

BASE UNITS

PRIMARY UNITS

Quantity	Imperial Sys. Units Symbol	Name	Metric Sys. Units Symbol	Name
Mass	lb	Pound	kg	Kilogram
Time	s	Second	s	Second
Length	ft	Foot	m	Meter
Temperature	°F	Fahrenheit	°C	Celsius
Electric Current	A	Ampere	A	Ampere

UNITS FOR GEOMETRIC PROPERTIES

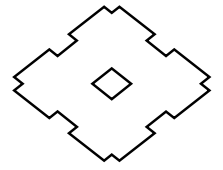
Quantity	Primary Symbol	Imperial Sys. Units Symbol	Name	Metric Sys. Units Symbol	Name
Area	A	ft ²	Square Foot	m ²	Square Meter
Depth	b	ft	Foot	m	Meter
Diameter	d	ft	Foot	m	Meter
Height	h	ft	Foot	m	Meter
Length	l	ft	Foot	m	Meter
Radius	r	ft	Foot	m	Meter
Displacement	s	ft	Foot	m	Meter
Volume	V	ft ³	Cubic Foot	m ³	Cubic Meter

UNITS FOR TIME & PERIODIC PHENOMENA

Quantity	Primary Symbol	Imperial Sys. Units Symbol	Name	Metric Sys. Units Symbol	Name
Acceleration	a	ft/s ²	Feet per Second ²	m/s ²	Meters per Second ²
Angular Acceleration	∞ (alpha)	rad/s ²	Radians per Second ²	rad/s ²	Radians per Second ²
Frequency	f	Hz	Hertz	Hz	Hertz
Rotational Velocity	n	RPM	Revolutions per Minute	RPM	Revolutions per Minute
Angular Velocity	ω (omega)	rad/s	Radians per Second	rad/s	Radians per Second
Time	t	s	Second	s	Second
Velocity	v	ft/s	Feet per Second	m/s	Meters per Second

UNITS FOR ENERGY & POWER

Quantity	Primary Symbol	Imperial Sys. Units Symbol	Name	Metric Sys. Units Symbol	Name
Energy (Work)	E (W)	lb ft	Pound Feet	Nm	Newton Meter
Thermodynamic		Btu	British Thermal Unit	kcal	Kilocalorie
Power	P	hp	Horsepower	kW	Kilowatt



UNITS FOR MECHANICAL MEASUREMENTS

Quantity	Primary Symbol	Imperial Sys. Units Symbol	Name	Metric Sys. Units Symbol	Name
Force	F	lbf	Pound Force (lb x a)	N	Newton (kg x a)
Moment of Inertia	u	Wr ²	Pound Feet ²	kgm ²	Kilogram Meter ²
Torque	T	lb•ft	Pound Foot	Nm	Newton Meter
Mass	m	lb	Pound	kg	Kilogram
Pressure	P	lb/in ²	Pound Per Square Inch	Pa	Pascal
Efficiency	η (Eta)	η		η	
Friction	μ (Mu)	μ	Coefficient of Friction	μ	Coefficient of Friction

UNITS FOR ELECTRICAL MEASUREMENT

Quantity	Primary Symbol	Imperial Sys. Units Symbol	Name	Metric Sys. Units Symbol	Name
Electric Current	I	A	Ampere	A	Ampere
Power	P	kw	Kilowatt	kw	Kilowatt
Resistance	R	Ω (Omega)	Ohm	Ω (Omega)	Ohm
Voltage	V	V	Volt	V	Volt

EQUATIONS FOR POWER TRANSMISSION

EQUATIONS FOR RATES & DISPLACEMENT

Linear Motion

$$\text{Velocity (v)} = \frac{\text{Displacement(s)}}{\text{Time (t)}} \quad \text{Time (t)} = \frac{\text{Displacement(s)}}{\text{Velocity (v)}}$$

$$\text{Displacement(s)} = \text{Velocity (v)} \times \text{Time (t)}$$

Rotary Motion

$$\text{Angular Velocity } (\omega \text{ (omega)}) = 2 \times \pi \text{ (pi)} \times \text{Rotational Velocity (n = (RPM))}$$

$$\text{Velocity (v)} = \text{Angular Velocity } (\omega \text{ (omega)}) \times \text{Radius (r)}$$

$$\text{Time (t)} = \frac{\text{Displacement (s)}}{\text{Velocity (v}^2 \text{ (} \omega \times r \text{))}}$$

$$\text{Displacement (s)} = \text{Velocity (v}^2 \text{ (} \omega \times r \text{))} \times \text{Time (t)}$$

EQUATIONS FOR TORQUE & WORK

$$\text{Work (w) or Energy (E)} = \text{Force (F)} \times \text{Displacement(s)}$$

$$\text{Torque (T)} = \text{Force (F)} \times \text{Radius (r)}$$

$$\begin{array}{l} \text{Torque (T)} \\ \text{Imperial Sys.} = \frac{5252 \times \text{hp}}{n} = \text{lb}\cdot\text{ft} \\ \text{Units} \end{array}$$

Note: for lb·in substitute 63025 for 5252

$$\begin{array}{l} \text{Torque (T)} \\ \text{Metric Sys.} = \frac{9550 \times \text{kw}}{n} = \text{Nm} \\ \text{Units} \end{array}$$

EQUATIONS FOR POWER

$$\text{Power (P)} = \frac{\text{Work (w)}}{\text{Time (t)}} = \frac{\text{Torque (T)}}{\text{Time (t)}}$$

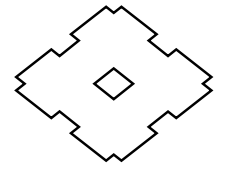
$$\begin{array}{l} \text{Power (P)} \\ \text{Imperial Sys.} = \text{hp} = \frac{33,000 \text{ lb}\cdot\text{ft}}{\text{minute}} = \frac{550 \text{ lb}\cdot\text{ft}}{\text{second}} \\ \text{Units} \end{array}$$

$$\text{hp} = \frac{\text{*Torque (T)} \times n}{\text{*5252}}$$

*Note: For torque in lb·in substitute 63025 for 5252

$$\begin{array}{l} \text{Power (P)} \\ \text{Metric Sys.} = \text{kw} = \frac{60,000 \text{ Nm}}{\text{minute}} = \frac{1000 \text{ Nm}}{\text{second}} \\ \text{Units} \end{array}$$

$$\text{kW} = \frac{\text{Torque (T)} \times n}{9550}$$



CONVERSION FACTORS

Length

	m	dm	cm	mm
1 m	= 1	10	100	1000
1 dm	= 0.1	1	10	100
1 cm	= 0.01	0.1	1	10
1 mm	= 0.001	0.01	0.1	1
1 yd	= 0.9144	9.144	91.44	914.4
1 ft	= 0.3048	3.048	30.48	304.8
1 in.	= 25.4X10 ⁻³	0.2540	2.540	25.40
1 mil	= 25.4X10 ⁻⁶	254X10 ⁻⁶	25.4X10 ⁻³	25.4X10 ⁻³

	yd	ft	in	mil
1 m	= 1.094	3.281	39.370	39.4X10 ³
1 dm	= 0.1094	0.3281	3.937	3937
1 cm	= 10.9X10 ⁻³	32.8X10 ⁻³	0.3937	393.7
1 mm	= 1.09X10 ⁻³	3.28X10 ⁻³	39.4X10 ⁻³	39.37
1 yd	= 1	3	36	36X10 ³
1 ft	= 0.3333	1	12	12X10 ³
1 in.	= 27.8X10 ⁻³	83.3X10 ⁻³	1	1000
1 mil	= 27.8X10 ⁻⁶	83.3X10 ⁻⁶	1X10 ⁻³	1

1 mile (statute or British mile) = 1760 yd = 5280 ft = 1609.344 m
 1 n mile (nautical mile) = 6080 ft = 1.853 km
 1 km = 39370 in = 3281 ft = 1093.6 yd = 0.6214 mile
 = 0.5396 n mile
 1 fathom = 6 ft = 1.8288 m

Area

	m ²	dm ²	cm ²	mm ²
1 m ²	= 1	100	10X10 ³	1X10 ⁶
1 dm ²	= 0.01	1	100	10X10 ³
1 cm ²	= 0.1X10 ⁻³	0.01	1	100
1 mm ²	= 1X10 ⁻⁶	0.1X10 ⁻³	0.01	1
1 yd ²	= 0.8361	83.61	8361	836X10 ³
1 ft ²	= 92.9X10 ⁻³	9.290	929.03	92.9X10 ³
1 in ²	= 0.645X10 ⁻³	64.5X10 ⁻³	6.4516	645.16
1 CM	= -	-	5.07X10 ⁶	0.507X10 ³

	yd ²	ft ²	in ²	CM
1 m ²	= 1.196	10.764	1550	-
1 dm ²	= 12X10 ⁻³	0.1076	15.50	-
1 cm ²	= 0.12X10 ⁻³	1.08X10 ⁻³	0.1550	197X10 ³
1 mm ²	= 1.2X10 ⁻⁶	10.8X10 ⁻⁶	1.55X10 ⁻³	1.97X10 ³
1 yd ²	= 1	9	1296	-
1 ft ²	= 0.1111	1	144	183X10 ⁶
1 in ²	= 772X10 ⁻⁶	6.94X10 ⁻³	1	1.27X10 ⁶
1 CM	= -	5.45X10 ⁹	0.785X10 ⁶	1

1 square mile = 640 acres = 2.590 km² = 259 ha
 1 acre = 4840 yd² = 0.405 ha = 4047 m²
 1 km² = 0.386 m² = 100 ha = 10000 a
 1 ha = 100 a = 2.471 acres = 11959.6 yd²
 1 a = 100 m² = 119.6 yd² = 1076.4 ft²

Volume

	m ³	dm ³	cm ³	yd ³
1 m ³	= 1	1000	1X10 ⁶	1.3079
1 dm ³	= 1X10 ⁻³	1	1000	1.3X10 ⁻³
1 cm ³	= 1X10 ⁻⁶	1X10 ⁻³	1	1.3X10 ⁻⁶
1 yd ³	= 0.765	764.6	765X10 ³	1
1 ft ³	= 28.3X10 ⁻³	28.32	28.3X10 ³	37X10 ⁻³
1 in ³	= 16.4X10 ⁻⁶	16.4X10 ⁻³	16.39	21.4X10 ⁻⁶
1 gal (UK)	= 4.55X10 ⁻³	4.546	4546	5.95X10 ⁻³
1 gal (US)	= 3.79X10 ⁻³	3.785	3785	4.95X10 ⁻³

	yd ³	in ³	gal (UK)	gal (US)
1 m ³	= 35.32	61.02X10 ³	220	264.2
1 dm ³	= 35.3X10 ⁻³	61.02	0.22	0.2642
1 cm ³	= 35.3X10 ⁻⁶	61X10 ⁻³	0.22X10 ⁻³	0.26X10 ⁻³
1 yd ³	= 27	46.7X10 ³	168.2	202
1 ft ³	= 1	1728	6.229	7.481
1 in ³	= 579X10 ⁻⁶	1	3.6X10 ⁻³	4.3X10 ⁻³
1 gal (UK)	= 0.1605	277	1	1.201
1 gal (US)	= 0.1337	231	0.8327	1

1 bushel (UK) = 8 gal (UK) = 64 pt (UK) = 36.371
 1 bushel (US) = 0.969 bu (UK) = 35.24 l
 1 pint (UK) = 1/8 gal (UK) = 0.5682 l
 1 liq. pt. (US) = 1/8 gal (US) = 0.4732 l
 1 l = 1.76 pt (UK) = 2.113 liq. pt (US)

Force and Weight

	N	kP	P
1 N	= 1	0.1020	102.0
1 kp	= 9.807	1	1000
1 p	= 9.81X10 ⁻³	1X10 ⁻³	1
1 dyn	= 1X10 ⁻⁵	1.02X10 ⁻⁶	1.02X10 ⁻³
1 tonf (UK)	= 9964	1016	1.02X10 ⁶
1 lbf	= 4.448	0.4536	453.6
1 ozf	=	28.4X10 ⁻³	28.35

	dyn	tonf (UK)	lbf	ozf
1 N	= 1X10 ⁵	100.4X10 ⁻⁶	0.2248	3.597
1 kP	= 981x10 ³	0.984X10 ⁻³	2.205	35.27
1 P	= 980.7	0.984X10 ⁻⁶	2.2X10 ⁻³	35.3X10 ⁻³
1 dyn	= 1	1X10 ⁻⁹	2.25X10 ⁻⁶	36X10 ⁻⁶
1 tonf (UK)	= 996X10 ⁶	1	2240	35.8X10 ³
1 lbf	= 445X10 ³	446X10 ⁻⁶	1	16
1 ozf	= 27.8X10 ³	27.9X10 ⁻⁶	62.5X10 ⁻³	1

1 (long) ton (UK) = 160 stones = 2240 lb = 1.016 t
 1 (short) ton (US) = 142.9 stones = 2000 lb = 0.907 t
 1 stone = 14 lb = 224 oz = 6.35 kg
 1 ton = 20 cwt
 1 cwt (UK) = 4 quarters = 8 stones = 112 lb
 1 cwt (US) = 100 lb = 45.36 kg
 1 t = 1000 kg = 0.984 ton (UK) = 1.101 ton (US)

CONVERSION FACTORS

Velocity

		km/h	m/min	m/s
1 km/h	=	1	16.667	0.2778
1 m/min	=	0.06	1	16.7X10 ⁻³
1 m/s	=	3.6	60	1
1 mile/h	=	1.609	26.82	0.4470
1 ft/min	=	18.3X10 ⁻³	0.3048	5.08X10 ⁻³
1 ft/s	=	1.097	18.288	0.3048
1 in/s	=	91X10 ⁻³	1.524	25.4X10 ⁻³

		mile/h	ft/min	ft/s	in/s
1 km/h	=	0.6214	54.68	0.9113	10.936
1 m/min	=	37.3X10 ⁻³	3.281	54.7x10 ⁻³	0.656
1 m/s	=	2.237	196.85	3.281	39.37
1 mile/h	=	1	88	1.467	17.6
1 ft/min	=	11.4X10 ⁻³	1	16.7X10 ⁻³	0.2
1 ft/s	=	0.6818	60	1	12
1 in/s	=	56.8X10 ⁻³	5	83.3X10 ⁻³	1

Torque

		Nm	cNm	kgfm
1 Nm	=	1	100	0.10197
1 cNm	=	0.01	1	1.02X10 ⁻³
1 kgfm	=	9.8067	980.67	1
1 cpm	=	98.1X10 ⁻⁶	9.81X10 ⁻³	10X10 ⁻⁶
1 lbf•ft	=	1.356	135.6	0.1383
1 lbf•in	=	0.1129	11.29	11.5X10 ⁻³
1 ozf•in	=	7.062X10 ⁻³	0.7062	0.72X10 ⁻³

		cpm	lbf•ft	lbf•in	ozf•in
1 Nm	=	10.2X10 ³	0.73756	8.8507	141.61
1 cNm	=	101.97	7.376X10 ⁻³	88.5X10 ⁻³	1.4161
1 kgfm	=	100X10 ³	7.233	86.796	1389
1 cpm	=	1	72.3X10 ⁻⁶	868X10 ⁻⁶	13.9X10 ⁻³
1 lbf•ft	=	13.8X10 ³	1	12	192
1 lbf•in	=	1152	83.3X10 ⁻³	1	16
1 ozf•in	=	72.01	5.21X10 ⁻³	62.5X10 ⁻³	1

Power

		kW	PS	hp
1 kW	=	1	1.360	1.341
1 PS	=	0.7355	1	0.9863
1 hp	=	0.7457	1.014	1
1 kgfm/s	=	9.81X10 ⁻³	13.33X10 ⁻³	13.15X10 ⁻³
1 ft•lbf/s	=	1.36X10 ⁻³	1.84X10 ⁻³	1.82X10 ⁻³
1 kcal/s	=	4.1868	5.692	5.615
1 Btu/s	=	1.055	1.435	1.415

		kgfm/s	ft•lbf/s	kcal/s	Btu/s
1 kW	=	102.0	737.6	0.2388	0.9478
1 PS	=	75	542.5	0.1757	0.6971
1 hp	=	76.04	550	0.1781	0.7068
1 kgfm/s	=	1	7.233	2.342X10 ⁻³	9.295X10 ⁻³
1 ft•lbf/s	=	0.1383	1	0.324X10 ⁻³	1.285X10 ⁻³
1 kcal/s	=	426.9	3088	1	3.968
1 Btu/s	=	107.6	778.2	0.2520	1

Moment of Inertia and Other Flywheel Effects

		kgm ² (<i>mr</i> ²)	kgfm ² (<i>GD</i> ²)
1 kgm ² (<i>mr</i> ²)	≅	1	4
1 kgfm ² (<i>GD</i> ²)	≅	0.25	1
1 lbf•ft ² (<i>Wr</i> ²)	≅	42.1X10 ⁻³	0.1686
1 kpms ²	≅	9.807	39.23
1 ft•lbf•s ²	≅	1.356	5.423

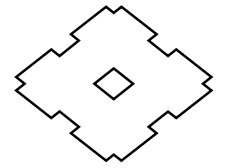
		lbf•ft ² (<i>Wr</i> ²)	kpms ²	ft•lbf•s ²
1 kgm ² (<i>mr</i> ²)	≅	23.73	0.102	0.7376
1 kgfm ² (<i>GD</i> ²)	≅	5.933	25.5X10 ⁻³	0.1844
1 lbf•ft ² (<i>Wr</i> ²)	≅	1	4.30X10 ⁻³	31.1X10 ⁻³
1 kpms ²	≅	232.7	1	7.233
1 ft•lbf•s ²	≅	32.17	0.1383	1

Pressure and Stress

		N/m ²	bar	kgf/m ²
1 N/m ²	=	1	1X10 ⁻⁵	0.102
1 bar	=	1X10 ⁵	1	10.2X10 ³
1 kgf/m ²	=	9.81	98.1X10 ⁻⁶	1
1 kgf/cm ²	=	98.1X10 ³	0.981	10X10 ³
1 kgf/mm ²	=	9.81X10 ⁶	98.1	1X10 ⁶
1 lbf/yd ²	=	5.32	53.2X10 ⁻⁶	0.543
1 lbf/ft ²	=	47.88	479X10 ⁻⁶	4.882
1 lbf/in ²	=	6.89X10 ³	68.9X10 ⁻³	703
1 tonf/in ²	=	15.4X10 ³	154	1.58X10 ⁶

		kgf/cm ²	kgf/mm ²	lbf/yd ²
1 N/m ²	=	10.2x10 ⁻⁶	0.102x10 ⁻⁶	0.188
1 bar	=	1.02	10.2X10 ⁻³	18.8X10 ³
1 kgf/m ²	=	0.1X10 ⁻³	1X10 ⁻⁶	1.843
1 kgf/cm ²	=	1	0.01	18.4X10 ³
1 kgf/mm ²	=	100	1	1.84X10 ⁶
1 lbf/yd ²	=	54X10 ⁻⁶	0.54X10 ⁻⁶	1
1 lbf/ft ²	=	0.488X10 ⁻³	4.88X10 ⁻⁶	9
1 lbf/in ²	=	70.3X10 ⁻³	0.703X10 ⁻³	1296
1 tonf/in ²	=	157.5	1.575	2.9X10 ⁶

		lbf/ft ²	lbf/in ²	tonf/in ²
1 N/m ²	=	20.88X10 ⁻³	145X10 ⁻⁶	64.75X10 ⁻⁹
1 bar	=	2.088X10 ³	14.5	6.475X10 ⁻³
1 kgf/m ²	=	0.2048	1.42X10 ⁻³	0.64X10 ⁻⁶
1 kgf/cm ²	=	2.05X10 ³	14.223	6.4X10 ⁻³
1 kgf/mm ²	=	205X10 ³	1.422X10 ³	0.6349
1 lbf/yd ²	=	0.1111	772X10 ⁻⁶	0.345X10 ⁻⁶
1 lbf/ft ²	=	1	6.94X10 ⁻³	3.1X10 ⁻⁶
1 lbf/in ²	=	144	1	0.446X10 ⁻³
1 tonf/in ²	=	0.323X10 ⁶	2240	1



TABLES

Temperature

	°F	°C
v °F ≅	V	$\frac{5}{9}(v - 32)$
w °C ≅	$\frac{9}{5}w + 32$	w
x K ≅	$\frac{9}{5}x - 460$	x - 273
y °Réau ≅	$\frac{9}{5}y + 32$	$\frac{5}{9}y$
z °R ≅	z - 460	$\frac{5}{9}z - 273$

	K	°Réau	°R
v °F ≅	$\frac{5}{9}(v - 32) + 273$	$\frac{5}{9}(v - 32)$	v + 460
w °C ≅	w + 273	$\frac{5}{9}w$	$\frac{5}{9}w + 492$
x K ≅	x	$\frac{5}{9}(x - 273)$	$\frac{5}{9}x$
y °Réau ≅	$\frac{5}{9}y + 273$	y	$\frac{5}{9}y + 492$
z °R ≅	$\frac{5}{9}z$	$\frac{5}{9}z - 219$	z

Reference points of temperature:

Boiling point of water:
 212°F 100°C 373.15K 80°Réau 671.67°R

Freezing point of water:
 32°F 0°C 273.15K 0°Réau 491.67°R

Absolute zero:
 -459.67°F -273.15°C 0°K 0°R

°C	← °F → °C	°F	°C	← °F → °C	°F
-17.8	0	32.0	-3.9	25	77.0
-17.2	1	33.8	-3.3	26	78.8
-16.7	2	35.6	-2.8	27	80.6
-16.1	3	37.4	-2.2	28	82.4
-15.6	4	39.2	-1.7	29	84.2
-15.0	5	41.0	-1.1	30	86.0
-14.4	6	42.8	-0.6	31	87.8
-13.9	7	44.6	0.0	32	89.6
-13.3	8	46.4	0.6	33	91.4
-12.8	9	48.2	1.1	34	93.2
-12.2	10	50.0	1.7	35	95.0
-11.7	11	51.8	2.2	36	96.8
-11.1	12	53.6	2.8	37	98.6
-10.6	13	55.4	3.3	38	100.4
-10.0	14	57.2	3.9	39	102.2
-9.4	15	59.0	4.4	40	104.0
-8.9	16	60.8	5.0	41	105.8
-8.3	17	62.6	5.6	42	107.6
-7.8	18	64.4	6.1	43	109.4
-7.2	19	66.2	6.7	44	111.2
-6.7	20	68.0	7.2	45	113.0
-6.1	21	69.8	7.8	46	114.8
-5.6	22	71.6	8.3	47	116.6
-5.0	23	73.4	8.9	48	118.4
-4.4	24	75.2	9.4	49	120.2

Temperature Conversion

Degree Fahrenheit to degree Celsius
 Degree Celsius to degree Fahrenheit

°C	← °F → °C	°F	°C	← °F → °C	°F
-45.6	-50	-58.0	-31.7	-25	-13.0
-45.0	-49	-56.2	-31.1	-24	-11.2
-44.4	-48	-54.4	-30.6	-23	-9.4
-43.9	-47	-52.6	-30.0	-22	-7.6
-43.3	-46	-50.8	-29.4	-21	-5.8
-42.8	-45	-49.0	-28.9	-20	-4.0
-42.2	-44	-47.2	-28.3	-19	-2.2
-41.7	-43	-45.4	-27.8	-18	-0.4
-41.1	-42	-43.6	-27.2	-17	1.4
-40.6	-41	-41.8	-26.7	-16	3.2
-40.0	-40	-40.0	-26.1	-15	5.0
-39.4	-39	-38.2	-25.6	-14	6.8
-38.9	-38	-36.4	-25.0	-13	8.6
-38.3	-37	-34.6	-24.4	-12	10.4
-37.8	-36	-32.8	-23.9	-11	12.2
-37.2	-35	-31.0	-23.3	-10	14.0
-36.7	-34	-29.2	-22.8	-9	15.8
-36.1	-33	-27.4	-22.2	-8	17.6
-35.6	-32	-25.6	-21.7	-7	19.4
-35.0	-31	-23.8	-21.1	-6	21.2
-34.4	-30	-22.0	-20.6	-5	23.0
-33.9	-29	-20.2	-20.0	-4	24.8
-33.3	-28	-18.4	-19.4	-3	26.6
-32.8	-27	-16.6	-18.9	-2	28.4
-32.2	-26	-14.8	-18.3	-1	30.2

°C	← °F → °C	°F	°C	← °F → °C	°F
10.0	50	122.0	23.9	75	167.0
10.6	51	123.8	24.4	76	168.8
11.1	52	125.6	25.0	77	170.6
11.7	53	127.4	25.6	78	172.4
12.2	54	129.2	26.1	79	174.2
12.8	55	131.0	26.7	80	176.0
13.3	56	132.8	27.2	81	177.8
13.9	57	134.6	27.8	82	179.6
14.4	58	136.4	28.3	83	181.4
15.0	59	138.2	28.9	84	183.2
15.6	60	140.0	29.4	85	185.0
16.1	61	141.8	30.0	86	186.8
16.7	62	143.6	30.6	87	188.6
17.2	63	145.4	31.1	88	190.4
17.8	64	147.2	31.7	89	192.2
18.3	65	149.0	32.2	90	194.0
18.9	66	150.8	32.8	91	195.8
19.4	67	152.6	33.3	92	197.6
20.0	68	154.4	33.9	93	199.4
20.6	69	156.2	34.4	94	201.2
21.1	70	158.0	35.0	95	203.0
21.7	71	159.8	35.6	96	204.8
22.2	72	161.6	36.1	97	206.6
22.8	73	163.4	36.7	98	208.4
23.3	74	165.2	37.2	99	210.2