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JAPANESE INDUSTRIAL STANDARD

**Sprocket Tooth Form for
Transmission Roller Chains**

JIS B 1802—1989

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**In the event of any doubt arising,
the original Standard in Japanese is to be final authority.**

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J I S

Sprocket Tooth Form for Transmission
Roller Chains

B 1802-1989

1. Scope

This Japanese Industrial Standard specifies the tooth profiles and dimensions of sprockets for transmission roller chains specified in JIS B 1801 (hereafter referred to as the "sprockets").

Remark: Informative Reference No. 1 attached to this Standard provides the dimensional tolerances and allowable values for individual parts of sprockets, Informative Reference No. 2 the measuring methods, Informative Reference No. 3 the designation of products, Informative Reference No. 4 the types of sprockets for general use, and Informative Reference No. 5 the drawing practice for sprockets.

2. Shapes and Dimensions

2.1 Basic Dimensions The basic dimensions of the sprockets, i.e. the pitch circle diameter, outside diameter, root circle diameter, bottom distance, maximum boss diameter, and maximum space diameter (in the case of two or more rows) shall be obtained as specified in Table 1.

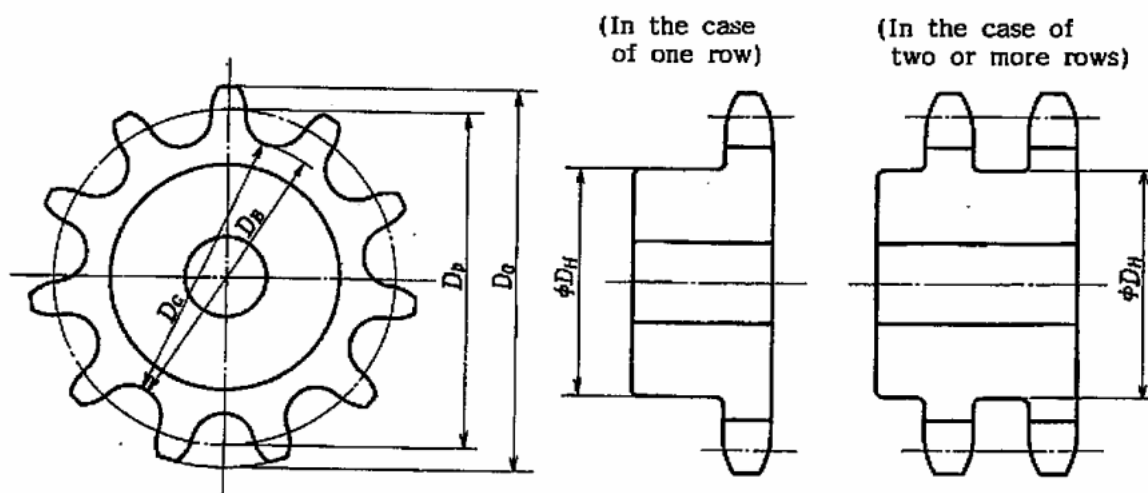
The numerical values for roller chain sprockets of unit pitch (pitch 1) to be used for calculating the basic dimensions are shown in Attached Table 1, and the basic dimensions of sprockets based thereon are shown in Attached Table 2.

Remark: The sprocket number shall be identical with that of the engaging transmission roller chain (specified in JIS B 1801).

Applicable Standard:

JIS B 1801-Transmission Roller Chains

Table 1. Basic Dimensions of Sprockets



Unit: mm

Item	Calculation formula
Pitch circle diameter (D_p)	$D_p = \frac{p}{\sin \frac{180^\circ}{N}}$
Outside diameter (D_o)	$D_o = p \left(0.6 + \cot \frac{180^\circ}{N} \right)$
Root circle diameter (D_B)	$D_B = D_p - d_1$
Bottom distance (D_c)	$D_c = D_B \quad \text{(Even-numbered teeth)}$ $D_c = D_p \cos \frac{90^\circ}{N} - d_1 \quad \text{(Odd-numbered teeth)}$ $= p \cdot \frac{1}{2 \sin \frac{180^\circ}{2N}} - d_1$
Maximum boss diameter and maximum space diameter (D_H)	$D_H = p \left(\cot \frac{180^\circ}{N} - 1 \right) - 0.76$

where, p : pitch of roller chain

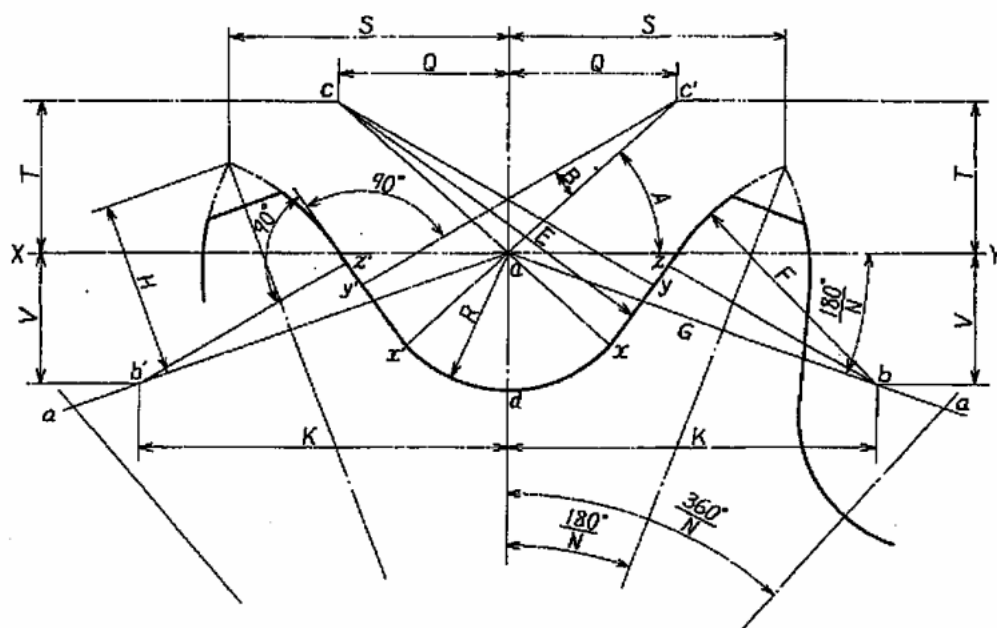
d_1 : outside diameter of roller chain roller

N : number of teeth

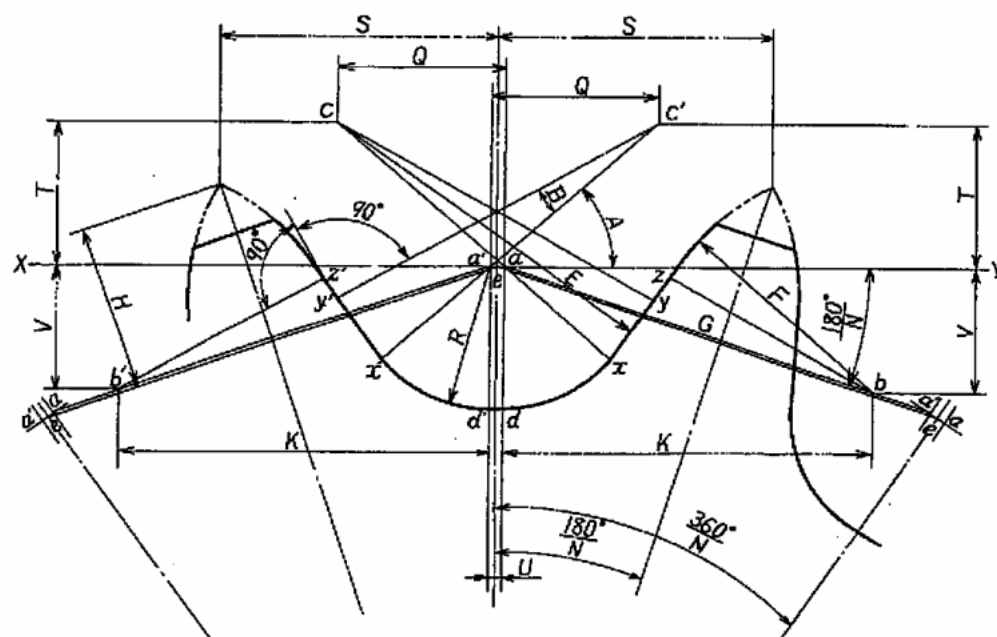
2.2 Tooth Profile The basic tooth profiles of sprockets shall be classified into two types S and U, as shown in Fig. 1.

Figure. Tooth Profile

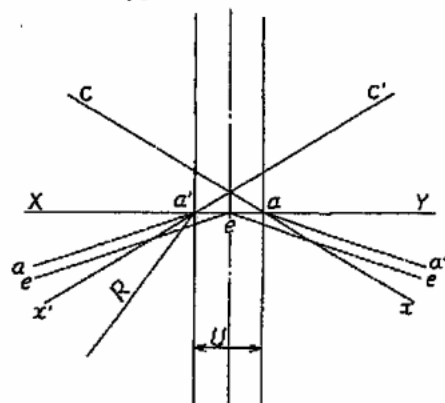
Type S Tooth Profile



Type U Tooth Profile



Enlarged View of Point e in Type U Tooth Profile



Unit: mm

Diameter of bottom arc $D_s^{(1)} = 1.005 d_1 + 0.076$

$$R = \frac{D_s}{2} = 0.5025 d_1 + 0.038$$

$U^{(1)} = 0.07(p - d_1) + 0.051$ For Type S tooth profile, $U = 0$

$$A = 35^\circ + \frac{60^\circ}{N}$$

$$B = 18^\circ - \frac{56^\circ}{N}$$

$$ac = 0.8 d_1$$

$$Q = 0.8 d_1 \cos\left(35^\circ + \frac{60^\circ}{N}\right)$$

$$T = 0.8 d_1 \sin\left(35^\circ + \frac{60^\circ}{N}\right)$$

$$E = cy = 1.3025 d_1 + 0.038$$

$$\overline{xy} = (2.605 d_1 + 0.076) \sin\left(9^\circ - \frac{28^\circ}{N}\right)$$

$$yz = d_1 \left[1.4 \sin\left(17^\circ - \frac{64^\circ}{N}\right) - 0.8 \sin\left(18^\circ - \frac{56^\circ}{N}\right) \right]$$

$G = ab = 1.4 d_1$ Point b is on the straight line, which is drawn from point a on line XY including an angle of $\frac{180^\circ}{N}$ to line XY .

$$K = 1.4 d_1 \cos \frac{180^\circ}{N}$$

$$V = 1.4 d_1 \sin \frac{180^\circ}{N}$$

$$F = d_1 \left[0.8 \cos\left(18^\circ - \frac{56^\circ}{N}\right) + 1.4 \cos\left(17^\circ - \frac{64^\circ}{N}\right) - 1.3025 \right] - 0.038$$

Tooth profile pitch ($a-a$ in Type S tooth profile,
or $e-e$ in Type U tooth profile) $= p_a = p \left(1 + \frac{D_s - d_1}{D_p} \right)$

$$H = \sqrt{F^2 - \left(1.4 d_1 - \frac{p_a}{2} + \frac{U}{2} \cos \frac{180^\circ}{N} \right)^2} + \frac{U}{2} \sin \frac{180^\circ}{N} \quad \text{For Type S tooth profile, } U = 0$$

$$S = \frac{p_a}{2} \cos \frac{180^\circ}{N} + H \sin \frac{180^\circ}{N}$$

Outside diameter when the tooth tip is sharp⁽²⁾ $= p_a \cot \frac{180^\circ}{N} + 2H$

$$\text{Maximum pressure angle} = xab = 35^\circ - \frac{120^\circ}{N}$$

$$\text{Minimum pressure angle} = xab - B = 17^\circ - \frac{64^\circ}{N}$$

$$\text{Mean pressure angle} = 26^\circ - \frac{92^\circ}{N}$$

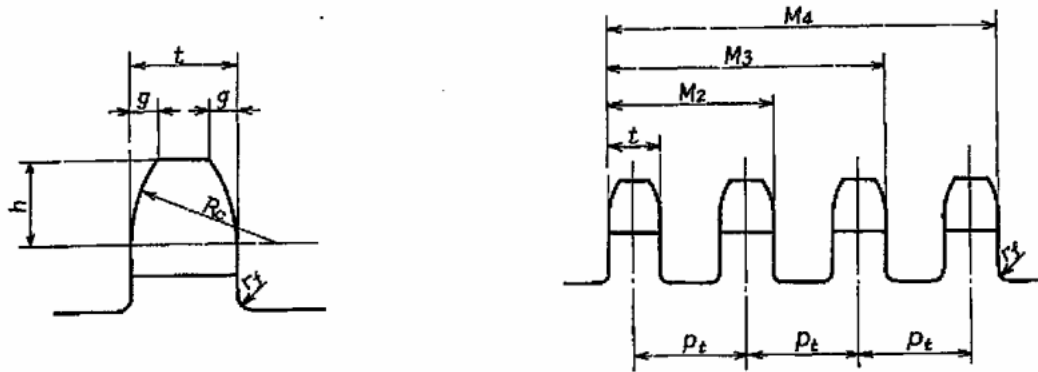
Notes (1) The dimensions D_s and U may be increased by up to $0.003d_1 + 0.127$ from the values obtained from the above formulas.

(2) This is the outside diameter obtained by drawing, and the diameter of the product is generally D_0 given in Table 1.

2.3 Lateral Tooth Profile The shapes and dimensions of lateral tooth profiles of sprockets shall conform to Table 2.

Remark: The lateral tooth profile means the shape of the section of a tooth cut by a plane including the sprocket axis.

Table 2. Lateral Tooth Profile



Unit: mm

Designation	Lateral tooth profile							Lateral pitch p_t	Applicable roller chain (for reference)		
	Chamfer width g (approx.)	Chamfer depth h (approx.)	Chamfer radius ⁽³⁾ R_c (min.)	Roundness ⁽⁴⁾ r_f (max.)	Face width t (max.)				Pitch p	Roller outside diameter d_1 (max.)	Roller link inside width b_1 (min.)
					Single row	2 or 3 rows	4 or more rows				
25	0.8	3.2	6.8	0.3	2.8	2.7	2.4	6.4	6.35	3.30 ⁽⁵⁾	3.10
35	1.2	4.8	10.1	0.4	4.3	4.1	3.8	10.1	9.525	5.08 ⁽⁵⁾	4.68
41 ⁽⁶⁾	1.6	6.4	13.5	0.5	5.8	—	—	—	12.70	7.77	6.25
40	1.6	6.4	13.5	0.5	7.2	7.0	6.5	14.4	12.70	7.95	7.85
50	2.0	7.9	16.9	0.6	8.7	8.4	7.9	18.1	15.875	10.16	9.40
60	2.4	9.5	20.3	0.8	11.7	11.3	10.6	22.8	19.05	11.91	12.57
80	3.2	12.7	27.0	1.0	14.6	14.1	13.3	29.3	25.40	15.88	15.75
100	4.0	15.9	33.8	1.3	17.6	17.0	16.1	35.8	31.75	19.05	18.90
120	4.8	19.0	40.5	1.5	23.5	22.7	21.5	45.4	38.10	22.23	25.22
140	5.6	22.2	47.3	1.8	23.5	22.7	21.5	48.9	44.45	25.40	25.22
160	6.4	25.4	54.0	2.0	29.4	28.4	27.0	58.5	50.80	28.58	31.55
200	7.9	31.8	67.5	2.5	35.3	34.1	32.5	71.6	63.50	39.68	37.85
240	9.5	38.1	81.0	3.0	44.1	42.7	40.7	87.8	76.20	47.63	47.35

Notes (3) For R_c , the minimum value given in the table is generally used, but the value may be infinitely large beyond this minimum and, in that case, the arc becomes a straight line.

(4) r_f (max.) is the value obtained by using the maximum value of boss diameter and space diameter D_H .

(5) d_1 in this case shows the bush outside diameter.

(6) Number 41 is applicable only to single row sprockets.

Remark: Total face width is

$$M_2, M_3, M_4, \dots, M_n = p_t(n-1) + t. \quad n: \text{number of rows}$$

Attached Table 1. Values of Pitch Circle Diameter, Bottom Distance
Coefficient $\left(= \frac{1}{2 \sin \frac{180^\circ}{2N}} \right)$ and $\cot \frac{180^\circ}{N}$ for Roller
Chain Sprockets of Unit Pitch (Pitch 1)

Number of teeth N	Pitch circle diameter of unit pitch D_p	Bottom distance coefficient	$\cot \frac{180^\circ}{N}$	Number of teeth N	Pitch circle diameter of unit pitch D_p	Bottom distance coefficient	$\cot \frac{180^\circ}{N}$
11	3.549 5	3.513 3	3.406	66	21.016 4	—	20.993
12	3.863 7	—	3.732	67	21.334 6	21.328 7	21.311
13	4.178 6	4.148 1	4.057	68	21.652 8	—	21.630
14	4.494 0	—	4.381	69	21.971 0	21.965 3	21.948
15	4.809 7	4.783 4	4.705	70	22.289 2	—	22.267
16	5.125 8	—	5.027	71	22.607 4	22.601 8	22.585
17	5.442 2	5.419 0	5.350	72	22.925 6	—	22.904
18	5.758 8	—	5.671	73	23.243 8	23.238 4	23.222
19	6.075 5	6.054 8	5.993	74	23.562 0	—	23.541
20	6.392 5	—	6.314	75	23.880 2	23.875 0	23.859
21	6.709 5	6.690 7	6.635	76	24.198 4	—	24.178
22	7.026 7	—	6.955	77	24.516 7	24.511 6	24.496
23	7.343 9	7.326 8	7.276	78	24.834 9	—	24.815
24	7.661 3	—	7.596	79	25.153 1	25.148 1	25.133
25	7.978 7	7.963 0	7.916	80	25.471 3	—	25.452
26	8.296 2	—	8.236	81	25.789 6	25.784 7	25.770
27	8.613 8	8.599 2	8.556	82	26.107 8	—	26.089
28	8.931 4	—	8.875	83	26.426 1	26.421 3	26.407
29	9.249 1	9.235 5	9.195	84	26.744 3	—	26.726
30	9.566 8	—	9.514	85	27.062 5	27.058 0	27.044
31	9.884 5	9.871 8	9.834	86	27.380 7	—	27.362
32	10.202 3	—	10.153	87	27.699 0	27.694 5	27.681
33	10.520 1	10.508 2	10.472	88	28.017 2	—	27.999
34	10.838 0	—	10.792	89	28.335 5	28.331 0	28.318
35	11.155 8	11.144 6	11.111	90	28.653 7	—	28.636
36	11.473 7	—	11.430	91	28.972 0	28.967 6	28.955
37	11.791 6	11.781 0	11.749	92	29.290 2	—	29.273
38	12.109 6	—	12.068	93	29.608 5	29.604 2	29.592
39	12.427 5	12.417 4	12.387	94	29.926 7	—	29.910
40	12.745 5	—	12.706	95	30.244 9	30.240 8	30.228
41	13.063 5	13.053 9	13.025	96	30.563 2	—	30.547
42	13.381 5	—	13.344	97	30.881 5	30.877 4	30.865
43	13.699 5	13.690 4	13.663	98	31.199 7	—	31.184
44	14.017 5	—	13.982	99	31.518 0	31.514 0	31.502
45	14.335 6	14.326 9	14.301	100	31.836 2	—	31.821
46	14.653 6	—	14.619	101	32.154 5	32.150 6	32.139
47	14.971 7	14.963 4	14.938	102	32.472 7	—	32.457
48	15.289 8	—	15.257	103	32.791 0	32.787 2	32.776
49	15.607 9	15.599 9	15.576	104	33.109 3	—	33.094
50	15.926 0	—	15.895	105	33.427 5	33.423 8	33.413
51	16.244 1	16.236 4	16.213	106	33.745 8	—	33.731
52	16.562 2	—	16.532	107	34.064 1	34.060 4	34.049
53	16.880 3	16.872 9	16.851	108	34.382 3	—	34.368
54	17.198 4	—	17.169	109	34.700 6	34.697 0	34.686
55	17.516 6	17.509 4	17.488	110	35.018 8	—	35.005
56	17.834 7	—	17.807	111	35.337 1	35.333 6	35.323
57	18.152 9	18.146 0	18.125	112	35.655 4	—	35.641
58	18.471 0	—	18.444	113	35.973 7	35.970 2	35.960
59	18.789 2	18.782 5	18.763	114	36.291 9	—	36.278
60	19.107 3	—	19.081	115	36.610 2	36.606 8	36.597
61	19.425 5	19.419 0	19.400	116	36.928 5	—	36.915
62	19.743 7	—	19.718	117	37.246 7	37.243 4	37.233
63	20.061 8	20.055 6	20.037	118	37.565 0	—	37.552
64	20.380 0	—	20.355	119	37.883 3	37.880 0	37.870
65	20.698 2	20.692 2	20.674	120	38.201 6	—	38.188

Attached Table 2. Basic Dimensions of Roller Chain Sprockets

Sprocket 25

Unit: mm

Number of teeth N	Pitch circle diameter D_p	Outside diameter D_o	Root circle diameter D_B	Bottom distance D_c	Max. boss diameter D_H	Number of teeth N	Pitch circle diameter D_p	Outside diameter D_o	Root circle diameter D_B	Bottom distance D_c	Max. boss diameter D_H
11	22.54	25	19.24	19.01	15	66	133.45	137	130.15	130.15	126
12	24.53	28	21.23	21.23	17	67	135.47	139	132.17	132.14	128
13	26.53	30	23.23	23.04	19	68	137.50	141	134.20	134.20	130
14	28.54	32	25.24	25.24	21	69	139.52	143	136.22	136.18	132
15	30.54	34	27.24	27.07	23	70	141.54	145	138.24	138.24	134
16	32.55	36	29.25	29.25	25	71	143.56	147	140.26	140.22	136
17	34.56	38	31.26	31.11	27	72	145.58	149	142.28	142.28	138
18	36.57	40	33.27	33.27	29	73	147.60	151	144.30	144.26	140
19	38.58	42	35.28	35.15	31	74	149.62	153	146.32	146.32	142
20	40.59	44	37.29	37.29	33	75	151.64	155	148.34	148.31	144
21	42.61	46	39.31	39.19	35	76	153.66	157	150.36	150.36	146
22	44.62	48	41.32	41.32	37	77	155.68	159	152.38	152.35	148
23	46.63	50	43.33	43.23	39	78	157.70	161	154.40	154.40	150
24	48.65	52	45.35	45.35	41	79	159.72	163	156.42	156.39	152
25	50.66	54	47.36	47.27	43	80	161.74	165	158.44	158.44	155
26	52.68	56	49.38	49.38	45	81	163.76	167	160.46	160.43	157
27	54.70	58	51.40	51.30	47	82	165.78	169	162.48	162.48	159
28	56.71	60	53.41	53.41	49	83	167.81	171	164.51	164.48	161
29	58.73	62	55.43	55.35	51	84	169.83	174	166.53	166.53	163
30	60.75	64	57.45	57.45	53	85	171.85	176	168.55	168.52	165
31	62.77	66	59.47	59.39	55	86	173.87	178	170.57	170.57	167
32	64.78	68	61.48	61.48	57	87	175.89	180	172.59	172.56	169
33	66.80	70	63.50	63.43	59	88	177.91	182	174.61	174.61	171
34	68.82	72	65.52	65.52	61	89	179.93	184	176.63	176.60	173
35	70.84	74	67.54	67.47	63	90	181.95	186	178.65	178.65	175
36	72.86	76	69.56	69.56	65	91	183.97	188	180.67	180.64	177
37	74.88	78	71.58	71.51	67	92	185.99	190	182.69	182.69	179
38	76.90	80	73.60	73.60	70	93	188.01	192	184.71	184.69	181
39	78.91	82	75.61	75.55	72	94	190.03	194	186.73	186.73	183
40	80.93	84	77.63	77.63	74	95	192.06	196	188.76	188.73	185
41	82.95	87	79.65	79.59	76	96	194.08	198	190.78	190.78	187
42	84.97	89	81.67	81.67	78	97	196.10	200	192.80	192.77	189
43	86.99	91	83.69	83.63	80	98	198.12	202	194.82	194.82	191
44	89.01	93	85.71	85.71	82	99	200.14	204	196.84	196.81	193
45	91.03	95	87.73	87.68	84	100	202.16	206	198.86	198.86	195
46	93.05	97	89.75	89.75	86	101	204.18	208	200.88	200.86	197
47	95.07	99	91.77	91.72	88	102	206.20	210	202.90	202.90	199
48	97.09	101	93.79	93.79	90	103	208.22	212	204.92	204.90	201
49	99.11	103	95.81	95.76	92	104	210.24	214	206.94	206.94	203
50	101.13	105	97.83	97.83	94	105	212.26	216	208.96	208.94	205
51	103.15	107	99.85	99.80	96	106	214.29	218	210.99	210.99	207
52	105.17	109	101.87	101.87	98	107	216.31	220	213.01	212.98	209
53	107.19	111	103.89	103.84	100	108	218.33	222	215.03	215.03	211
54	109.21	113	105.91	105.91	102	109	220.35	224	217.05	217.03	213
55	111.23	115	107.93	107.88	104	110	222.37	226	219.07	219.07	215
56	113.25	117	109.95	109.95	106	111	224.39	228	221.09	221.07	217
57	115.27	119	111.97	111.93	108	112	226.41	230	223.11	223.11	219
58	117.29	121	113.99	113.99	110	113	228.43	232	225.13	225.11	221
59	119.31	123	116.01	115.97	112	114	230.45	234	227.15	227.15	223
60	121.33	125	118.03	118.03	114	115	232.47	236	229.17	229.15	225
61	123.35	127	120.05	120.01	116	116	234.50	238	231.20	231.20	227
62	125.37	129	122.07	122.07	118	117	236.52	240	233.22	233.20	229
63	127.39	131	124.09	124.05	120	118	238.54	242	235.24	235.24	231
64	129.41	133	126.11	126.11	122	119	240.56	244	237.26	237.24	233
65	131.43	135	128.13	128.10	124	120	242.58	246	239.28	239.28	235