valveforce
the power in your process

IMPERIAL TO METRIC

Length
ft × 0.305 = M
in × 25.4 = mm

Volume
ft^3 × 0.028 = m^3
UK Gal × 4.546 = Litres

Weight
lb × 0.45 = Kg

Pressure
psi × 0.069 = Bar
psi × 6.89 = kPa (kN/m^2)
Bar × 100 = kPa (kN/m^2)
ft.hd. × 2.98 = kPa (kN/m^2)
in.w.g. × 0.249 = kPa (kN/m^2)

Heat and Energy
BTU/hr × 0.00029 = kW
BTU/hr × 0.252 = K.Cal/hr
BTU/hr/ft^2°F × 5.68 = w/m^2°C
H.P. × 746 = W
BTU/lb × 2.326 = kJ/kg

Temperature
(°F − 32) × 0.555 = °C

Velocity/Flow Rate
GPM × 0.076 = l/s
lbs/hr × 0.000126 = kg/s
ft^3/min × 0.000472 = m^3/s
ft^2/min × 1.7 = m^3/hr
ft/min × 0.0051 = m/s
ft/s × 0.305 = m/s

METRIC TO IMPERIAL

Length
M × 3.28 = ft
mm × 0.039 = in

Volume
m^3 × 35.31 = ft^3
Litres × 0.22 = UK Gall

Weight
Kg × 2.2 = lb

Pressure
Bar × 14.5 = psi
kPa (kN/m^2) × 0.145 = psi
kPa (kN/m^2) × 0.01 = Bar
kPa (kN/m^2) × 0.33 = ft.hd.
kPa (kN/m^2) × 4 = In.w.g.

Heat and Energy
kW × 3412 = BTU/hr
K.Cal/hr × 3.97 = BTU/hr
w/m^2°C × 0.176 = BTU/hr/ft^2°F
W × 0.0013 = H.P.
kJ/kg × 0.43 = BTU/lb

Temperature
(°C × 1.8) + 32 = °F

Velocity/Flow Rate
l/s × 13.2 = GPM
kg/s × 7937 = lbs/hr
m^3/s × 2119 = ft^3/min
m^3/hr × 0.588 = ft^3/min
m/s × 197 = ft/min
m/s × 3.28 = ft/s

DECIMAL MULTIPLES and SUB-MULTIPLES

Although the SI units are preferred it will not be practical for everyday use to limit usage to these and therefore their decimal multiples and sub-multiples will also be used. These are formed by using the following prefixes:

Factor by which the unit is multiplied	Prefix	Symbol
10^{12}	tera	T
10^{9}	giga	G
10^{6}	mega	M
10^{3}	kilo	k
10^{2}	hecto	h
10	deca	da
10^{-1}	deci	d
10^{-2}	centi	c
10^{-3}	milli	m
10^{-6}	micro	µ
10^{-9}	nano	n
10^{-12}	pico	p
10^{-15}	femto	f
10^{-18}	atto	a

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The following conversions have generally been based on BS350. The degree of rounding has been adjusted to an extent considered to be of value to a practical engineer.

In the tabulation of conversion factors, the SI unit, or multiple thereof, recommended by the British Valve Manufacturers Association for use in the valve industry, is shown in the left hand column.

LENGTH

millimetre mm	metre m	inch in	foot ft	yard yd
1	0.001	0.0394	0.0033	0.0011
1000	**1**	39.3701	3.2808	1.0936
25.4	0.0254	**1**	0.0833	0.0278
304.8	0.3048	12	**1**	0.3333
914.4	0.9144	36	3	**1**

VOLUME

cubic metre m^3	cubic centimetre cm^3	litre l	cubic inch in^3	cubic foot ft^3	UK gallon UK gal	US gallon US gal
1	1 000 000	999.972	61 023.7	35.314 7	219.969	264.172
0.000 001	**1**	0.000 999 7	0.0610	0.000 035 3	0.000 22	0.000 26
0.001	1 000.028	**1**	61.0255	0.035 3	0.22	0.264 2
0.000 016	16.3871	0.016 4	**1**	0.000 58	0.003 6	0.004 3
0.028 3	28 316.8	28.316 1	1 728	**1**	6.228 8	7.480 5
0.004 5	4 546.09	4.546	277.419	0.160 5	**1**	1.201
0.003 8	3 785.41	3.785 3	231	0.133 7	0.832 7	**1**

VELOCITY

metre per second m/s	foot per second ft/s	foot per minute ft/m	kilometre per hour km/h	mile per hour mile/h
1	3.2808	0.0547	3.6	2.2369
0.3048	**1**	0.0167	1.097	0.6818
18.288	60	**1**	65.8368	40.9091
0.2778	0.9113	0.0152	**1**	0.6214
0.4470	1.4667	0.0245	1.6093	**1**

MASS

kilogram kg	pound lb	hundredweight cwt	tonne t	UK ton	US short ton sh ton
1	2.2046	0.0197	0.001	0.000 98	0.0011
0.4536	**1**	0.0089	0.000 454	0.000 446	0.0005
50.8023	112	**1**	0.050 8	0.05	0.056
1000	2204.62	19.6841	**1**	0.984 2	1.1023
1016.05	2240	20	1.016 1	**1**	1.12
907.185	2000	17.8571	0.907 2	0.892 9	**1**

MASS RATE OF FLOW (LIQUID)

kilogram per second kg/s	kilogram per hour kg/h	pound per hour lb/h	ton per hour UK ton/hr	tonne per day t/d
1	3600	7936.64	3.543 14	86.40
0.000 278	**1**	2.2046	0.000 984	.024
0.000 126	0.4536	**1**	0.000 446	.0109
0.282 2	1016.05	2240	**1**	24.3852
0.011 6	41.6667	91.8592	0.041 01	**1**

VOLUMETRIC RATE OF FLOW (LIQUID)

litre per second l/s	litre per minute l/min	cubic metre per hour m^3/h	cubic foot per hour ft^3/h	cubic foot per minute ft^3/m	UK gallon per minute UK gal/min	US gallon per minute US gal/min	US barrel per day US barrel/d
1	60	3.6001	127.136	2.1189	13.1986	15.8508	543.456
0.0167	**1**	0.0600	2.1189	0.3532	0.22	0.2642	9.0576
0.2778	16.6666	**1**	35.3147	0.5886	3.6662	4.4029	150.956
0.0079	0.4719	0.0283	**1**	0.1067	0.1038	0.1247	4.2746
0.4719	28.316	1.6990	60	**1**	6.2288	7.4805	256.475
0.0758	4.546	0.2728	9.6326	0.1605	**1**	1.201	41.1754
0.0631	3.7853	0.2271	8.0208	0.1337	0.8327	**1**	4.2857
0.0018	0.1104	0.0066	0.2339	0.0039	0.0243	0.0292	**1**

STANDARD GAS CONDITIONS AND MOLAR VOLUMES

NORMAL (eg nft³) – European and scientific work	= 0°C and 1.0133 bar	Molar Volume 22.412 m³/kg mol
STANDARD (eg std ft³) – British Gas Industry	= 15.55°C and 1.016 bar	Molar Volume 24.112 m³/kg mol
STANDARD (scf) – USA	= 15.55°C and 1.0133 bar	Molar Volume 23.681 m³/kg mol

PRESSURE AND LIQUID HEAD

① bar	kilogram force per square centimetre ② kgf/cm²	pound force per square inch ③ lbf/in²	④ atm	foot of water ⑤ ft H_20	inch of water in H_20	metre of water m H_20	centimetre of mercury cm Hg	inch of mercury in Hg	millimetre of mercury ⑥ mm Hg
1	1.0197	14.5038	0.9869	33.4553	401.463	10.1972	75.0062	29.530	750.062
0.9807	**1**	14.2233	0.9878	32.8084	393.701	10	73.556	28.959	735.559
0.0689	0.0703	**1**	0.0609	2.3067	27.68	0.7031	5.1715	2.036	51.715
1.0133	1.0332	14.6959	**1**	33.889	406.782	10.3323	76.0	29.9213	760
0.0299	0.0305	0.4335	0.0295	**1**	12	0.3048	2.242	0.8827	22.4198
0.0025	0.0025	0.0361	0.0025	0.0833	**1**	0.0254	0.1868	0.0734	1.8683
0.0981	0.1000	1.422	0.0968	3.2808	39.3701	**1**	7.3556	2.896	73.356
0.0133	0.0136	0.1934	0.0132	0.4461	5.3524	0.136	**1**	0.3937	10
0.0339	0.0345	0.4911	0.0334	1.133	13.5951	0.3453	2.54	**1**	25.4
0.0013	0.0014	0.0193	0.0013	0.446	0.5352	0.0136	0.1	0.0394	**1**

① 1 bar = 10^5N/m²
② Technical (metric) atmosphere (at)
③ Often denoted non-technically as psi
④ International standard atmosphere
⑤ At density 1g/cm³
⑥ Also known as torr

PRESSURE STANDARDS

International standard atmosphere (1 atm) = 1.0133 bar = 1.0332 kgf/cm² = 14.6959 lbf/in²
Metric atmosphere (1 at) = 0.9807 bar = 1 kgf/cm² = 14.2233 lbf/in²
ata = at absolute
atu = at gauge
STANDARD CONDITIONS – s.t.p. or NTP = 1.0133 bar at 0°C = 14.6959 lbf/in² at 0°C

DENSITY

gram per millilitre g/ml	kilogram per cubic metre kg/m³	pound per cubic foot lb/ft³	pound per cubic inch lb/in³
1	1 000	62.428	0.036 1
0.001	**1**	0.0624	0.000 036
0.016	16.02	**1**	0.000 58
27.6807	27 679.9	1728	**1**

HEAT FLOW RATE

watts W	calorie per second cal/s	kilocalorie per hour kcal/h	British Thermal unit per hour Btu/h
1	0.2388	0.8598	3.4121
4.1868	**1**	3.6	14.286
1.163	0.2778	**1**	3.9683
0.2931	0.07	0.252	**1**

FORCE

kilonewton kN	kilogram force kgf	pound force lbf	poundal pdl
1	101.972	224.809	7233.01
0.009 81	**1**	2.2046	70.9316
0.004 4	0.4536	**1**	32.1740
0.000 138	0.0141	0.0311	**1**

POWER

watt W	kilogram force metre per second kgf m/s	metric horse power	foot pound force per second ft lbf/s	horse power hp
1	0.102	0.001 36	0.7376	0.001 34
9.8067	**1**	0.013 33	7.2330	0.013 15
735.499	75	**1**	542.476	0.986 32
1.3558	0.1383	0.001 84	**1**	0.001 82
745.70	76.0402	0.013 9	550.0	**1**

MASS/VOLUMETRIC RATE OF FLOW FORMULAE

Gases

$$ft^3/h\ (std) = \frac{lb/h \times 379}{M} \qquad m^3/h\ (norm) = \frac{kg/h \times 22.40}{M}$$

$$ft^3/h\ (std) = \frac{lb/h}{p1} \qquad m^3/h\ (norm) = \frac{kg/h}{p2}$$

$$ft^3/h\ (std) = \frac{lb/h \times 13.1}{G1} \qquad m^3/h\ (norm) = \frac{kg/h \times 0.82}{G2}$$

Liquids

$$US\ gal/min = \frac{lb/h}{500 \times SG_1} \qquad m^3/h = \frac{.001\ kg/h}{SG_2}$$

Where: (std) is at 14.7 lbf/in² (abs) and 60°F
(norm) is at 760 mm Hg and 0°C
SG_1 Water = 1 at 60°F
SG_2 Water = 1 at 4°C
M = Molecular Weight
$p1$ = Density lb/ft³ (std)
$p2$ = Density kg/cm³ (norm)
G_1 = sp.gr. Air = 1 (std)
G_2 = sp.gr. Air = 1 (norm)

SPECIFIC GRAVITY OF LIQUIDS

Water	1.0
Sea Water	1.025
Kerosene	0.80
Sulphuric Acid 100%	1.83
Hydrochloric Acid 45%	1.48
Sodium Hydroxide 25%	1.27
Carbon Tetrachloride	1.60
Petrol (Gasoline)	0.65-0.80
Benzene	0.88
Turpentine	1.1-1.2

TORQUE

newton metre Nm	kilogram force metre kgf m	pound force foot lbf ft	pound force inch lbf in
1	0.102	0.7376	8.8508
9.8067	**1**	7.2330	86.7962
1.3558	0.1383	**1**	12
0.113	0.0115	0.0833	**1**

SPECIFIC GRAVITY AND MOLECULAR WEIGHT OF GASES

	Symbol	Specific Gravity	Molecular Weight
Air	—	1.000	28.97
Ammonia	NH_3	0.5963	17.03
Carbon Dioxide	CO_2	1.5290	44.00
Carbon Monoxide	CO	0.9670	28.00
Chlorine	Cl_2	2.486	70.91
Ethylene	C_2H_4	0.9749	28.03
Helium	He	0.1380	4.00
Hydrogen	H_2	0.0695	2.016
Hydrogen Sulphide	H_2S	1.1900	34.08
Methane	CH_4	0.5544	16.03
Methyl Chloride	CH_3Cl	1.7848	50.48
Nitrogen	N_2	0.9672	28.02
Nitrous Oxide	N_2O	1.530	44.02
Oxygen	O_2	1.105	32.00
Sulphur Dioxide	SO_2	2.264	64.06
Natural Gas (Typical)		0.60	

CONVERSION TABLE FOR SPECIFIC ENTHALPY

		kJ/kg = J/g	kcal/kg = cal/g	Btu/lb	kgf m/kg	ft lbf/lb	kWh/kg = Wh/g
1 kJ/kg	=	*1	0.238 846	0.429 923	101.972	334.553	$2.777\,78 \times 10^{-4}$
1 kcal/kg	=	*4.186 8	*1	*1.8	426.935	1400.70	$*1.163 \times 10^{-3}$
1 Btu/lb	=	*2.326	0.555 556	*1	237.186	778.169	$6.461\,11 \times 10^{-4}$
1 kgf m/kg	=	$*9.806\,65 \times 10^{-3}$	$2.342\,28 \times 10^{-3}$	$4.216\,10 \times 10^{-3}$	*1	3.280 84	$2.724\,07 \times 10^{-6}$
1 ft lbf/lb	=	$2.989\,07 \times 10^{-3}$	$7.139\,26 \times 10^{-4}$	$1.285\,07 \times 10^{-3}$	*0.304 8	*1	$0.830\,296 \times 10^{-6}$
1 kWh/kg	=	*3600	859.845	1547.72	$3.670\,98 \times 10^{5}$	$1.204\,39 \times 10^{6}$	*1

* Factors are exact.

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Head and pressure equivalents are based on pure air-free water at standard atmosphere at 20°C having a density of 0.99823 g/cm³.

Metres head to feet head, bar and lbf/in²

Head		Pressure	
metres	feet	bar	lbf/in²
0.10	0.328	0.010	0.142
0.20	0.656	0.020	0.284
0.30	0.984	0.029	0.426
0.40	1.312	0.039	0.568
0.50	1.640	0.049	0.710
0.60	1.969	0.059	0.852
0.70	2.297	0.069	0.994
0.80	2.625	0.078	1.136
0.90	2.953	0.088	1.278
1	3.281	0.098	1.420
2	6.562	0.196	2.840
3	9.843	0.294	4.259
4	13.123	0.392	5.679
5	16.404	0.489	7.099
6	19.685	0.587	8.519
7	22.966	0.685	9.939
8	26.247	0.783	11.358
9	29.528	0.881	12.778
10	32.808	0.979	14.198
11	36.089	1.077	15.618
12	39.370	1.175	17.038
13	42.651	1.273	18.457
14	45.932	1.371	19.877
15	49.213	1.468	21.297
16	52.493	1.566	22.717
17	55.774	1.664	24.137
18	59.055	1.762	25.557
19	62.336	1.860	26.976
20	65.617	1.958	28.396
30	98.425	2.937	42.594
40	131.234	3.916	56.792
50	164.042	4.895	70.990
60	196.850	5.874	85.188
70	229.659	6.853	99.386
80	262.467	7.831	113.584
90	295.276	8.810	127.783
100	328.084	9.789	141.981
110	360.892	10.768	156.179
120	393.701	11.747	170.377
130	426.509	12.726	184.575
140	459.318	13.705	198.773
150	492.126	14.684	212.971
160	524.934	15.663	227.169
170	557.743	16.642	241.367
180	590.551	17.621	255.565
190	623.360	18.600	269.763
200	656.168	19.579	283.961
210	688.976	20.558	298.159
220	721.785	21.536	312.357
230	754.593	22.515	326.555
240	787.402	23.494	340.753
250	820.210	24.473	354.951

Feet head to metres head, bar and lbf/in²

Head		Pressure	
feet	metres	bar	lbf/in²
1	0.305	0.030	0.433
2	0.610	0.060	0.866
3	0.914	0.090	1.298
4	1.219	0.119	1.731
5	1.524	0.149	2.164
6	1.829	0.179	2.597
7	2.134	0.209	3.029
8	2.438	0.239	3.462
9	2.743	0.269	3.895
10	3.048	0.298	4.328
20	6.096	0.597	8.655
30	9.144	0.895	12.983
40	12.192	1.194	17.310
50	15.240	1.492	21.638
60	18.288	1.790	25.965
70	21.336	2.089	30.293
80	24.384	2.387	34.621
90	27.432	2.685	38.948
100	30.480	2.984	43.276
150	45.720	4.476	64.914
200	60.960	5.968	86.551
250	76.200	7.459	108.189
300	91.440	8.951	129.827
350	106.680	10.443	151.465
400	121.920	11.935	173.103
450	137.160	13.427	194.741
500	152.400	14.919	216.378
550	167.640	16.411	238.016
600	182.880	17.903	259.654
650	198.120	19.395	281.292
700	213.360	20.886	302.930
750	228.600	22.378	324.568
800	243.840	23.870	346.205

bar to lbf/in², metres head and feet head

Pressure		Head	
bar	lbf/in²	metres	feet
0.01	0.145	0.102	0.335
0.02	0.290	0.204	0.670
0.03	0.435	0.306	1.005
0.04	0.580	0.409	1.341
0.05	0.725	0.511	1.676
0.06	0.870	0.613	2.011
0.07	1.015	0.715	2.346
0.08	1.160	0.817	2.681
0.09	1.305	0.919	3.016
0.10	1.450	1.022	3.351

continued

bar to lbf/in², metres head and feet

Pressure		Head	
bar	lbf/in²	metres	feet
0.20	2.901	2.043	6.703
0.30	4.351	3.065	10.054
0.40	5.802	4.086	13.406
0.50	7.252	5.108	16.757
0.60	8.702	6.129	20.109
0.70	10.153	7.151	23.460
0.80	11.603	8.172	26.812
0.90	13.053	9.194	30.163
1.00	14.504	10.215	33.515
1.20	17.405	12.258	40.218
1.40	20.305	14.301	46.920
1.60	23.206	16.344	53.623
1.80	26.107	18.387	60.326
2.00	29.008	20.430	67.029
2.20	31.908	22.474	73.732
2.40	34.809	24.517	80.435
2.60	37.710	26.560	87.138
2.80	40.611	28.603	93.841
3.00	43.511	30.646	100.544
3.20	46.412	32.689	107.247
3.40	49.313	34.732	113.950
3.60	52.214	36.775	120.653
3.80	55.114	38.818	127.355
4.00	58.015	40.861	134.058
4.20	60.916	42.904	140.761
4.40	63.817	44.947	147.464
4.60	66.717	46.990	154.167
4.80	69.618	49.033	160.870
5.00	72.519	51.076	167.573
5.20	75.420	53.119	174.276
5.40	78.321	55.162	180.979
5.60	81.221	57.205	187.682
5.80	84.122	59.248	194.385
6.00	87.023	61.291	201.088
6.20	89.924	63.335	207.790
6.40	92.824	65.378	214.493
6.60	95.725	67.421	221.196
6.80	98.626	69.464	227.899
7.00	101.527	71.507	234.602
7.20	104.427	73.550	241.305
7.40	107.328	75.593	248.008
7.60	110.229	77.636	254.711
7.80	113.130	79.679	261.414
8.00	116.030	81.722	268.117
8.20	118.931	83.765	274.820
8.40	121.832	85.808	281.523
8.60	124.733	87.851	288.225
8.80	127.633	89.894	294.928
9.00	130.534	91.937	301.631
9.20	133.435	93.980	208.334
9.40	136.336	96.023	315.037
9.60	139.236	98.066	321.740
9.80	142.137	100.109	328.443
10	145.038	102.152	335.146
11	159.542	112.368	368.660
12	174.046	122.583	402.175
13	188.549	132.798	435.690
14	203.053	143.013	469.204
15	217.557	153.229	502.719
16	232.061	163.444	536.233
17	246.565	173.659	569.748
18	261.068	183.874	603.263
19	275.572	194.090	636.777
20	290.076	204.305	670.292
21	304.580	214.520	703.806
22	319.084	224.735	737.321
23	333.587	234.951	770.835
24	348.091	245.166	804.350
25	362.595	255.381	837.865

lbf/in² to bar, metres head and feet head

Pressure		Head	
lbf/in²	bar	metres	feet
1	0.069	0.704	2.311
2	0.138	1.409	4.622
3	0.207	2.113	6.932
4	0.276	2.817	9.243
5	0.345	3.522	11.554
6	0.414	4.226	13.865
7	0.483	4.930	16.175
8	0.552	5.635	18.486
9	0.621	6.339	20.797
10	0.689	7.043	23.108
11	0.758	7.748	25.418
12	0.827	8.452	27.729
13	0.896	9.156	30.040
14	0.965	9.861	32.351
15	1.034	10.565	34.661
16	1.103	11.269	36.972
17	1.172	11.973	39.283
18	1.241	12.678	41.594
19	1.310	13.382	43.905
20	1.379	14.086	46.215
21	1.448	14.791	48.526
22	1.517	15.495	50.837
23	1.586	16.199	53.148
24	1.655	16.904	55.458
25	1.724	17.608	57.769
26	1.793	18.312	60.080
27	1.862	19.017	62.391
28	1.931	19.721	64.701
29	1.999	20.425	67.012
30	2.068	21.130	69.323
31	2.137	21.834	71.634
32	2.206	22.538	73.945
33	2.275	23.243	76.255
34	2.344	23.947	78.566
35	2.413	24.651	80.877
36	2.482	25.356	83.188
37	2.551	26.060	85.498
38	2.620	26.764	87.809
39	2.689	27.469	90.120
40	2.758	28.173	92.431
41	2.827	28.877	94.741
42	2.896	29.582	97.052
43	2.965	30.286	99.363
44	3.034	30.990	101.674
45	3.103	31.694	103.984
46	3.172	32.399	106.295
47	3.241	33.103	108.606
48	3.309	33.807	110.917
49	3.378	34.512	113.228
50	3.447	35.216	115.538
60	4.137	42.259	138.646
70	4.826	49.303	161.754
80	5.516	56.346	184.861
90	6.205	63.389	207.969
100	6.895	70.432	231.077
150	10.342	105.648	346.615
200	13.789	140.864	462.153
250	17.237	176.080	577.692
300	20.684	211.296	693.230
350	24.132	246.513	808.768

Note: Figures published above have been calculated, where applicable, to the nearest 3rd decimal point.

valveforce
the power in your process

Find the temperature to be converted in the centre column. Read off the centrigrade (Celsius) conversion on the left or the Fahrenheit conversion on the right.

°C	↓	°F	°C	↓	°F	°C	↓	°F	°C	↓	°F	°C	↓	°F	°C	↓	°F	°C	↓	°F
-273	-459		**-31.7**	-25	**-13.0**	**5.6**	42	**107.6**	**42.8**	109	**228.2**	**80.0**	176	**348.8**	**117.2**	243	**469.4**	**454**	850	**1562**
-268	-450		**-31.1**	-24	**-11.2**	**6.1**	43	**109.4**	**43.3**	110	**230.0**	**80.6**	177	**350.6**	**117.8**	244	**471.2**	**460**	860	**1580**
-262	-440		**-30.6**	-23	**-9.4**	**6.7**	44	**111.2**	**43.9**	111	**231.8**	**81.1**	178	**352.4**	**118.3**	245	**473.0**	**466**	870	**1598**
-257	-430		**-30.0**	-22	**-7.6**	**7.2**	45	**113.0**	**44.4**	112	**233.6**	**81.7**	179	**354.2**	**118.9**	246	**474.8**	**471**	880	**1616**
-251	-420		**-29.4**	-21	**-5.8**	**7.8**	46	**114.8**	**45.0**	113	**235.4**	**82.2**	180	**356.0**	**119.4**	247	**476.6**	**477**	890	**1634**
-246	-410		**-28.9**	-20	**-4.0**	**8.3**	47	**116.6**	**45.6**	114	**237.2**	**82.8**	181	**357.8**	**120.0**	248	**478.4**	**482**	900	**1652**
-240	-400		**-28.3**	-19	**-2.2**	**8.9**	48	**118.4**	**46.1**	115	**239.0**	**83.3**	182	**359.6**	**120.6**	249	**480.2**	**488**	910	**1670**
-234	-390		**-27.8**	-18	**-0.4**	**9.4**	49	**120.2**	**46.7**	116	**240.8**	**83.9**	183	**361.4**	**121**	250	**482**	**493**	920	**1688**
-229	-380		**-27.2**	-17	**1.4**	**10.0**	50	**122.0**	**47.2**	117	**242.6**	**84.4**	184	**363.2**	**127**	260	**500**	**499**	930	**1706**
-223	-370		**-26.7**	-16	**3.2**	**10.6**	51	**123.8**	**47.8**	118	**244.4**	**85.0**	185	**365.0**	**132**	270	**518**	**504**	940	**1724**
-218	-360		**-26.1**	-15	**5.0**	**11.1**	52	**125.6**	**48.3**	119	**246.2**	**85.6**	186	**366.8**	**138**	280	**536**	**510**	950	**1742**
-212	-350		**-25.6**	-14	**6.8**	**11.7**	53	**127.4**	**48.9**	120	**248.0**	**86.1**	187	**368.6**	**143**	290	**554**	**516**	960	**1760**
-207	-340		**-25.0**	-13	**8.6**	**12.2**	54	**129.2**	**49.4**	121	**249.8**	**86.7**	188	**370.4**	**149**	300	**572**	**521**	970	**1778**
-201	-330		**-24.4**	-12	**10.4**	**12.8**	55	**131.0**	**50.0**	122	**251.6**	**87.2**	189	**372.2**	**154**	310	**590**	**527**	980	**1796**
-196	-320		**-23.9**	-11	**12.2**	**13.3**	56	**132.8**	**50.6**	123	**253.4**	**87.8**	190	**374.0**	**160**	320	**608**	**532**	990	**1814**
-190	-310		**-23.3**	-10	**14.0**	**13.9**	57	**134.6**	**51.1**	124	**255.2**	**88.3**	191	**375.8**	**166**	330	**626**	**538**	1000	**1832**
-184	-300		**-22.8**	-9	**15.8**	**14.4**	58	**136.4**	**51.7**	125	**257.0**	**88.9**	192	**377.6**	**177**	340	**644**	**543**	1010	**1850**
-179	-290		**-22.2**	-8	**17.6**	**15.0**	59	**138.2**	**52.2**	126	**258.8**	**89.4**	193	**379.4**	**177**	350	**662**	**549**	1020	**1868**
-173	-280		**-21.7**	-7	**19.4**	**15.6**	60	**140.0**	**52.8**	127	**260.6**	**90.0**	194	**381.2**	**182**	360	**680**	**554**	1030	**1886**
-169	-273	**-459.4**	**-21.1**	-6	**21.2**	**16.1**	61	**141.8**	**53.3**	128	**262.4**	**90.6**	195	**383.0**	**188**	370	**698**	**560**	1040	**1904**
-168	-270	**-454**	**-20.6**	-5	**23.0**	**16.7**	62	**143.6**	**53.9**	129	**264.2**	**91.1**	196	**384.8**	**193**	380	**716**	**566**	1050	**1922**
-162	-260	**-436**	**-20.0**	-4	**24.8**	**17.2**	63	**145.4**	**54.4**	130	**266.0**	**91.7**	197	**386.6**	**199**	390	**734**	**571**	1060	**1940**
-157	-250	**-418**	**-19.4**	-3	**26.6**	**17.8**	64	**147.2**	**55.0**	131	**267.8**	**92.2**	198	**388.4**	**204**	400	**752**	**577**	1070	**1958**
-151	-240	**-400**	**-18.9**	-2	**28.4**	**18.3**	65	**149.0**	**55.6**	132	**269.6**	**92.8**	199	**390.2**	**210**	410	**770**	**582**	1080	**1976**
-146	-230	**-382**	**-18.3**	-1	**30.2**	**18.9**	66	**150.8**	**56.1**	133	**271.4**	**93.3**	200	**392.0**	**216**	420	**788**	**588**	1090	**1994**
-140	-220	**-364**	**-17.8**	0	**32.0**	**19.4**	67	**152.6**	**56.7**	134	**273.2**	**93.9**	201	**393.8**	**221**	430	**806**	**593**	1100	**2012**
-134	-210	**-346**	**-17.2**	1	**33.8**	**20.0**	68	**154.4**	**57.2**	135	**275.0**	**94.4**	202	**395.6**	**227**	440	**824**	**559**	1110	**2030**
-129	-200	**-328**	**-16.7**	2	**35.6**	**20.6**	69	**156.2**	**57.8**	136	**276.8**	**95.0**	203	**397.4**	**232**	450	**842**	**604**	1120	**2048**
-123	-190	**-310**	**-16.1**	3	**37.4**	**21.1**	70	**158.0**	**58.3**	137	**278.6**	**95.6**	204	**399.2**	**238**	460	**860**	**610**	1130	**2066**
-118	-180	**-292**	**-15.6**	4	**39.2**	**21.7**	71	**159.8**	**58.9**	138	**280.4**	**96.1**	205	**401.0**	**243**	270	**878**	**616**	1140	**2084**
-112	-170	**-274**	**-15.0**	5	**41.0**	**22.2**	72	**161.6**	**59.4**	139	**282.2**	**96.7**	206	**402.8**	**249**	480	**896**	**621**	1150	**2102**
-107	-160	**-256**	**-14.4**	6	**42.8**	**22.8**	73	**163.4**	**60.0**	140	**284.0**	**97.2**	207	**404.6**	**254**	490	**914**	**627**	1160	**2120**
-101	-150	**-238**	**-13.9**	7	**44.6**	**23.3**	74	**165.2**	**60.6**	141	**285.8**	**97.8**	208	**406.4**	**260**	500	**932**	**632**	1170	**2138**
-96	-140	**-220**	**-13.3**	8	**46.4**	**23.9**	75	**167.0**	**61.1**	142	**287.6**	**98.3**	209	**408.2**	**266**	510	**950**	**638**	1180	**2156**
-90	-130	**-202**	**-12.8**	9	**48.2**	**24.4**	76	**168.8**	**61.7**	143	**289.4**	**98.9**	210	**410.0**	**271**	520	**968**	**643**	1190	**2174**
-84	-120	**-184**	**-12.2**	10	**50.0**	**25.0**	77	**170.6**	**62.2**	144	**291.2**	**99.4**	211	**411.8**	**277**	530	**986**	**649**	1200	**2192**
-79	-110	**-166**	**-11.7**	11	**51.8**	**25.6**	78	**172.4**	**62.8**	145	**293.0**	**100.0**	212	**413.6**	**282**	540	**1004**	**654**	1210	**2210**
-73	-100	**-148**	**-11.1**	12	**53.6**	**26.1**	79	**174.2**	**63.3**	146	**294.8**	**100.6**	213	**415.4**	**288**	550	**1022**	**660**	1220	**2228**
-68	-90	**-130**	**-10.6**	13	**55.4**	**26.7**	80	**176.0**	**63.9**	147	**296.6**	**101.1**	214	**417.2**	**293**	560	**1040**	**666**	1230	**2246**
-62	-80	**-112**	**-10.0**	14	**57.2**	**27.2**	81	**177.8**	**64.4**	148	**298.4**	**101.7**	215	**419.0**	**299**	570	**1058**	**671**	1240	**2264**
-57	-70	**-94**	**-9.4**	15	**59.0**	**27.8**	82	**179.6**	**65.0**	149	**300.2**	**102.2**	216	**420.8**	**304**	580	**1076**	**677**	1250	**2282**
-51	-60	**-76**	**-8.9**	16	**60.8**	**28.3**	83	**181.4**	**65.6**	150	**302.0**	**102.8**	217	**422.6**	**310**	590	**1094**	**682**	1260	**2300**
-45.6	-50	**-58.0**	**-8.3**	17	**62.6**	**28.9**	84	**183.2**	**66.1**	151	**303.8**	**103.3**	218	**424.4**	**316**	600	**1112**	**688**	1270	**2318**
-45.0	-49	**-56.2**	**-7.8**	18	**64.4**	**29.4**	85	**185.0**	**66.7**	152	**305.6**	**103.9**	219	**426.2**	**321**	610	**1130**	**693**	1280	**2336**
-44.4	-48	**-54.4**	**-7.2**	19	**66.2**	**30.0**	86	**186.8**	**67.2**	153	**307.4**	**104.4**	220	**428.0**	**327**	620	**1148**	**699**	1290	**2354**
-43.9	-47	**-52.6**	**-6.7**	20	**68.0**	**30.6**	87	**188.6**	**67.8**	154	**309.2**	**105.0**	221	**429.8**	**332**	630	**1166**	**704**	1300	**2372**
-43.3	-46	**-50.8**	**-6.1**	21	**69.8**	**31.1**	88	**190.4**	**68.3**	155	**311.0**	**105.6**	222	**431.6**	**338**	640	**1184**	**710**	1310	**2390**
-42.8	-45	**-49.0**	**-5.6**	22	**71.6**	**31.7**	89	**192.2**	**68.9**	156	**312.8**	**106.1**	223	**433.4**	**343**	650	**1202**	**716**	1320	**2408**
-42.2	-44	**-47.2**	**-5.0**	23	**73.4**	**32.2**	90	**194.0**	**69.4**	157	**314.6**	**106.7**	224	**435.2**	**349**	660	**1220**	**721**	1330	**2426**
-41.7	-43	**-45.4**	**-4.4**	24	**75.2**	**32.8**	91	**195.8**	**70.0**	158	**316.4**	**107.2**	225	**437.0**	**354**	670	**1238**	**727**	1340	**2444**
-41.1	-42	**-43.6**	**-3.9**	25	**77.0**	**33.3**	92	**197.6**	**70.6**	159	**318.2**	**107.8**	226	**438.8**	**360**	680	**1246**	**732**	1350	**2462**
-40.6	-41	**-41.8**	**-3.3**	26	**78.8**	**33.9**	93	**199.4**	**71.1**	160	**320.0**	**108.3**	227	**440.6**	**366**	690	**1274**	**738**	1360	**2480**
-40.0	-40	**-40.0**	**-2.8**	27	**80.6**	**34.4**	94	**201.2**	**71.7**	161	**321.8**	**108.9**	228	**442.4**	**371**	700	**1292**	**743**	1370	**2498**
-39.4	-39	**-38.2**	**-2.2**	28	**82.4**	**35.0**	95	**203.0**	**72.2**	162	**323.6**	**109.4**	229	**444.2**	**377**	710	**1310**	**749**	1380	**2516**
-38.9	-38	**-36.4**	**-1.7**	29	**84.2**	**35.6**	96	**204.8**	**72.8**	163	**325.4**	**110.0**	230	**446.0**	**382**	720	**1328**	**754**	1390	**2534**
-38.3	-37	**-34.6**	**-1.1**	30	**86.0**	**36.1**	97	**206.6**	**73.3**	164	**327.2**	**110.6**	231	**447.8**	**388**	730	**1346**	**760**	1400	**2552**
-37.8	-36	**-32.8**	**-0.6**	31	**87.8**	**36.7**	98	**208.4**	**73.9**	165	**329.0**	**111.1**	232	**449.6**	**393**	740	**1364**	**766**	1410	**2570**
-37.2	-35	**-31.0**	**0.0**	32	**89.6**	**37.2**	99	**210.2**	**74.4**	166	**330.8**	**111.7**	233	**451.4**	**339**	750	**1382**	**771**	1420	**2588**
-36.7	-34	**-29.2**	**0.6**	33	**91.4**	**37.8**	100	**212.0**	**75.0**	167	**332.6**	**112.2**	234	**453.2**	**404**	760	**1400**	**777**	1430	**2606**
-36.1	-33	**-27.4**	**1.1**	34	**93.2**	**38.3**	101	**213.8**	**75.6**	168	**334.4**	**112.8**	235	**455.0**	**410**	770	**1418**	**782**	1440	**2624**
-35.6	-32	**-25.6**	**1.7**	35	**95.0**	**38.9**	102	**215.6**	**76.1**	169	**336.2**	**113.3**	236	**456.8**	**416**	780	**1436**	**788**	1450	**2642**
-35.0	-31	**-23.8**	**2.2**	36	**96.8**	**39.4**	103	**217.4**	**76.7**	170	**338.0**	**113.9**	237	**458.6**	**421**	790	**1454**	**793**	1460	**2660**
-34.4	-30	**-22.0**	**2.8**	37	**98.6**	**40.0**	104	**219.2**	**77.2**	171	**339.8**	**114.4**	238	**460.4**	**427**	800	**1472**	**799**	1470	**2678**
-33.9	-29	**-20.2**	**3.3**	38	**100.4**	**40.6**	105	**221.0**	**77.8**	172	**341.6**	**115.0**	239	**462.2**	**432**	810	**1490**	**804**	1480	**2696**
-33.3	-28	**-18.4**	**3.9**	39	**102.2**	**41.1**	106	**222.8**	**78.3**	173	**343.4**	**115.6**	240	**464.0**	**438**	820	**1508**	**810**	1490	**2714**
-32.8	-27	**-16.6**	**4.4**	40	**104.0**	**41.7**	107	**224.6**	**78.9**	174	**345.2**	**116.1**	241	**465.8**	**443**	830	**1526**	**816**	1500	**2732**
-32.2	-26	**-14.8**	**5.0**	41	**105.8**	**42.2**	108	**226.4**	**79.4**	175	**347.0**	**116.7**	242	**467.6**	**449**	840	**1544**			