

# CONVERSION PROBLEMS

1. CONVERT 1550 SQUARE FEET ( $\square$ ) AREA TO  
i)  $\text{cm}^2$  ii)  $\text{m}^2$  iii)  $\text{INCH}^2$
2. CONVERT 1650  $\text{m}^2$  TO sq inches
3. CONVERT 20000 psi ( $\text{Ns}/\text{in}^2$ ) TO MPa
4. CONVERT 60 miles/hr to  
i) km/hr ii) ft/sec iii) m/sec
5. CONVERT 1500 ft-lb BENDING MOMENT TO N.m (NEWTON METERS)
6. ~~CONVERT~~ GIVEN 150  $\text{lbs}/\text{ft}^3$   
CONVERT TO  $\text{kg}/\text{m}^3$
7. CONVERT 10 m/sec TO mph (miles/hr)
8. CONVERT  $120^\circ 26' 15''$  INTO RADIANS (Three Dec)
9. CONVERT A LOAD OF 2250  $\text{lbs}$  INTO KN (Kilo NEWTON)
10. A LOAD OF 50  $\text{KN}/\text{m}$  TO BE CONVERTED TO  $\text{lbs}/\text{ft}$

## CONVERSION PROBLEMS (ANSWERS)

- 1) i)  $1.442 \times 10^6 \text{ cm}^2$     ii)  $1.442 \times 10^2 \text{ m}^2$     iii)  $2.232 \times 10^5 \text{ in}^2$
- 2)  $2\,557\,494 \text{ in}^2$
- 3)  $138 \text{ MPa}$
- 4) i)  $96.54 \text{ km/h}$     ii)  $88 \text{ ft/s}$     iii)  $26.82 \text{ m/s}$
- 5)  $2035.06 \text{ N}\cdot\text{m}$
- 6)  $2405.97 \text{ kg/m}^3$
- 7)  $22.36 \text{ mph}$
- 8)  $10.01 \text{ kN}$
- 9)  $3425.6 \text{ lbs/ft}$

## Unit Conversions (Equivalents)

### Length

1 in. = 2.54 cm
1 cm = 0.394 in.
1 ft = 30.5 cm
1 m = 39.37 in. = 3.28 ft
1 mi = 5280 ft = 1.61 km
1 km = 0.621 mi
1 nautical mile (U.S.) = 1.15 mi. = 6076 ft = 1.852 km
1 fermi = 1 femtometer (fm) = $10^{-15}$ m
1 angstrom (Å) = $10^{-10}$ m
1 light-year (ly) = $9.46 \times 10^{15}$ m
1 parsec = 3.26 ly = $3.09 \times 10^{16}$ m

### Volume

1 liter (L) = 1000 mL = 1000 cm <sup>3</sup> = $1.0 \times 10^{-3}$ m <sup>3</sup> = 1.057 quart (U.S.) = 54.6 in. <sup>3</sup>
1 gallon (U.S.) = 4 qt (U.S.) = 231 in. <sup>3</sup> = 3.78 L = 0.83 gal (Imperial)
1 m <sup>3</sup> = 35.31 ft <sup>3</sup>

### Speed

1 mi/h = 1.47 ft/s = 1.609 km/h = 0.447 m/s
1 km/h = 0.278 m/s = 0.621 mi/h
1 ft/s = 0.305 m/s = 0.682 mi/h
1 m/s = 3.28 ft/s = 3.60 km/h
1 knot = 1.151 mi/h = 0.5144 m/s

### Angle

1 radian (rad) = 57.30° = 57°18'
1° = 0.01745 rad
1 rev/min (rpm) = 0.1047 rad/s

### Time

1 day = $8.64 \times 10^4$ s
1 year = $3.156 \times 10^7$ s

### Mass

1 atomic mass unit (u) = $1.6605 \times 10^{-27}$ kg
1 kg = 0.0685 slug
[1 kg has a weight of 2.20 lb where $g = 9.81 \text{ m/s}^2$ ]

### Force

1 lb = 4.45 N
1 N = $10^5$ dyne = 0.225 lb

### Energy and Work

1 J = $10^7$ ergs = 0.738 ft-lb
1 ft-lb = 1.36 J = $1.29 \times 10^{-3}$ Btu = $3.24 \times 10^{-4}$ kcal
1 kcal = $4.18 \times 10^3$ J = 3.97 Btu
1 eV = $1.602 \times 10^{-19}$ J
1 kWh = $3.60 \times 10^6$ J = 860 kcal

### Power

1 W = 1 J/s = 0.738 ft-lb/s = 3.42 Btu/h
1 hp = 550 ft-lb/s = 746 W

### Pressure

1 atm = 1.013 bar = $1.013 \times 10^5$ N/m <sup>2</sup> = 14.7 lb/in. <sup>2</sup> = 760 torr
1 lb/in. <sup>2</sup> = $6.90 \times 10^3$ N/m <sup>2</sup>
1 Pa = 1 N/m <sup>2</sup> = $1.45 \times 10^{-4}$ lb/in. <sup>2</sup>

## SI Derived Units and Their Abbreviations

Quantity	Unit	Abbreviation	In Terms of Base Units†
Force	newton	N	kg·m/s <sup>2</sup>
Energy and work	joule	J	kg·m <sup>2</sup> /s <sup>2</sup>
Power	watt	W	kg·m <sup>2</sup> /s <sup>3</sup>
Pressure	pascal	Pa	kg/(m·s <sup>2</sup> )
Frequency	hertz	Hz	s <sup>-1</sup>
Electric charge	coulomb	C	A·s
Electric potential	volt	V	kg·m <sup>2</sup> /(A·s <sup>3</sup> )
Electric resistance	ohm	Ω	kg·m <sup>2</sup> /(A <sup>2</sup> ·s <sup>3</sup> )
Capacitance	farad	F	A <sup>2</sup> ·s <sup>4</sup> /(kg·m <sup>2</sup> )
Magnetic field	tesla	T	kg/(A·s <sup>2</sup> )
Magnetic flux	weber	Wb	kg·m <sup>2</sup> /(A·s <sup>2</sup> )
Inductance	henry	H	kg·m <sup>2</sup> /(s <sup>2</sup> ·A <sup>2</sup> )

†kg = kilogram (mass), m = meter (length), s = second (time), A = ampere (electric current).

## Metric (SI) Multipliers

Prefix	Abbreviation	Value
exa	E	10 <sup>18</sup>
peta	P	10 <sup>15</sup>
tera	T	10 <sup>12</sup>
giga	G	10 <sup>9</sup>
mega	M	10 <sup>6</sup>
kilo	k	10 <sup>3</sup>
hecto	h	10 <sup>2</sup>
deka	da	10 <sup>1</sup>
deci	d	10 <sup>-1</sup>
centi	c	10 <sup>-2</sup>
milli	m	10 <sup>-3</sup>
micro	μ	10 <sup>-6</sup>
nano	n	10 <sup>-9</sup>
pico	p	10 <sup>-12</sup>
femto	f	10 <sup>-15</sup>
atto	a	10 <sup>-18</sup>