and Heat Conversion Constants for Metric and U.S. Units

Calorie x 0.003968 = B.T.U.

Joules x .7373 =foot pounds

Kilogram-meters x 7.233 = foot pounds

Kilowatts x 1.34 = horsepower

Kilowatt hours x 3415 = B.T.U.

B.T.U. x 252 = calories

Foot pounds x 1.3563 = joules

Foot pounds x 1.3825 = kilogram-meter

Horsepower x .746 = kilowatt

B.T.U. x .00029282 = kilowatt hours

FRACTIONAL/DECIMAL/METRIC EQUIVALENTS

To convert inches to millimeters, multiply the inches by 25.4. To convert millimeters to inches, divide the millimeters by 25.4. (As established by the American Standards Association.)

inches fractional	decimal	inches fractional	decimal	m/m	inches	m/m	inches								
	/64 —.0156 —.0312	33/64 - 17/32 - 35/64 -	5312	1 2 3	0.0394 0.0787 0.1181	51 52 53	2.0079 2.0472 2.0866	101 102 103	3.9764 4.0157 4.0551	151 152 153	5.9449 5.9843 6.0236	201 202 203	7.9134 7.9527 7.9921	251 252 253	9.8819 9.9212 9.9606
1/16	/64 —.0469 ——.0625 /64 —.0781	9/16	.5625	4 5 6	0.1575 0.1969 0.2362	54 55 56	2.1260 2.1654 2.2047	104 105 106	4.0945 4.1339 4.1732	154 155 156	6.0630 6.1024 6.1417	204 205 206	8.0315 8.0709 8.1102	254 255 256	10.0000 10.0394 10.0787
3/32 -		19/32 ——	5938	7 8 9	0.2756 0.3150 0.3543	57 58 59	2.2441 2.2835 2.3228	107 108 109	4.2126 4.2520 4.2913	157 158 159	6.1811 6.2205 6.2598	207 208 209	8.1496 8.1890 8.2283	259	10.1181 10.1575 10.1968
1	7/641094	<u>5</u> 39/64 — .609 .625	─.6094 ─.6250	10 11 12	0.3937 0.4331 0.4724	60 61 62	2.3622 2.4016 2.4409	110 111 112	4.3307 4.3701 4.4094	160 161 162	6.2992 6.3386 6.3780	210 211 212	8.2677 8.3071 8.3464	262	10.2362 10.2756 10.3149
9	9/64 —.1406 5/32 —	41/64 —.6406 21/32 ——.6562		13 14 15	0.5118 0.5512 0.5906	63 64 65	2.4803 2.5197 2.5591	113 114 115	4.4488 4.4882 4.5276	163 164 165	6.4173 6.4567 6.4961	213 214 215	8.3858 8.4252 8.4646	264 265	10.3543 10.3937 10.4331
	/64 —.1719 —	1	43/64 —.6719	16 17 18	0.6299 0.6693 0.7087	66 67 68	2.5984 2.6378 2.6772	116 117 118	4.5669 4.6063 4.6457	166 167 168	6.5354 6.5748 6.6142	216 217 218	8.5039 8.5433 8.5827	267 268	10.5512
	13/64 — 2031 7/32 — 2188 15/64 — 2344	45/64 — 7031 23/32 — 7188 47/64 — 7344		19 20 21	0.7480 0.7874 0.8268	69 70 71	2.7165 2.7559 2.7953	119 120 121	4.6850 4.7244 4.7638	169 170 171	6.6535 6.6929 6.7323	219 220 221	8.6220 8.6614 8.7008	270 271	10.5905 10.6299 10.6693
				22 23 24	0.8661 0.9055 0.9449	72 73 74	2.8346 2.8740 2.9134	122 123 124	4.8031 4.8425 4.8819	172 173 174	6.7717 6.8110 6.8504	222 223 224	8.7401 8.7795 8.8189	273 274	10.7086 10.7480 10.7874
4	2500 /64 —.2656	49/64 - 25/32		25 26 27	0.9843 1.0236 1.0630	75 76 77	2.9528 2.9921 3.0315	125 126 127	4.9213 4.9606 5.0000	175 176 177	6.8898 6.9291 6.9685	225 226 227	8.8583 8.8976 8.9370	276 277	10.8268 10.8661 10.9055
19	9/32 ——2812 19/64 ——2969 5/16 ——3125 21/64 ——3281 11/32 ——3438 23/64 ——3594	53/64 —.8 27/32 —		28 29 30	1.1024 1.1417 1.1811	78 79 80	3.0709 3.1102 3.1496	128 129 130	5.0394 5.0787 5.1181	178 179 180	7.0079 7.0472 7.0866	228 229 230	8.9764 9.0157 9.0551	279	10.9449 10.9842 11.0236
•			—.8125 —.8281	31 32 33	1.2205 1.2598 1.2992	81 82 83	3.1890 3.2283 3.2677	131 132 133	5.1575 5.1969 5.2362	181 182 183	7.1260 7.1654 7.2047	231 232 233	9.0945 9.1338 9.1732	282	11.0630 11.1023 11.1417
			8438 8594	34 35 36	1.3386 1.3780 1.4173	84 85 86	3.3071 3.3465 3.3858	134 135 136	5.2756 5.3150 5.3543	184 185 186	7.2441 7.2835 7.3228	234 235 236	9.2126 9.2520 9.2913	285	11.1811 11.2205 11.2598
3	3594 3750 /643906	57/64 -		37 38 39	1.4567 1.4961 1.5354	87 88 89	3.4252 3.4646 3.5039	137 138 139	5.3937 5.4331 5.4724	187 188 189	7.3622 7.4016 7.4409	237 238 239	9.3307 9.3701 9.4094	288	11.2992 11.3386 11.3779
•	-,	29/32 ———.9062 59/64 —.9219 15/16 ——.9375 61/64 —.9531 31/32 ——.9688	40 41 42	1.5748 1.6142 1.6535	90 91 92	3.5433 3.5827 3.6220	140 141 142	5.5118 5.5512 5.5906	190 191 192	7.4803 7.5197 7.5591	240 241 242	9.4488 9.4882 9.5275	291	11.4173 11.4567 11.4960	
			43 44 45	1.6929 1.7323 1.7717	93 94 95	3.6614 3.7008 3.7402	143 144 145	5.6299 5.6693 5.7087	193 194 195	7.5984 7.6378 7.6772	243 244 245	9.5669 9.6063 9.6457	294	11.5354 11.5748 11.6142	
29. 15/32 -	/64 —.4531 ——.4688			46 47 48	1.8110 1.8504 1.8898	96 97 98	3.7795 3.8189 3.8583	146 147 148	5.7480 5.7874 5.8268	196 197 198	7.7165 7.7559 7.7953	246 247 248	9.6850 9.7244 9.7638	297	11.6535 11.6929 11.7323
1 31	/64 —:4844 —:5000	63/64 -	9844 1.0000	49 50	1.9291 1.9685	99 100	3.8976 3.9370	149 150	5.8661 5.9055	199 200	7.8346 7.8740	249 250	9.8031 9.8425	299	11.7716 11.8110