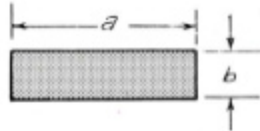


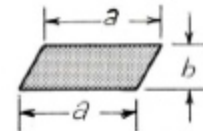


FORMULAS USEFUL IN CALCULATING WEIGHT OF CASTINGS



Rectangle and Parallelogram

Area = ab



Triangle

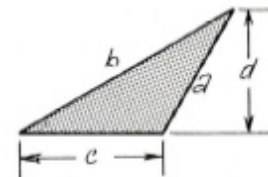
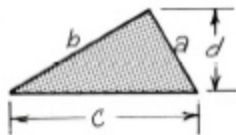
Area = $\frac{1}{2} cd$.

Area = $\sqrt{s(s-a)(s-b)(s-c)}$ when
 $s = \frac{1}{2}(a+b+c)$

Example: a = 3", b = 4", c = 5"

$$s = \frac{3" + 4" + 5"}{2} = 6"$$

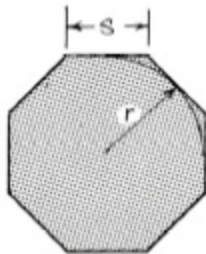
Area = $\sqrt{6(6-3)(6-4)(6-5)} = 6$ sq. in.



Regular Polygons

n = Number of sides, s = Length of one side, r = Inside radius

Area = $\frac{1}{2} nsr$



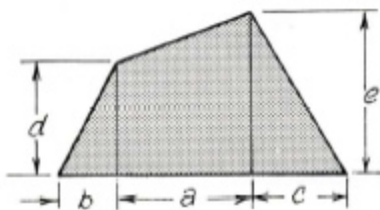
Number of Sides	Area
5	1.72047 s ² = 3.63273 r ²
6	2.59809 s ² = 3.46408 r ²
7	3.63395 s ² = 3.37099 r ²
8	4.82847 s ² = 3.31368 r ²
9	6.18181 s ² = 3.27574 r ²
10	7.69416 s ² = 3.24922 r ²
11	9.36570 s ² = 3.22987 r ²
12	11.19616 s ² = 3.21539 r ²

Trapezium

Area = $\frac{1}{2} [a(e+d) + bd + ce]$

Example: a = 10", b = 3", c = 5", d = 6", e = 8"

Area = $\frac{1}{2} [10(8+6) + (3 \times 6) + (5 \times 8)] = 99$ sq. in.

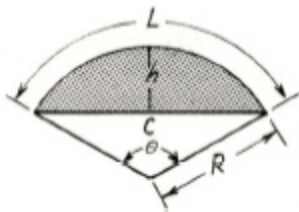




FORMULAS USEFUL IN CALCULATING WEIGHT OF CASTINGS

Segment of a Circle

$$\text{Area} = \frac{\theta}{360} R^2 - \frac{C(R-h)}{2}$$



$$\text{Area} = 3.1416 \times 5^2 \times \frac{120}{360} - \frac{8.66(5-2.5)}{2} = 15.355 \text{ sq. in.}$$

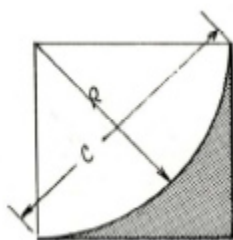
Example: $R = 5''$, $\theta = 120^\circ$, $C = 8.66''$, $h = 2.5''$
 Length of arc $L = 0.0174533 R \theta$

$$\text{Area} = \frac{1}{2} [LR - C(R-h)]$$

Example: $R = 5''$, $C = 8.66''$, $h = 2.5''$, $\theta = 120^\circ$

$$L = 0.0174533 \times 5 \times 120 = 10.472''$$

$$\text{Area} = \frac{1}{2} [(10.472 \times 5) - 8.66(5 - 2.5)] = 15.355 \text{ sq. in.}$$

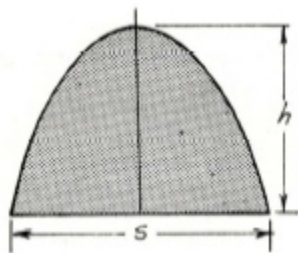


Spandrel

$$\text{Area} = 0.2146 R^2 = 0.1073 C^2$$

Example: $R = 3$

$$\text{Area} = 0.2146 \times 3^2 = 1.9314$$

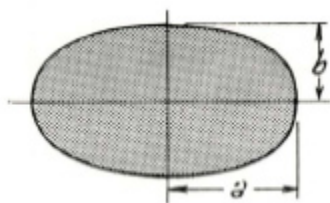


Parabolic Segment

$$\text{Area} = \frac{2}{3} sh$$

Example: $s = 3$, $h = 4$

$$\text{Area} = \frac{2}{3} \times 3 \times 4 = 8$$

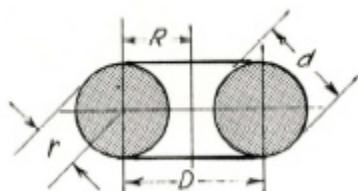


Ellipse

$$\text{Area} = \pi ab = 3.1416 ab$$

Example: $a = 3$, $b = 4$

$$\text{Area} = 3.1416 \times 3 \times 4 = 37.6992$$



Ring of Circular Cross Section

$$\text{Area of Surface} = 4\pi^2 Rr = 39.4784 Rr$$

$$\text{Area of Surface} = \pi^2 Dd = 9.8696 Dd$$

$$\text{Volume} = 2\pi^2 Rr^2 = 19.7392 Rr^2$$

$$\text{Volume} = \frac{1}{4} \pi^2 Dd^2 = 2.4674 Dd^2$$



FORMULAS USEFUL IN CALCULATING WEIGHT OF CASTINGS



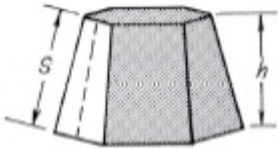
Pyramid

A = area of base

P = perimeter of base

Lateral Area = $\frac{1}{2} Ps$

Volume = $\frac{1}{3} Ah$



Frustum of a Pyramid

A = area of base

a = area of top

m = area of midsection

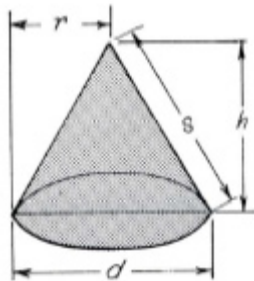
P = perimeter of base

p = perimeter of top

Lateral Area = $\frac{1}{2} s (P + p)$

Volume = $\frac{1}{3} h (a + A + \sqrt{aA})$

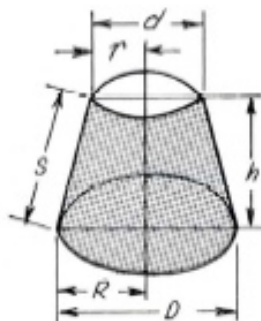
Volume = $h (A + a + 4 m)$



Cone

Volume = $\frac{1}{3} \pi r^2 h = 1.0472 r^2 h = 0.2618 d^2 h$

Conical Area = $\pi r s = \pi r \sqrt{r^2 + h^2}$



Frustum of a Cone

A = area of base

a = area of top

m = area of midsection

$R = D \div 2$; $r = d \div 2$

Area of Conical Surface = $\frac{1}{2} \pi s (D + d) = 1.5708 s (D + d)$

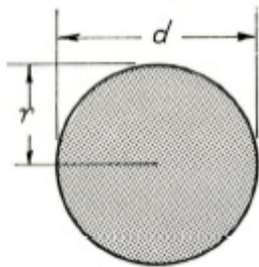
Volume = $\frac{1}{3} h (R^2 + Rr + r^2) = 1.0472 h (R^2 + Rr + r^2)$

Volume = $\frac{1}{12} h (D^2 + Dd + d^2) = 0.2618 h (D^2 + Dd + d^2)$

Volume = $\frac{1}{3} h (a + A + \sqrt{aA}) = \frac{1}{6} h (a + A + 4 m)$



FORMULAS USEFUL IN CALCULATING WEIGHT OF CASTINGS

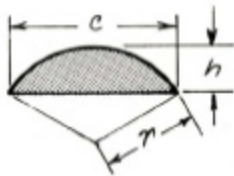


Sphere

$$\text{Surface} = 4 \pi r^2 = 12.5664 r^2 = \pi d^2$$

$$\text{Volume} = \pi r^3 = 4.1888 r^3$$

$$\text{Volume} = \pi d^3 = 0.5236 d^3$$



Segment of a Sphere

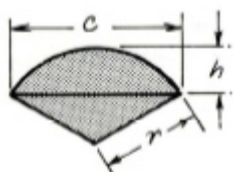
$$\text{Spherical Surface} = 2\pi rh = \frac{1}{4} \pi (c^2 + 4 h^2) = 0.7854 (c^2 + 4 h^2)$$

$$\text{Total Surface} = \frac{1}{4} \pi (c^2 + 8 rh) = 0.7854 (c^2 + 8 rh)$$

$$\text{Volume} = \frac{1}{3} \pi h^2 (3 r - h) = 1.0472 h^2 (3 r - h)$$

or

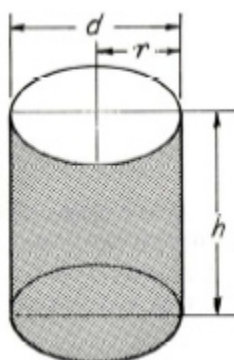
$$\text{Volume} = \pi h (3 c^2 + 4 h^2) = 0.1309 h (3 c^2 + 4 h^2)$$



Sector of a Sphere

$$\text{Total Surface} = \frac{1}{2} \pi r (4 h + c) = 1.5708 r (4 h + c)$$

$$\text{Volume} = \frac{2}{3} \pi r^2 h = 2.0944 r^2 h$$



Cylinder

$$\text{Cylindrical Surface} = \pi dh = 2 \pi rh = 6.2832 rh$$

$$\text{Total Surface} = 2 \pi r (r + h) = 6.2832 r (r + h)$$

$$\text{Volume} = \pi r^2 h = \frac{1}{4} \pi d^2 h = 0.7854 d^2 h$$



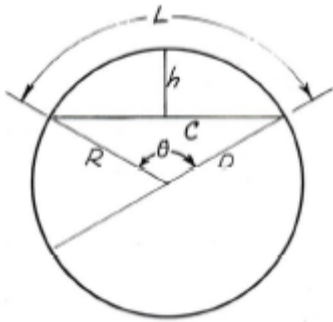
FORMULAS USEFUL IN CALCULATING WEIGHT OF CASTINGS

Circle

θ (the Greek letter Theta) = angle included between radii

π (pi) = 3.1416, D = Diameter, R = Radius, C = Chord,

h = Height of Arc, L = Length of Arc.



$$\text{Circumference} = \pi D = 2\pi R = 2\sqrt{\frac{\text{Area}}{\pi}}$$

$$\text{Diameter} = 2R = \frac{\text{Circumference}}{\pi} = 2\sqrt{\frac{\text{Area}}{\pi}}$$

$$\text{Radius} = \frac{1}{2}D = \frac{\text{Circumference}}{2\pi} = \sqrt{\frac{\text{Area}}{\pi}}$$

$$\text{Radius} = \frac{\left(\frac{C}{2}\right)^2 + h^2}{2h}$$

$$\text{Area} = \frac{1}{4}\pi D^2 = 0.7854 D^2 = \pi R^2$$

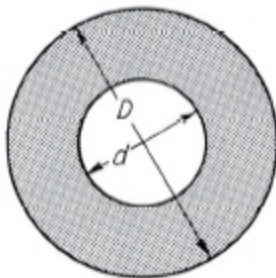
$$\text{Chord} = 2\sqrt{h(D-h)} = 2R \times \sin \frac{\theta}{2}$$

$$\text{Height of Arc, } h = R - \sqrt{R^2 - \left(\frac{C}{2}\right)^2}$$

$$\text{Length of Arc, } L = \frac{\theta}{360} \times 2\pi R = 0.0174533 R \theta$$

$$\frac{1}{2}\theta \text{ (in degrees)} = 28.6479 \frac{L}{R}$$

$$\text{Sine } \frac{1}{2}\theta = \frac{C}{2R}$$



Circle Ring

$$\text{Area} = 0.7854 (D^2 - d^2), \text{ or } 0.7854 (D-d)(D+d)$$

Example: D = 10", d = 3"

$$\text{Area} = 0.7854 (10^2 - 3^2) = 71.4714 \text{ sq. in.}$$

Sector of a Circle

$$\text{Area} = \frac{1}{2}LR$$

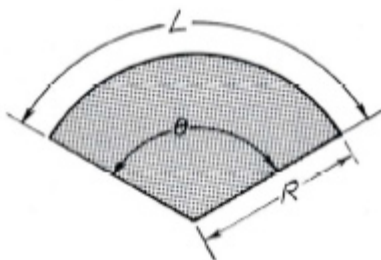
Example: L = 10.472", R = 5"

$$\text{Area} = \frac{10.472}{2} \times 5 = 26.180 \text{ sq. in.}$$

$$\text{or Area} = \frac{\theta}{360} \times \pi R^2 = 0.0087266 R^2 \theta$$

Example: R = 5", $\theta = 120^\circ$

$$\text{Area} = 3.1416 \times 5^2 \times \frac{120}{360} = 26.180 \text{ sq. in.}$$





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ENGLISH/METRIC (SI) STRESS CONVERSION FACTORS

Look up stress to be converted in the boldface column.

If in ksi (103 psi), read MPa in righthand column.

If in MPa, read ksi in lefthand column.

Conversion factors: 1 MPa = 1 MN/m² (meganewton per square metre) or 1 N/mm² (newton per square millimetre); 1 MPa = 0.1450377 ksi, and 1 ksi = 6.894759 MPa.

To convert ksi or MPa values above 400, use the supplemental table. Example: Convert 1320 MPa to ksi. Solution: 1000 MPa = 145.04 ksi (from the small table), and 320 MPa = 46.41 ksi (from the large table).

Then, 145.04 + 46.41 = 191.45 ksi.

0 to 100				
ksi	MPa	ksi	MPa	
—	0	7.25	50	344.7
0.15	1	7.40	51	351.6
0.29	2	7.54	52	358.5
0.44	3	7.69	53	365.4
0.58	4	7.83	54	372.3
0.73	5	7.98	55	379.2
0.87	6	8.12	56	386.1
1.02	7	8.27	57	393.0
1.16	8	8.41	58	399.9
1.31	9	8.56	59	406.8
1.45	10	8.70	60	413.7
1.60	11	8.85	61	420.6
1.74	12	8.99	62	427.5
1.89	13	9.14	63	434.4
2.03	14	9.28	64	441.3
2.18	15	9.43	65	448.2
2.32	16	9.57	66	455.1
2.47	17	9.72	67	462.0
2.61	18	9.86	68	468.8
2.76	19	10.01	69	475.7
2.90	20	10.15	70	482.6
3.05	21	10.30	71	489.5
3.19	22	10.44	72	496.4
3.34	23	10.59	73	503.3
3.48	24	10.73	74	510.2
3.63	25	10.88	75	517.1
3.77	26	11.02	76	524.0
3.92	27	11.17	77	530.9
4.06	28	11.31	78	537.8
4.21	29	11.46	79	544.7
4.35	30	11.60	80	551.6
4.50	31	11.75	81	558.5
4.64	32	11.89	82	565.4
4.79	33	12.04	83	572.3
4.93	34	12.18	84	579.2
5.08	35	12.33	85	586.1
5.22	36	12.47	86	593.0
5.37	37	12.62	87	599.8
5.51	38	12.76	88	606.7
5.66	39	12.91	89	613.6
5.80	40	13.05	90	620.5
5.95	41	13.20	91	627.4
6.09	42	13.34	92	634.3
6.24	43	13.49	93	641.2
6.38	44	13.63	94	648.1
6.53	45	13.78	95	655.0
6.67	46	13.92	96	661.9
6.82	47	14.07	97	668.8
6.96	48	14.21	98	675.7
7.11	49	14.36	99	682.6
7.25	50	14.50	100	689.5



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ENGLISH/METRIC (SI) STRESS CONVERSION FACTORS

100 to 200			
ksi	MPa	ksi	MPa
14.50	100	21.76	150
14.65	101	21.90	151
14.79	102	22.05	152
14.94	103	22.19	153
15.08	104	22.34	154
15.23	105	22.48	155
15.37	106	22.63	156
15.52	107	22.77	157
15.66	108	22.92	158
15.81	109	23.06	159
15.95	110	23.21	160
16.10	111	23.35	161
16.24	112	23.50	162
16.39	113	23.64	163
16.53	114	23.79	164
16.68	115	23.93	165
16.82	116	24.08	166
16.97	117	24.22	167
17.11	118	24.37	168
17.26	119	24.51	169
17.40	120	24.66	170
17.55	121	24.80	171
17.69	122	24.95	172
17.84	123	25.09	173
17.98	124	25.24	174
18.13	125	25.38	175
18.27	126	25.53	176
18.42	127	25.67	177
18.56	128	25.82	178
18.71	129	25.96	179
18.85	130	26.11	180
19.00	131	26.25	181
19.14	132	26.40	182
19.29	133	26.54	183
19.44	134	26.69	184
19.58	135	26.83	185
19.73	136	26.98	186
19.87	137	27.12	187
20.02	138	27.27	188
20.16	139	27.41	189
20.31	140	27.56	190
20.45	141	27.70	191
20.60	142	27.85	192
20.74	143	27.99	193
20.89	144	28.14	194
21.03	145	28.28	195
21.18	146	28.43	196
21.32	147	28.57	197
21.47	148	28.72	198
21.61	149	28.86	199
21.76	150	29.01	200

200 to 300			
ksi	MPa	ksi	MPa
29.01	200	36.26	250
29.15	201	36.40	251
29.30	202	36.55	252
29.44	203	36.69	253
29.59	204	36.84	254
29.73	205	36.98	255
29.88	206	37.13	256
30.02	207	37.27	257
30.17	208	37.42	258
30.31	209	37.56	259
30.46	210	37.71	260
30.60	211	37.85	261
30.75	212	38.00	262
30.89	213	38.14	263
31.04	214	38.29	264
31.18	215	38.43	265
31.33	216	38.58	266
31.47	217	38.73	267
31.62	218	38.87	268
31.76	219	39.02	269
31.91	220	39.16	270
32.05	221	39.31	271
32.20	222	39.45	272
32.34	223	39.60	273
32.49	224	39.74	274
32.63	225	39.89	275
32.78	226	40.03	276
32.92	227	40.18	277
33.07	228	40.32	278
33.21	229	40.47	279
33.36	230	40.61	280
33.50	231	40.76	281
33.65	232	40.90	282
33.79	233	41.05	283
33.94	234	41.19	284
34.08	235	41.34	285
34.23	236	41.48	286
34.37	237	41.63	287
34.52	238	41.77	288
34.66	239	41.92	289
34.81	240	42.06	290
34.95	241	42.21	291
35.10	242	42.35	292
35.24	243	42.50	293
35.39	244	42.64	294
35.53	245	42.79	295
35.68	246	42.93	296
35.82	247	43.07	297
35.97	248	43.22	298
36.11	249	43.37	299
36.26	250	43.51	300



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ENGLISH/METRIC (SI) STRESS CONVERSION FACTORS

300 to 400			
ksi		MPa	
43.51	300	2 068	
43.66	301	2 075	
43.80	302	2 082	
43.95	303	2 089	
44.09	304	2 096	
44.24	305	2 103	
44.38	306	2 110	
44.53	307	2 117	
44.67	308	2 124	
44.82	309	2 130	
44.96	310	2 137	
45.11	311	2 144	
45.25	312	2 151	
45.40	313	2 158	
45.54	314	2 165	
45.69	315	2 172	
45.83	316	2 179	
45.98	317	2 186	
46.12	318	2 193	
46.27	319	2 199	
46.41	320	2 206	
46.56	321	2 213	
46.70	322	2 220	
46.85	323	2 227	
46.99	324	2 234	
47.14	325	2 241	
47.28	326	2 248	
47.43	327	2 255	
47.57	328	2 261	
47.72	329	2 268	
47.86	330	2 275	
48.01	331	2 282	
48.15	332	2 289	
48.30	333	2 296	
48.44	334	2 303	
48.59	335	2 310	
48.73	336	2 317	
48.88	337	2 324	
49.02	338	2 330	
49.17	339	2 337	
49.31	340	2 344	
49.46	341	2 351	
49.60	342	2 358	
49.75	343	2 365	
49.89	344	2 372	
50.04	345	2 379	
50.18	346	2 386	
50.33	347	2 392	
50.47	348	2 399	
50.62	349	2 406	
50.76	350	2 413	

ksi		MPa	
50.76	350	2 413	
50.91	351	2 420	
51.05	352	2 427	
51.20	353	2 434	
51.34	354	2 441	
51.49	355	2 448	
51.63	356	2 455	
51.78	357	2 461	
51.92	358	2 468	
52.07	359	2 475	
52.21	360	2 482	
52.36	361	2 489	
52.50	362	2 496	
52.65	363	2 503	
52.79	364	2 510	
52.94	365	2 517	
53.08	366	2 523	
53.23	367	2 530	
53.37	368	2 537	
53.52	369	2 544	
53.66	370	2 551	
53.81	371	2 558	
53.95	372	2 565	
54.10	373	2 572	
54.24	374	2 579	
54.39	375	2 585	
54.53	376	2 592	
54.68	377	2 599	
54.82	378	2 606	
54.97	379	2 613	
55.11	380	2 620	
55.26	381	2 627	
55.40	382	2 634	
55.55	383	2,641	
55.69	384	2 648	
55.84	385	2 654	
55.98	386	2 661	
56.13	387	2 668	
56.27	388	2 675	
56.42	389	2 682	
56.56	390	2 689	
56.71	391	2 696	
56.85	392	2 703	
57.00	393	2 710	
57.14	394	2 717	
57.29	395	2 723	
57.43	396	2 730	
57.58	397	2 737	
57.72	398	2 744	
57.87	399	2 751	
58.02	400	2 758	

500 to 5000		
ksi		MPa
72.52	500	3447
87.02	600	4137
101.53	700	4826
116.03	800	5516
130.53	900	6205
145.04	1000	6895
290.08	2000	13 790
435.11	3000	20 684
580.15	4000	27 579
725.19	5000	34 474

Source: Anton deS. Brasunas. University of Missouri-Rolla
MID-JUNE 1979 — METAL PROGRESS



H. KRAMER & CO.

TEMPERATURE CONVERSION

read known temperatures in bold face and corresponding temperatures in degrees fahrenheit will be found in the column to the left –temperatures in celsius (centigrade) to the right

F	C	F	C	F	C			
-18.4	-28	-33.33	215.6	102	38.89	449.6	232	111.11
-14.8	-26	-32.22	219.2	104	40.00	453.2	234	112.22
-11.2	-24	-31.11	222.8	106	41.11	456.8	236	113.33
-7.6	-22	-30.00	226.4	108	42.22	460.4	238	114.44
-4.0	-20	-28.89	230.0	110	43.33	464.0	240	115.56
0.4	-18	-27.78	233.6	112	44.44	467.6	242	116.67
3.2	-16	-26.67	237.2	114	45.56	471.2	244	117.78
6.8	-14	-25.56	240.8	116	46.67	474.8	246	118.89
10.4	-12	-24.44	244.4	118	47.78	478.4	248	120.00
14.0	-10	-23.33	248.0	120	48.89	482.0	250	121.11
17.6	-8	-22.22	251.6	122	50.00	485.6	252	122.22
21.2	-6	-21.11	255.2	124	51.11	489.2	254	123.33
24.8	-4	-20.00	258.8	126	52.22	492.8	256	124.44
28.4	-2	-18.89	262.4	128	53.33	496.4	258	125.56
32.0	±0	-17.78	266.0	130	54.44	500.0	260	126.67
35.6	2	-16.67	269.6	132	55.56	503.6	262	127.78
39.2	4	-15.56	273.2	134	56.67	507.2	264	128.89
42.8	6	-14.44	276.8	136	57.78	510.8	266	130.00
46.4	8	-13.33	280.4	138	58.89	514.4	268	131.11
50.0	10	-12.22	284.0	140	60.00	518.0	270	132.22
53.6	12	-11.11	287.6	142	61.11	521.6	272	133.33
57.2	14	-10.00	291.2	144	62.22	525.2	274	134.44
60.8	16	-8.89	294.8	146	63.33	528.8	276	135.56
64.4	18	-7.78	298.4	148	64.44	532.4	278	136.67
68.0	20	-6.67	302.0	150	65.56	536.0	280	137.78
71.6	22	-5.56	305.6	152	66.67	539.6	282	138.89
75.2	24	-4.44	309.2	154	67.78	543.2	284	140.00
78.8	26	-3.33	312.8	156	68.89	546.8	286	141.11
82.4	28	-2.22	316.4	158	70.00	550.4	288	142.22
86.0	30	-1.11	320.0	160	71.11	554.0	290	143.33
89.6	32	±0.00	323.6	162	72.22	557.6	292	144.44
93.2	34	1.11	327.2	164	73.33	561.2	294	145.56
96.8	36	2.22	330.8	166	74.44	564.8	296	146.67
100.4	38	3.33	334.4	168	75.56	568.4	298	147.78
104.0	40	4.44	338.0	170	76.67	572.0	300	148.89
107.6	42	5.56	341.6	172	77.78	575.6	302	150.00
111.2	44	6.67	345.2	174	78.89	579.2	304	151.11
114.8	46	7.78	348.8	176	80.00	582.8	306	152.22
118.4	48	8.89	352.4	178	81.11	586.4	308	153.33
122.0	50	10.00	356.0	180	82.22	590.0	310	154.44
125.6	52	11.11	359.6	182	83.33	593.6	312	155.56
129.2	54	12.22	363.2	184	84.44	597.2	314	156.67
132.8	56	13.33	366.8	186	85.56	600.8	316	157.78
136.4	58	14.44	370.4	188	86.67	604.4	318	158.89
140.0	60	15.56	374.0	190	87.78	608.0	320	160.00
143.6	62	16.67	377.6	192	88.89	611.6	322	161.11
147.2	64	17.78	381.2	194	90.00	615.2	324	162.22
150.8	66	18.89	384.8	196	91.11	618.8	326	163.33
154.4	68	20.00	388.4	198	92.22	622.4	328	164.44
158.0	70	21.11	392.0	200	93.33	626.0	330	165.56
161.6	72	22.22	395.6	202	94.44	629.6	332	166.67
165.2	74	23.33	399.2	204	95.56	633.2	334	167.78
168.8	76	24.44	402.8	206	96.67	636.8	336	168.89
172.4	78	25.56	406.4	208	97.78	640.4	338	170.00
176.0	80	26.67	410.0	210	98.89	644.0	340	171.11
179.6	82	27.78	413.6	212	100.00	647.6	342	172.22
183.2	84	28.89	417.2	214	101.11	651.2	344	173.33
186.8	86	30.00	420.8	216	102.22	654.8	346	174.44
190.4	88	31.11	424.4	218	103.33	658.4	348	175.56
194.0	90	32.22	428.0	220	104.44	662.0	350	176.67
197.6	92	33.33	431.6	222	105.56	665.6	352	177.78
201.2	94	34.44	435.2	224	106.67	669.2	354	178.89
204.8	96	35.56	438.8	226	107.78	672.8	356	180.00
208.4	98	36.67	442.4	228	108.89	676.4	358	181.11
212.0	100	37.78	446.0	230	110.00	680.0	360	182.22



TEMPERATURE CONVERSION

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F	C	F	C	F	C			
683.6	362	183.33	917.6	492	255.56	1670.0	910	487.78
687.2	364	184.44	921.2	494	256.67	1688.0	920	493.33
690.8	366	185.56	924.8	496	257.78	1706.0	930	498.89
694.4	368	186.67	928.4	498	258.89	1724.0	940	504.44
698.0	370	187.78	932.0	500	260.00	1742.0	950	510.00
701.6	372	188.89	935.6	502	261.11	1760.0	960	515.56
705.2	374	190.00	939.2	504	262.22	1778.0	970	521.11
708.8	376	191.11	942.8	506	263.33	1796.0	980	526.67
712.4	378	192.22	946.4	508	264.44	1814.0	990	532.22
716.0	380	193.33	950.0	510	265.56	1832.0	1000	537.78
719.6	382	194.44	953.6	512	266.67	1850.0	1010	543.33
723.2	384	195.56	957.2	514	267.78	1868.0	1020	548.89
726.8	386	196.67	960.8	516	268.89	1886.0	1030	554.44
730.4	388	197.78	964.4	518	270.00	1904.0	1040	560.00
734.0	390	198.89	968.0	520	271.11	1922.0	1050	565.56
737.6	392	200.00	971.6	522	272.22	1940.0	1060	571.11
741.2	394	201.11	975.2	524	273.33	1958.0	1070	576.67
744.8	396	202.22	978.8	526	274.44	1976.0	1080	582.22
748.4	398	203.33	982.4	528	275.56	1994.0	1090	587.78
752.0	400	204.44	986.0	530	276.67	2012.0	1100	593.33
755.6	402	205.56	989.6	532	277.78	2030.0	1110	598.89
759.2	404	206.67	993.2	534	278.89	2048.0	1120	604.44
762.8	406	207.78	996.8	536	280.00	2066.0	1130	610.00
766.4	408	208.89	1000.4	538	281.11	2084.0	1140	615.56
770.0	410	210.00	1004.0	540	282.22	2102.0	1150	621.11
773.6	412	211.11	1007.6	542	283.33	2120.0	1160	626.67
777.2	414	212.22	1011.2	544	284.44	2138.0	1170	632.22
780.8	416	213.33	1014.8	546	285.56	2156.0	1180	637.78
784.4	418	214.44	1018.4	548	286.67	2174.0	1190	643.33
788.0	420	215.56	1022.0	550	287.78	2192.0	1200	648.89
791.6	422	216.67	1040.0	560	293.33	2210.0	1210	654.44
795.2	424	217.78	1058.0	570	298.89	2228.0	1220	660.00
798.8	426	218.89	1076.0	580	304.44	2246.0	1230	665.56
802.4	428	220.00	1094.0	590	310.00	2264.0	1240	671.11
806.0	430	221.11	1112.0	600	315.56	2282.0	1250	676.67
809.6	432	222.22	1130.0	610	321.11	2300.0	1260	682.22
813.2	434	223.33	1148.0	620	326.67	2318.0	1270	687.78
816.8	436	224.44	1166.0	630	332.22	2336.0	1280	693.33
820.4	438	225.56	1184.0	640	337.78	2354.0	1290	698.89
824.0	440	226.67	1202.0	650	343.33	2372.0	1300	704.44
827.6	442	227.78	1220.0	660	348.89	2390.0	1310	710.00
831.2	444	228.89	1238.0	670	354.44	2408.0	1320	715.56
834.8	446	230.00	1256.0	680	360.00	2426.0	1330	721.11
838.4	448	231.11	1274.0	690	365.56	2444.0	1340	726.67
842.0	450	232.22	1292.0	700	371.11	2462.0	1350	732.22
845.6	452	233.33	1310.0	710	376.67	2480.0	1360	737.78
849.2	454	234.44	1328.0	720	382.22	2498.0	1370	743.33
852.8	456	235.56	1346.0	730	387.78	2516.0	1380	748.89
856.4	458	236.67	1364.0	740	393.33	2534.0	1390	754.44
860.0	460	237.78	1382.0	750	398.89	2552.0	1400	760.00
863.6	462	238.89	1400.0	760	404.44	2570.0	1410	765.56
867.2	464	240.00	1418.0	770	410.00	2588.0	1420	771.11
870.8	466	241.11	1436.0	780	415.56	2606.0	1430	776.67
874.4	468	242.22	1454.0	790	421.11	2624.0	1440	782.22
878.0	470	243.33	1472.0	800	426.67	2642.0	1450	787.78
881.6	472	244.44	1490.0	810	432.22	2660.0	1460	793.33
885.2	474	245.56	1508.0	820	437.76	2678.0	1470	798.89
888.8	476	246.67	1526.0	830	443.33	2696.0	1480	804.44
892.4	478	247.78	1544.0	840	448.89	2714.0	1490	810.00
896.0	480	248.89	1562.0	850	454.44	2732.0	1500	815.56
899.6	482	250.00	1580.0	860	460.00	2750.0	1510	821.11
903.2	484	251.11	1598.0	870	465.56	2768.0	1520	826.67
906.8	486	252.22	1616.0	880	471.11	2786.0	1530	832.22
910.4	488	253.33	1634.0	890	476.67	2804.0	1540	837.78
914.0	490	254.44	1652.0	900	482.22	2822.0	1550	843.33



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F	C	F	C	F	C			
2840.0	1560	848.89	4010.0	2210	1210.0	5180.0	2860	1571.1
2858.0	1570	854.44	4028.0	2220	1215.6	5198.0	2870	1576.7
2876.0	1580	860.00	4046.0	2230	1221.1	5216.0	2880	1582.2
2894.0	1590	865.56	4064.0	2240	1226.7	5234.0	2890	1587.8
2912.0	1600	871.11	4082.0	2250	1232.2	5252.0	2900	1593.3
2930.0	1610	876.67	4100.0	2260	1237.8	5270.0	2910	1598.9
2948.0	1620	882.22	4118.0	2270	1243.3	5288.0	2920	1604.4
2966.0	1630	887.78	4136.0	2280	1248.9	5306.0	2930	1610.0
2984.0	1640	893.33	4154.0	2290	1254.4	5324.0	2940	1615.6
3002.0	1650	898.89	4172.0	2300	1260.0	5342.0	2950	1621.1
3020.0	1660	904.44	4190.0	2310	1265.6	5360.0	2960	1626.7
3038.0	1670	910.00	4208.0	2320	1271.1	5378.0	2970	1632.2
3056.0	1680	915.56	4226.0	2330	1276.7	5396.0	2980	1637.8
3074.0	1690	921.11	4244.0	2340	1282.2	5414.0	2990	1643.3
3092.0	1700	926.67	4262.0	2350	1287.8	5432.0	3000	1648.9
3110.0	1710	932.22	4280.0	2360	1293.3	5450.0	3010	1654.4
3128.0	1720	937.78	4298.0	2370	1298.9	5468.0	3020	1660.0
3146.0	1730	943.33	4316.0	2380	1304.4	5486.0	3030	1665.6
3164.0	1740	948.89	4334.0	2390	1310.0	5504.0	3040	1671.1
3182.0	1750	954.44	4352.0	2400	1315.6	5522.0	3050	1676.7
3200.0	1760	960.00	4370.0	2410	1321.1	5540.0	3060	1682.2
3218.0	1770	965.56	4388.0	2420	1326.7	5558.0	3070	1687.8
3236.0	1780	971.11	4406.0	2430	1332.2	5576.0	3080	1693.3
3254.0	1790	976.67	4424.0	2440	1337.8	5594.0	3090	1698.9
3272.0	1800	982.22	4442.0	2450	1343.3	5612.0	3100	1704.4
3290.0	1810	987.78	4460.0	2460	1348.9	5702.0	3150	1732.2
3308.0	1820	993.33	4478.0	2470	1354.4	5792.0	3200	1760.0
3326.0	1830	998.89	4496.0	2480	1360.0	5882.0	3250	1787.7
3344.0	1840	1004.4	4514.0	2490	1365.6	5972.0	3300	1815.5
3362.0	1850	1010.0	4532.0	2500	1371.1	6062.0	3350	1843.3
3380.0	1860	1015.6	4550.0	2510	1376.7	6152.0	3400	1871.1
3398.0	1870	1021.1	4568.0	2520	1382.2	6242.0	3450	1898.8
3416.0	1880	1026.7	4586.0	2530	1387.8	6332.0	3500	1926.6
3434.0	1890	1032.2	4604.0	2540	1393.3	6422.0	3550	1954.4
3452.0	1900	1037.8	4622.0	2550	1398.9	6512.0	3600	1982.2
3470.0	1910	1043.3	4640.0	2560	1404.4	6602.0	3650	2010.0
3488.0	1920	1048.9	4658.0	2570	1410.0	6692.0	3700	2037.7
3506.0	1930	1054.4	4676.0	2580	1415.6	6782.0	3750	2065.5
3524.0	1940	1060.0	4694.0	2590	1421.1	6872.0	3800	2093.3
3542.0	1950	1065.6	4712.0	2600	1426.7	6962.0	3850	2121.1
3560.0	1960	1071.1	4730.0	2610	1432.2	7052.0	3900	2148.8
3578.0	1970	1076.7	4748.0	2620	1437.8	7142.0	3950	2176.6
3596.0	1980	1082.2	4766.0	2630	1443.3	7232.0	4000	2204.4
3614.0	1990	1087.8	4784.0	2640	1448.9	7322.0	4050	2232.2
3632.0	2000	1093.3	4802.0	2650	1454.4	7412.0	4100	2260.0
3650.0	2010	1098.9	4820.0	2660	1460.0	7502.0	4150	2287.7
3668.0	2020	1104.4	4838.0	2670	1465.6	7592.0	4200	2315.5
3686.0	2030	1110.0	4856.0	2680	1471.1	7682.0	4250	2343.3
3704.0	2040	1115.6	4874.0	2690	1476.7	7772.0	4300	2371.1
3722.0	2050	1121.1	4892.0	2700	1482.2	7862.0	4350	2398.8
3740.0	2060	1126.7	4910.0	2710	1487.8	7952.0	4400	2426.6
3758.0	2070	1132.2	4928.0	2720	1493.3	8042.0	4450	2454.4
3776.0	2080	1137.8	4946.0	2730	1498.9	8132.0	4500	2482.2
3794.0	2090	1143.3	4964.0	2740	1504.4	8222.0	4550	2510.0
3812.0	2100	1148.9	4982.0	2750	1510.0	8312.0	4600	2537.7
3830.0	2110	1154.4	5000.0	2760	1515.6	8402.0	4650	2565.5
3848.0	2120	1160.0	5018.0	2770	1521.1	8492.0	4700	2593.3
3866.0	2130	1165.6	5036.0	2780	1526.7	8582.0	4750	2621.1
3884.0	2140	1171.1	5054.0	2790	1532.2	8672.0	4800	2648.8
3902.0	2150	1176.7	5072.0	2800	1537.8	8762.0	4850	2676.6
3920.0	2160	1182.2	5090.0	2810	1543.3	8852.0	4900	2704.4
3938.0	2170	1187.8	5108.0	2820	1548.9	8942.0	4950	2732.2
3956.0	2180	1193.3	5126.0	2830	1554.4	9032.0	5000	2760.0
3974.0	2190	1198.9	5144.0	2840	1560.0	9122.0	5050	2787.7
3992.0	2200	1204.4	5162.0	2850	1565.6	9212.0	5100	2815.5