Units Conversions

The following table contains numerous unit conversions. To create a unit conversion factor, take the conversion factor in the third column and the unit symbol in the right-hand column and divide it by the unit symbol in the second column. For example, in the first row, a unit conversion factor from acres to ft^2 would be:

$$\frac{4.356 \times 10^4 \ ft^2}{acres}$$

Note that the inverse of this can be used to convert from ft^2 to acres:

$$\frac{acres}{4.356 \times 10^4 \ ft^2}$$

Multiply:		**By:**	**To Obtain:**
unit name	symbol	conversion factor	symbol
acres	acres	4.356×10^4	ft^2
acres	acres	$4.046\ 9 \times 10^{-1}$	ha {hectare}
acres	acres	$4.046\ 9 \times 10^3$	m^2
amperes	A	1	C/s {coulomb per second}
ampere hours	A·h[A]	3.6×10^3	C
angstroms	Å	1×10^{-8}	cm
angstroms	Å	$3.937\ 0 \times 10^{-9}$	in
are	a	1×10^2	m^2
are	a	1×10^{-2}	ha
atmospheres	atm	1.013 3	bars
atmospheres	atm	$2.992\ 1 \times 10^1$	in of Hg {mercury}
atmospheres	atm	$1.469\ 6 \times 10^1$	lb_f/in^2 (psi)
atmospheres	atm	7.6×10^2	mm of Hg
atmospheres	atm	$1.013\ 3 \times 10^5$	Pa {pascals} (or N/m^2)
barrels (petroleum, US)	barrels	4.2×10^1	gal[B]
bars	bars	$9.869\ 2 \times 10^{-1}$	atm
bars	bars	$2.953\ 0 \times 10^1$	in of Hg
bars	bars	$1.450\ 4 \times 10^1$	lb_f/in^2
bars	bars	1×10^5	Pa
British thermal unit	Btu (or btu)	$7.776\ 5 \times 10^2$	$ft \cdot lb_f$
British thermal unit	Btu	$3.927\ 5 \times 10^{-4}$	hp·h {horsepower hour}
British thermal unit	Btu	$1.055\ 1 \times 10^3$	J
British thermal unit	Btu	$2.928\ 8 \times 10^{-4}$	kW·h (or kWh)

[A] "h" is the accepted unit for hours in most unit systems. However, one may see "hr" used in some non-SI units systems.

[B] All gallon units are US liquid gallons.

Multiply:		**By:**	**To Obtain:**
unit name	symbol	conversion factor	symbol
British thermal unit per hour	Btu/h	$2.160\ 1 \times 10^{-1}$	$ft \cdot lb_f/s$
British thermal unit per hour	Btu/h	3.927×10^{-4}	hp
British thermal unit per hour	Btu/h	$2.928\ 8 \times 10^{-1}$	W
British thermal unit per minute	Btu/min	$7.776\ 5 \times 10^{2}$	$ft \cdot lb_f/min$
British thermal unit per minute	Btu/min	$2.356\ 5 \times 10^{-2}$	hp
British thermal unit per minute	Btu/min	$1.757\ 3 \times 10^{-2}$	kW
bushels (US)	bu	1.244 5	ft^3
bushels (US)	bu	$3.523\ 9 \times 10^{1}$	L {liters}
bushels (US)	bu	$3.523\ 9 \times 10^{-2}$	m^3
candelas	cd	1	lm/sr {lumens per steradian}
candelas per square foot	cd/ft^2	$3.381\ 6 \times 10^{-3}$	lamberts
centimeters	cm	1×10^{8}	Å
centimeters	cm	$3.280\ 8 \times 10^{-2}$	ft
centimeters	cm	$3.937\ 0 \times 10^{-1}$	in
centipoise	cP	1×10^{-3}	Pa·s
coulombs	C	1	A·s
cubic centimeters	cm^3	$6.102\ 4 \times 10^{-2}$	in^3
cubic centimeters	cm^3	$3.531\ 5 \times 10^{-5}$	ft^3
cubic centimeters	cm^3	$2.641\ 7 \times 10^{-4}$	gal
cubic centimeters	cm^3	1×10^{-3}	L
cubic centimeters	cm^3	$3.381\ 4 \times 10^{-2}$	oz (US fluid)
cubic centimeters per gram	cm^3	$1.601\ 8 \times 10^{-2}$	ft^3/lb_m
cubic centimeters per second	cm^3	$2.118\ 9 \times 10^{-3}$	ft^3/min
cubic centimeters per second	cm^3	$1.585\ 0 \times 10^{-2}$	gal/min
cubic feet	ft^3	$2.295\ 7 \times 10^{-5}$	acre·ft
cubic feet	ft^3	$8.035\ 6 \times 10^{-1}$	bu
cubic feet	ft^3	7.480 5	gal
cubic feet	ft^3	1.728×10^{3}	in^3
cubic feet	ft^3	$2.831\ 7 \times 10^{1}$	L
cubic feet	ft^3	$2.831\ 7 \times 10^{-2}$	m^3
cubic feet per minute	ft^3/min	7.480 5	gal/min
cubic feet per minute	ft^3/min	$4.719\ 5 \times 10^{-1}$	L/s
cubic feet per pound-mass	ft^3/lb_m	$6.242\ 8 \times 10^{-2}$	m^3/kg
cubic feet per second	ft^3/s	$4.488\ 3 \times 10^{2}$	gal/min
cubic feet per second	ft^3/s	$2.831\ 7 \times 10^{1}$	L/s
cubic inches	in^3	$4.650\ 3 \times 10^{-4}$	bu
cubic inches	in^3	$1.638\ 7 \times 10^{1}$	cm^3
cubic inches	in^3	$4.329\ 0 \times 10^{-3}$	gal

Multiply:		**By:**	**To Obtain:**
unit name	symbol	conversion factor	symbol
cubic inches	in^3	$1.638\ 7 \times 10^{-2}$	L
cubic inches	in^3	$1.638\ 7 \times 10^{-5}$	m^3
cubic meters	m^3	$2.837\ 8 \times 10^{1}$	bu
cubic meters	m^3	$3.531\ 5 \times 10^{1}$	ft^3
cubic meters	m^3	$2.641\ 7 \times 10^{2}$	gal
cubic meters	m^3	1×10^{3}	L
cubic yards	yd^3	$2.169\ 6 \times 10^{1}$	bu
cubic yards	yd^3	$2.019\ 7 \times 10^{2}$	gal
cubic yards	yd^3	$7.645\ 5 \times 10^{2}$	L
cubic yards	yd^3	$7.645\ 5 \times 10^{-1}$	m^3
dynes	dynes	1×10^{-5}	N
dynes per square centimeter	$dynes/cm^2$	$9.869\ 2 \times 10^{-7}$	atm
dynes per square centimeter	$dynes/cm^2$	1×10^{-6}	bars
dynes per square centimeter	$dynes/cm^2$	$1.450\ 4 \times 10^{-5}$	lb_f/in^2
dynes centimeters	dynes·cm	$7.375\ 6 \times 10^{-8}$	$ft{\cdot}lb_f$
dynes centimeters	dynes·cm	1×10^{-7}	N·m
ergs	ergs	1	dyne·cm
farad	F	1	C/V
fathoms	fathoms	6	ft
feet	ft	3.048×10^{1}	cm
feet	ft	1.2×10^{1}	in
feet	ft	3.048×10^{-4}	km
feet	ft	3.048×10^{-1}	m
feet	ft	$1.893\ 9 \times 10^{-4}$	mi {miles}
feet per second	ft/s	1.097 3	km/h
feet per second	ft/s	$1.828\ 8 \times 10^{1}$	m/min
feet per second	ft/s	$6.818\ 2 \times 10^{-1}$	mi/h
feet per second squared	ft/s^2	3.048×10^{-1}	m/s^2
foot-candles	foot-candles	1	lm/ft^2
foot-candles	foot-candles	$1.076\ 4 \times 10^{1}$	lx (lux, or lm/m^2)
foot pounds-force	$ft{\cdot}lb_f$	$1.285\ 9 \times 10^{-3}$	Btu (or btu)
foot pounds-force	$ft{\cdot}lb_f$	$1.355\ 8 \times 10^{7}$	dyne·cm
foot pounds-force	$ft{\cdot}lb_f$	$5.050\ 5 \times 10^{-7}$	hp·h
foot pounds-force	$ft{\cdot}lb_f$	1.355 8	J
foot pounds-force	$ft{\cdot}lb_f$	$3.766\ 2 \times 10^{-7}$	kW·h
foot pounds-force	$ft{\cdot}lb_f$	1.355 8	N·m
foot pounds-force per hour	$ft{\cdot}lb_f/h$	$2.143\ 2 \times 10^{-5}$	Btu/min
foot pounds-force per hour	$ft{\cdot}lb_f/h2$	$2.259\ 7 \times 10^{5}$	ergs/min

Multiply:		**By:**	**To Obtain:**
unit name	symbol	conversion factor	symbol
foot pounds-force per hour	$ft \cdot lb_f/h$	5.0505×10^{-7}	hp
foot pounds-force per hour	$ft \cdot lb_f/h$	$3.766\ 2 \times 10^{-7}$	kW
gallons	gal	$1.336\ 8 \times 10^{-1}$	ft^3
gallons	gal	2.31×10^{2}	in^3
gallons	gal	3.785 4	L
gallons	gal	$3.785\ 4 \times 10^{-3}$	m^3
gallons	gal	1.28×10^{2}	oz
gallons	gal	8	pt (US liquid)
gallons	gal	4	qt (US liquid)
grams	g	$2.204\ 6 \times 10^{-3}$	lb_m
grams per cubic centimeter	g/cm^3	$6.242\ 8 \times 10^{1}$	lb_m/ft^3
hectares	ha	2.471 1	acres
hectares	ha	1×10^{2}	ares
hectares	ha	$1.076\ 4 \times 10^{5}$	ft^2
hectares	ha	1×10^{4}	m^2
henry	H	1	Wb/A
hertz	Hz	1	1/s (or cycles/s, revolutions/s)
horsepower	hp	$2.546\ 1 \times 10^{3}$	Btu/h
horsepower	hp	5.5×10^{2}	$ft \cdot lb_f/s$
horsepower	hp	$7.457\ 0\ 10^{-1}$	kW
horsepower hours	hp·h	$2.546\ 1 \times 10^{3}$	Btu
horsepower hours	hp·h	1.98×10^{6}	$ft \cdot lb_f$
horsepower hours	hp·h	$2.684\ 5 \times 10^{6}$	J
horsepower hours	hp·h	$7.457\ 0 \times 10^{-1}$	kW·h
hours	h	6×10^{1}	min
hours	h	3.6×10^{3}	s
inches	in	2.54×10^{8}	Å
inches	in	2.54	cm
inches	in	$8.333\ 3 \times 10^{-2}$	ft
inches	in	1×10^{3}	mils
inches	in	$2.777\ 8 \times 10^{-2}$	yd
joule	J	$9.478\ 2 \times 10^{-4}$	Btu
joule	J	$7.375\ 6 \times 10^{-1}$	$ft \cdot lb_f$
joule	J	$3.725\ 1 \times 10^{-7}$	hp·h
joule	J	1	N·m
joule	J	1	W·s
joule	J	$2.777\ 8\ 10^{-7}$	kW·h
joules per second	J/s	$5.690\ 7 \times 10^{-2}$	Btu/min

Multiply:		**By:**	**To Obtain:**
unit name	symbol	conversion factor	symbol
joules per second	J/s	1×10^{7}	ergs/s
joules per second	J/s	$7.375\ 6 \times 10^{-1}$	$ft \cdot lb_f/s$
joules per second	J/s	$1.341\ 0 \times 10^{-3}$	hp
joules per second	J/s	1	W
kilograms	kg	2.204 6	lb_m
kilograms	kg	1×10^{-3}	t[C]
kilograms	kg	$6.852\ 2 \times 10^{-2}$	slugs
kilometers	km	$3.280\ 8 \times 10^{3}$	ft
kilometers	km	$6.213\ 7 \times 10^{-1}$	mi
kilometers per hour	km/h	$5.468\ 1 \times 10^{1}$	ft/min
kilometers per hour	km/h	$9.113\ 4 \times 10^{-1}$	ft/s
kilometers per hour	km/h	$5.399\ 6 \times 10^{-1}$	knots
kilometers per hour	km/h	$2.777\ 8 \times 10^{-1}$	m/s
kilometers per hour	km/h	$6.213\ 7 \times 10^{-1}$	mi/h
kilowatts	kW	$3.414\ 4 \times 10^{3}$	Btu/h
kilowatts	kW	1×10^{10}	ergs/s
kilowatts	kW	$7.375\ 6 \times 10^{2}$	$ft \cdot lb_f/s$
kilowatts	kW	1.341 0	hp
kilowatts	kW	1×10^{3}	J/s
kilowatt hours	kW·h	$3.414\ 4 \times 10^{3}$	Btu
kilowatt hours	kW·h	$2.655\ 2 \times 10^{6}$	$ft \cdot lb_f$
kilowatt hours	kW·h	1.341 0	hp·h
kilowatt hours	kW·h	3.6×10^{6}	J
knots	knots	1.687 8	ft/s
knots	knots	1.1508	mi/hr
liters	L	$2.837\ 8 \times 10^{-2}$	bu
liters	L	$3.531\ 5 \times 10^{-2}$	ft^3
liters	L	$2.641\ 7 \times 10^{-1}$	gal
liters	L	$6.102\ 4 \times 10^{1}$	in^3
liters per second	L/s	2.118 9	ft^3/min
liters per second	L/s	$1.585\ 0 \times 10^{1}$	gal/min
lumens	lm	$7.957\ 7 \times 10^{-2}$	candle power
lumens per square foot	lm/ft^2	1	foot-candles
lumens per square meter	lm/m^2	$9.290\ 3 \times 10^{-2}$	foot-candles
lux	lux	1	lm/m^2
meters	m	1×10^{10}	Å

[C] Metric ton

Multiply:		**By:**	**To Obtain:**
unit name	symbol	conversion factor	symbol
meters	m	3.280 8	ft
meters	m	$3.937\ 0 \times 10^{1}$	in
meters	m	$6.213\ 7 \times 10^{-4}$	mi
meters per minute	m/min	1.666 7	cm/s
meters per minute	m/min	$5.468\ 1 \times 10^{-2}$	ft/s
meters per minute	m/min	6×10^{-2}	km/h
meters per minute	m/min	$3.239\ 7 \times 10^{-2}$	knots
meters per minute	m	$3.728\ 2 \times 10^{-2}$	mi/h
meters per second	m/s	3.280 8	ft/s
meters per second	m/s	3.6	km/h
meters per second	m/s	2.236 9	mi/h
microns	µm	1×10^{4}	Å
microns	µm	$3.280\ 8 \times 10^{-6}$	ft
microns	µm	1×10^{-6}	m
miles	mi	5.28×10^{3}	ft
miles	mi	1.6093	km
mile	mi	$8.689\ 8 \times 10^{-1}$	nmi {nautical mile}
miles per hour	mi/h	8.8×10^{1}	ft/min
miles per hour	mi/h	1.4667	ft/s
miles per hour	mi/h	1.6093	km/hr
miles per hour	mi/h	$8.689\ 8 \times 10^{-1}$	knots
miles per hour	mi/h	$2.682\ 2 \times 10^{1}$	m/min
nautical mile	nmi	1.1508	mi
newtons	N	$2.248\ 1 \times 10^{-1}$	lb_f
newtons	N	1×10^{5}	dynes
newton meters	N·m	1×10^{7}	dyne·cm
newton meters	N·m	$7.375\ 6 \times 10^{-1}$	$ft \cdot lb_f$
ohm	Ω	1	V/A
pascals	Pa	$9.869\ 2 \times 10^{-6}$	atm
pascals	Pa	$2.088\ 5 \times 10^{-2}$	lb_f/ft^2
pascals	Pa	$1.450\ 4 \times 10^{-4}$	lb_f/in^2
poises	P	1×10^{-1}	Pa·s
pounds-force	lb_f	4.448 2	N
pounds-mass	lb_m	$4.535\ 9 \times 10^{2}$	g
pounds-mass	lb_m	$4.535\ 9 \times 10^{-1}$	kg
pounds-mass	lb_m	$3.108\ 1 \times 10^{-2}$	slugs
pounds-mass	lb_m	$4.535\ 9 \times 10^{-4}$	t
pounds-mass	lb_m	5×10^{-4}	tons (short)

Multiply:		**By:**	**To Obtain:**
unit name	symbol	conversion factor	symbol
pounds-force per square foot	lb_f/ft^2	4.725×10^{-3}	atm
pounds-force per square foot	lb_f/ft^2	$4.788\ 0 \times 10^{1}$	Pa
pounds-force per square inch	lb_f/in^2	$6.804\ 6 \times 10^{-2}$	atm
pounds-force per square inch	lb_f/in^2	$6.894\ 8 \times 10^{-2}$	bars
pounds-force per square inch	lb_f/in^2	2.036 0	in of hg
pounds-force per square inch	lb_f/in^2	$5.171\ 5 \times 10^{1}$	mm of Hg
pounds-force per square inch	lb_f/in^2	$6.894\ 8 \times 10^{3}$	Pa
pounds-mass per cubic foot	lb_m/ft^3	$1.601\ 8 \times 10^{1}$	kg/m^3
pounds-mass per cubic inch	lb_m/in^3	$2.768\ 0 \times 10^{4}$	kg/m^3
radians	rad[D]	$5.729\ 6 \times 10^{1}$	°
radians	rad	$1.591\ 5 \times 10^{-1}$	revolutions (or cycles)
radians per second	rad/s	9.549 3	revolutions/minute
siemens	S	1	A/V
slugs	slugs	$1.459\ 4 \times 10^{1}$	kg
slugs	slugs	$3.217\ 4 \times 10^{1}$	lb_m
slugs per cubic foot	$slugs/ft^3$	$5.153\ 6 \times 10^{2}$	kg/m^3
square centimeters	cm^2	$1.076\ 4 \times 10^{-3}$	ft^2
square centimeters	cm^2	$1.550\ 0 \times 10^{-1}$	in^2
square feet	ft^2	$2.295\ 7 \times 10^{-5}$	acre
square feet	ft^2	$9.290\ 3 \times 10^{2}$	cm^2
square feet	ft^2	$9.290\ 3 \times 10^{-6}$	ha
square feet	ft^2	$9.290\ 3 \times 10^{-2}$	m^2
square meters	m^2	$1.076\ 4 \times 10^{1}$	ft^2
square meters	m^2	$1.550\ 0 \times 10^{3}$	in^2
square miles	mi^2	6.4×10^{2}	acres
square miles	mi^2	$2.787\ 8 \times 10^{7}$	ft^2
square miles	mi^2	$2.590\ 0 \times 10^{2}$	ha
square miles	mi^2	2.590 0	km^2
square millimeters	mm^2	$1.076\ 4 \times 10^{-5}$	ft^2
square millimeters	mm^2	$1.550\ 0 \times 10^{-3}$	in^2
stokes	stokes	1	cm^2/s
stokes	stokes	$1.550\ 0 \times 10^{-1}$	in^2/s
tesla	T	1	Wb/m^2
tons (long)	long tons	2.24×10^{3}	lb_m
tons (long)	long tons	1.016 0	t
tons (long)	long tons	1.12	tons (short)

[D] Not to be confused with the unit for radiation dosage, whose symbol is also “rad”.

Multiply:		**By:**	**To Obtain:**
unit name	symbol	conversion factor	symbol
tons (metric)	t	1×10^{3}	kg
tons (metric)	t	$9.017\ 2 \times 10^{-1}$	tons (short)
tons (short)	tons	2×10^{3}	lb_m
volt	V	1	W/A
watts	W	1	J/s
watt	W	3.414 4	Btu/h
watts	W	$4.425\ 4 \times 10^{1}$	$ft \cdot lb_f/min$
watts	W	$1.341\ 0 \times 10^{-3}$	hp
watt hours	W·h	3.414 4	Btu
watt hours	W·h	$2.655\ 2 \times 10^{3}$	$ft \cdot lb_f$
watt hours	W·h	$1.341\ 0 \times 10^{-3}$	hp·h
weber	Wb	1	V·s