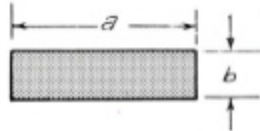


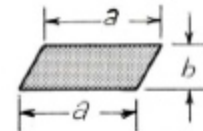


# FORMULAS USEFUL IN CALCULATING WEIGHT OF CASTINGS



## Rectangle and Parallelogram

Area = ab



## Triangle

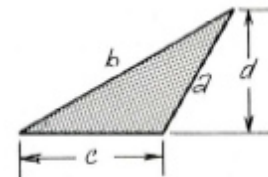
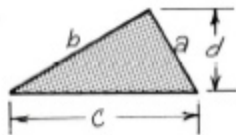
Area = 1/2 cd.

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

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

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

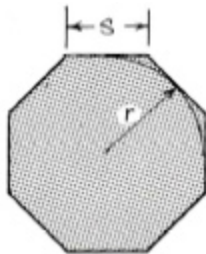
Area =  $\sqrt{6(6-3)(6-4)(6-5)} = 6$  sq. in.



## Regular Polygons

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

Area = 1/2 nsr



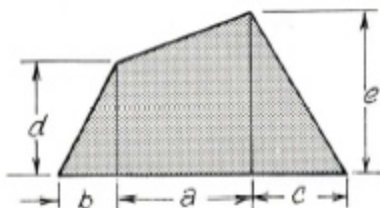
Number of Sides	Area
5	1.72047 s <sup>2</sup> = 3.63273 r <sup>2</sup>
6	2.59809 s <sup>2</sup> = 3.46408 r <sup>2</sup>
7	3.63395 s <sup>2</sup> = 3.37099 r <sup>2</sup>
8	4.82847 s <sup>2</sup> = 3.31368 r <sup>2</sup>
9	6.18181 s <sup>2</sup> = 3.27574 r <sup>2</sup>
10	7.69416 s <sup>2</sup> = 3.24922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

## Trapezium

Area = 1/2 [a(e+d) + bd + ce]

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

Area = 1/2 [10(8+6) + (3 × 6) + (5 × 8)] = 99 sq. in.

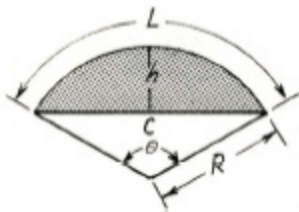




# FORMULAS USEFUL IN CALCULATING WEIGHT OF CASTINGS

## Segment of a Circle

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



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

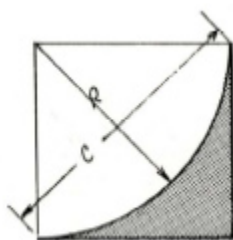
Example:  $R = 5''$ ,  $\theta = 120^\circ$ ,  $C = 8.66''$ ,  $h = 2.5''$   
 Length of arc  $L = 0.0174533 R \theta$

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

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

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

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

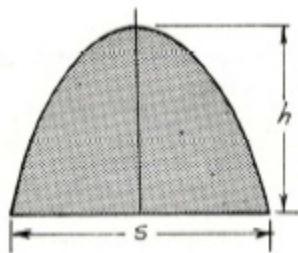


## Spandrel

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

Example:  $R = 3$

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

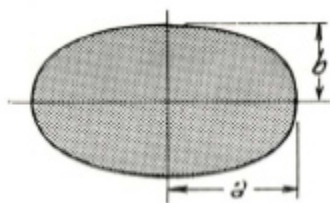


## Parabolic Segment

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

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

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

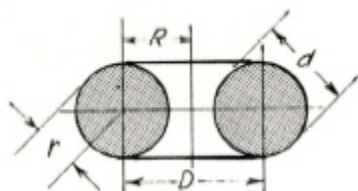


## Ellipse

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

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



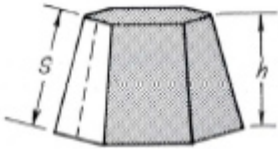
## Pyramid

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

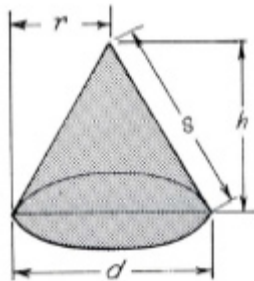
P = perimeter of base

p = perimeter of top

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

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

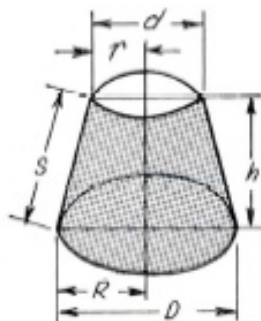
Volume =  $h (A + a + 4 m)$



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

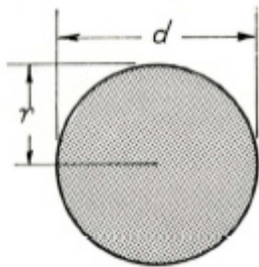
Volume =  $\frac{1}{12} h (D^2 + Dd + d^2) = 0.2618 h (D^2 + Dd + d^2)$

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



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## FORMULAS USEFUL IN CALCULATING WEIGHT OF CASTINGS

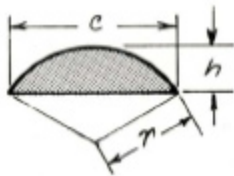


### Sphere

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

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

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



### Segment of a Sphere

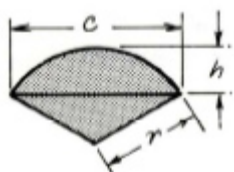
$$\text{Spherical Surface} = 2 \pi r h = \frac{1}{4} \pi (c^2 + 4 h^2) = 0.7854 (c^2 + 4 h^2)$$

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

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

or

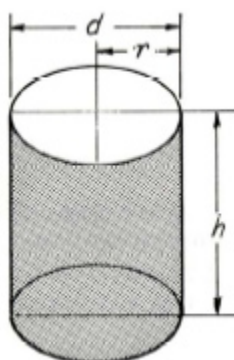
$$\text{Volume} = \pi h (3 c^2 + 4 h^2) = 0.1309 h (3 c^2 + 4 h^2)$$



### 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

$$\text{Cylindrical Surface} = \pi d h = 2 \pi r h = 6.2832 r h$$

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

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



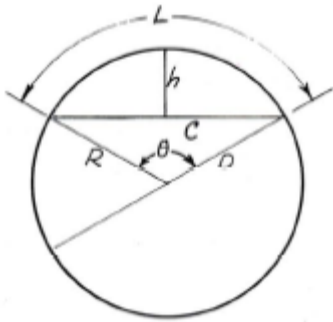
# FORMULAS USEFUL IN CALCULATING WEIGHT OF CASTINGS

## Circle

$\theta$  (the Greek letter Theta) = angle included between radii

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

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



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

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

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

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

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

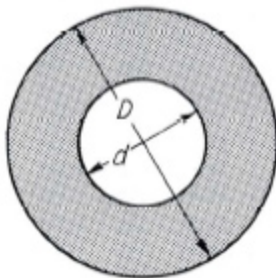
$$\text{Chord} = 2\sqrt{h(D-h)} = 2R \times \sin \frac{\theta}{2}$$

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

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

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

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



## 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

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

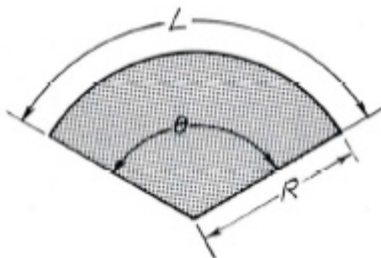
Example: L = 10.472", R = 5"

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

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

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



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## ENGLISH/METRIC (SI) STRESS CONVERSION FACTORS

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

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



H. KRAMER & CO.

## ENGLISH/METRIC (SI) STRESS CONVERSION FACTORS

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

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

500 to 5000		
ksi		MPa
72.52	<b>500</b>	3447
87.02	<b>600</b>	4137
101.53	<b>700</b>	4826
116.03	<b>800</b>	5516
130.53	<b>900</b>	6205
145.04	<b>1000</b>	6895
290.08	<b>2000</b>	13 790
435.11	<b>3000</b>	20 684
580.15	<b>4000</b>	27 579
725.19	<b>5000</b>	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			
683.6	<b>362</b>	183.33	917.6	<b>492</b>	255.56	1670.0	<b>910</b>	487.78
687.2	<b>364</b>	184.44	921.2	<b>494</b>	256.67	1688.0	<b>920</b>	493.33
690.8	<b>366</b>	185.56	924.8	<b>496</b>	257.78	1706.0	<b>930</b>	498.89
694.4	<b>368</b>	186.67	928.4	<b>498</b>	258.89	1724.0	<b>940</b>	504.44
698.0	<b>370</b>	187.78	932.0	<b>500</b>	260.00	1742.0	<b>950</b>	510.00
701.6	<b>372</b>	188.89	935.6	<b>502</b>	261.11	1760.0	<b>960</b>	515.56
705.2	<b>374</b>	190.00	939.2	<b>504</b>	262.22	1778.0	<b>970</b>	521.11
708.8	<b>376</b>	191.11	942.8	<b>506</b>	263.33	1796.0	<b>980</b>	526.67
712.4	<b>378</b>	192.22	946.4	<b>508</b>	264.44	1814.0	<b>990</b>	532.22
716.0	<b>380</b>	193.33	950.0	<b>510</b>	265.56	1832.0	<b>1000</b>	537.78
719.6	<b>382</b>	194.44	953.6	<b>512</b>	266.67	1850.0	<b>1010</b>	543.33
723.2	<b>384</b>	195.56	957.2	<b>514</b>	267.78	1868.0	<b>1020</b>	548.89
726.8	<b>386</b>	196.67	960.8	<b>516</b>	268.89	1886.0	<b>1030</b>	554.44
730.4	<b>388</b>	197.78	964.4	<b>518</b>	270.00	1904.0	<b>1040</b>	560.00
734.0	<b>390</b>	198.89	968.0	<b>520</b>	271.11	1922.0	<b>1050</b>	565.56
737.6	<b>392</b>	200.00	971.6	<b>522</b>	272.22	1940.0	<b>1060</b>	571.11
741.2	<b>394</b>	201.11	975.2	<b>524</b>	273.33	1958.0	<b>1070</b>	576.67
744.8	<b>396</b>	202.22	978.8	<b>526</b>	274.44	1976.0	<b>1080</b>	582.22
748.4	<b>398</b>	203.33	982.4	<b>528</b>	275.56	1994.0	<b>1090</b>	587.78
752.0	<b>400</b>	204.44	986.0	<b>530</b>	276.67	2012.0	<b>1100</b>	593.33
755.6	<b>402</b>	205.56	989.6	<b>532</b>	277.78	2030.0	<b>1110</b>	598.89
759.2	<b>404</b>	206.67	993.2	<b>534</b>	278.89	2048.0	<b>1120</b>	604.44
762.8	<b>406</b>	207.78	996.8	<b>536</b>	280.00	2066.0	<b>1130</b>	610.00
766.4	<b>408</b>	208.89	1000.4	<b>538</b>	281.11	2084.0	<b>1140</b>	615.56
770.0	<b>410</b>	210.00	1004.0	<b>540</b>	282.22	2102.0	<b>1150</b>	621.11
773.6	<b>412</b>	211.11	1007.6	<b>542</b>	283.33	2120.0	<b>1160</b>	626.67
777.2	<b>414</b>	212.22	1011.2	<b>544</b>	284.44	2138.0	<b>1170</b>	632.22
780.8	<b>416</b>	213.33	1014.8	<b>546</b>	285.56	2156.0	<b>1180</b>	637.78
784.4	<b>418</b>	214.44	1018.4	<b>548</b>	286.67	2174.0	<b>1190</b>	643.33
788.0	<b>420</b>	215.56	1022.0	<b>550</b>	287.78	2192.0	<b>1200</b>	648.89
791.6	<b>422</b>	216.67	1040.0	<b>560</b>	293.33	2210.0	<b>1210</b>	654.44
795.2	<b>424</b>	217.78	1058.0	<b>570</b>	298.89	2228.0	<b>1220</b>	660.00
798.8	<b>426</b>	218.89	1076.0	<b>580</b>	304.44	2246.0	<b>1230</b>	665.56
802.4	<b>428</b>	220.00	1094.0	<b>590</b>	310.00	2264.0	<b>1240</b>	671.11
806.0	<b>430</b>	221.11	1112.0	<b>600</b>	315.56	2282.0	<b>1250</b>	676.67
809.6	<b>432</b>	222.22	1130.0	<b>610</b>	321.11	2300.0	<b>1260</b>	682.22
813.2	<b>434</b>	223.33	1148.0	<b>620</b>	326.67	2318.0	<b>1270</b>	687.78
816.8	<b>436</b>	224.44	1166.0	<b>630</b>	332.22	2336.0	<b>1280</b>	693.33
820.4	<b>438</b>	225.56	1184.0	<b>640</b>	337.78	2354.0	<b>1290</b>	698.89
824.0	<b>440</b>	226.67	1202.0	<b>650</b>	343.33	2372.0	<b>1300</b>	704.44
827.6	<b>442</b>	227.78	1220.0	<b>660</b>	348.89	2390.0	<b>1310</b>	710.00
831.2	<b>444</b>	228.89	1238.0	<b>670</b>	354.44	2408.0	<b>1320</b>	715.56
834.8	<b>446</b>	230.00	1256.0	<b>680</b>	360.00	2426.0	<b>1330</b>	721.11
838.4	<b>448</b>	231.11	1274.0	<b>690</b>	365.56	2444.0	<b>1340</b>	726.67
842.0	<b>450</b>	232.22	1292.0	<b>700</b>	371.11	2462.0	<b>1350</b>	732.22
845.6	<b>452</b>	233.33	1310.0	<b>710</b>	376.67	2480.0	<b>1360</b>	737.78
849.2	<b>454</b>	234.44	1328.0	<b>720</b>	382.22	2498.0	<b>1370</b>	743.33
852.8	<b>456</b>	235.56	1346.0	<b>730</b>	387.78	2516.0	<b>1380</b>	748.89
856.4	<b>458</b>	236.67	1364.0	<b>740</b>	393.33	2534.0	<b>1390</b>	754.44
860.0	<b>460</b>	237.78	1382.0	<b>750</b>	398.89	2552.0	<b>1400</b>	760.00
863.6	<b>462</b>	238.89	1400.0	<b>760</b>	404.44	2570.0	<b>1410</b>	765.56
867.2	<b>464</b>	240.00	1418.0	<b>770</b>	410.00	2588.0	<b>1420</b>	771.11
870.8	<b>466</b>	241.11	1436.0	<b>780</b>	415.56	2606.0	<b>1430</b>	776.67
874.4	<b>468</b>	242.22	1454.0	<b>790</b>	421.11	2624.0	<b>1440</b>	782.22
878.0	<b>470</b>	243.33	1472.0	<b>800</b>	426.67	2642.0	<b>1450</b>	787.78
881.6	<b>472</b>	244.44	1490.0	<b>810</b>	432.22	2660.0	<b>1460</b>	793.33
885.2	<b>474</b>	245.56	1508.0	<b>820</b>	437.76	2678.0	<b>1470</b>	798.89
888.8	<b>476</b>	246.67	1526.0	<b>830</b>	443.33	2696.0	<b>1480</b>	804.44
892.4	<b>478</b>	247.78	1544.0	<b>840</b>	448.89	2714.0	<b>1490</b>	810.00
896.0	<b>480</b>	248.89	1562.0	<b>850</b>	454.44	2732.0	<b>1500</b>	815.56
899.6	<b>482</b>	250.00	1580.0	<b>860</b>	460.00	2750.0	<b>1510</b>	821.11
903.2	<b>484</b>	251.11	1598.0	<b>870</b>	465.56	2768.0	<b>1520</b>	826.67
906.8	<b>486</b>	252.22	1616.0	<b>880</b>	471.11	2786.0	<b>1530</b>	832.22
910.4	<b>488</b>	253.33	1634.0	<b>890</b>	476.67	2804.0	<b>1540</b>	837.78
914.0	<b>490</b>	254.44	1652.0	<b>900</b>	482.22	2822.0	<b>1550</b>	843.33



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