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THE FORMULA SCRIBNER LOG RULE

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The Scribner Decimal C is the accepted log rule in the Pacific Northwest. Usually volume, growth and yield tables are expressed by this rule to give them practical meaning. Yet in the research required for such studies, the rule is unsatisfactory because of rounded values and irregular jumps in volume from diameter to diameter and length to length.

As long ago as 1925, Donald Bruce published a mathematical formula fitted to the Scribner volumes for 16-foot logs[1]: $V = .79D^2 - 2D - 4$, in which V is the volume in board feet and D is the diameter, inside bark, in inches at the small end of the log. For scientific purposes, volumes calculated from this formula are superior to either the Decimal C rule or the original values from which the Decimal C was taken.

Volume of a one-foot section of a log may then be taken as 1/16 the volume of a 16-foot log:

$$.0625(79D^2 - 2D - 4),$$

or

$$.049375D^2 - .125D - .25$$

Volumes computed from this formula are given in table 1 for logs from 6 to 40 inches in diameter by 1/10-inch classes.

1/ Bruce, Donald. A formula for the Scribner rule. Journal Forestry 23:432-433. 1925.

Since the Scribner rule makes no taper allowance for logs up to 40 feet long, the volume of any log may be determined by multiplying the volume of the one-foot section by the length of the log in feet. Table 2 gives the volumes so computed for logs from 8 to 40 feet long by one-inch diameter classes.

These tables are particularly useful for volume table construction but also have wider application. A unique use for table 1 is in determination of the diameter of the average log when the length and volume are known. Such information is often wanted in lumber grade recovery studies, cost of logging studies, and other studies in which those two variables are known. It is only necessary to divide the volume of the average log by its length to get its per-foot volume; then by comparing this volume with tabular values in the table, its diameter may be read directly. This is much simpler than interpolation for length and diameter in a conventional table. Research workers will find many more uses for the tables.

Table 1.--Formula Scribner log rule
Volumes for a 1-foot section by tenth-inch diameter classes[1]

Dia. In.	Volume Bd.ft.	Dia. In.	Volume Bd.ft.	Dia. In.	Volume Bd.ft.	Dia. In.	Volume Bd.ft.	Dia. In.	Volume Bd.ft.
6-10 inch diameter									
6.0	.7775	7.0	1.2944	8.0	1.9100	9.0	2.6244	10.0	3.4375
.1	.8247	.1	1.3515	.1	1.9770	.1	2.7012	.1	3.5242
.2	.8730	.2	1.4096	.2	2.0450	.2	2.7791	.2	3.6120
.3	.9222	.3	1.4687	.3	2.1139	.3	2.8579	.3	3.7007
.4	.9724	.4	1.5288	.4	2.1839	.4	2.9378	.4	3.7904
.5	1.0236	.5	1.5898	.5	2.2548	.5	3.0186	.5	3.8811
.6	1.0758	.6	1.6519	.6	2.3268	.6	3.1004	.6	3.9728
.7	1.1289	.7	1.7149	.7	2.3997	.7	3.1832	.7	4.0654
.8	1.1831	.8	1.7790	.8	2.4736	.8	3.2670	.8	4.1591
.9	1.2382	.9	1.8440	.9	2.5485	.9	3.3517	.9	4.2537
11-15 inch diameter									
11.0	4.3494	12.0	5.3600	13.0	6.4694	14.0	7.6775	15.0	8.9844
.1	4.4460	.1	5.4665	.1	6.5857	.1	7.8037	.1	9.1205
.2	4.5436	.2	5.5740	.2	6.7031	.2	7.9310	.2	9.2576
.3	4.6422	.3	5.6824	.3	6.8214	.3	8.0592	.3	9.3957
.4	4.7418	.4	5.7919	.4	6.9408	.4	8.1884	.4	9.5348
.5	4.8423	.5	5.9023	.5	7.0611	.5	8.3186	.5	9.6748
.6	4.9439	.6	6.0138	.6	7.1824	.6	8.4498	.6	9.8159
.7	5.0464	.7	6.1262	.7	7.3047	.7	8.5819	.7	9.9579
.8	5.1500	.8	6.2396	.8	7.4280	.8	8.7151	.8	10.1010
.9	5.2545	.9	6.3540	.9	7.5522	.9	8.8492	.9	10.2450
16-20 inch diameter									
16.0	10.3900	17.0	11.8944	18.0	13.4975	19.0	15.1994	20.0	17.0000
.1	10.5360	.1	12.0502	.1	13.6632	.1	15.3750	.1	17.1855
.2	10.6830	.2	12.2071	.2	13.8300	.2	15.5516	.2	17.3720
.3	10.8309	.3	12.3649	.3	13.9977	.3	15.7292	.3	17.5594
.4	10.9799	.4	12.5238	.4	14.1664	.4	15.9078	.4	17.7479
.5	11.1298	.5	12.6836	.5	14.3361	.5	16.0873	.5	17.9373
.6	11.2808	.6	12.8444	.6	14.5068	.6	16.2679	.6	18.1278
.7	11.4327	.7	13.0062	.7	14.6784	.7	16.4494	.7	18.3192
.8	11.5856	.8	13.1690	.8	14.8511	.8	16.6320	.8	18.5116
.9	11.7395	.9	13.3327	.9	15.0247	.9	16.8155	.9	18.7050

1/ Diameter is diameter inside bark at the small end of the log. Volume for any length may be computed by multiplying the length of log in feet by the 1-foot volume.

Table 1.--(Continued)

Dia. In.	Volume Bd.ft.	Dia. In.	Volume Bd.ft.	Dia. In.	Volume Bd.ft.	Dia. In.	Volume Bd.ft.	Dia. In.	Volume Bd.ft.
21-25 inch diameter									
21.0	18.8994	22.0	20.8975	23.0	22.9944	24.0	25.1900	25.0	27.4844
.1	19.0947	.1	21.1027	.1	23.2095	.1	25.4150	.1	27.7192
.2	19.2911	.2	21.3090	.2	23.4256	.2	25.6410	.2	27.9551
.3	19.4884	.3	21.5162	.3	23.6427	.3	25.8679	.3	28.1919
.4	19.6868	.4	21.7244	.4	23.8608	.4	26.0959	.4	28.4298
.5	19.8861	.5	21.9336	.5	24.0798	.5	26.3248	.5	28.6686
.6	20.0864	.6	22.1438	.6	24.2999	.6	26.5548	.6	28.9084
.7	20.2877	.7	22.3549	.7	24.5209	.7	26.7857	.7	29.1492
.8	20.4900	.8	22.5671	.8	24.7430	.8	27.0176	.8	29.3910
.9	20.6932	.9	22.7802	.9	24.9660	.9	27.2505	.9	29.6337
26-30 inch diameter									
26.0	29.8775	27.0	32.3694	28.0	34.9600	29.0	37.6494	30.0	40.4375
.1	30.1222	.1	32.6240	.1	35.2245	.1	37.9237	.1	40.7217
.2	30.3680	.2	32.8796	.2	35.4900	.2	38.1991	.2	41.0070
.3	30.6147	.3	33.1362	.3	35.7564	.3	38.4754	.3	41.2932
.4	30.8624	.4	33.3938	.4	36.0239	.4	38.7528	.4	41.5804
.5	31.1111	.5	33.6523	.5	36.2923	.5	39.0311	.5	41.8686
.6	31.3608	.6	33.9119	.6	36.5618	.6	39.3104	.6	42.1578
.7	31.6114	.7	34.1724	.7	36.8322	.7	39.5907	.7	42.4479
.8	31.8631	.8	34.4340	.8	37.1036	.8	39.8720	.8	42.7391
.9	32.1157	.9	34.6965	.9	37.3760	.9	40.1542	.9	43.0312
31-35 inch diameter									
31.0	43.3244	32.0	46.3100	33.0	49.3944	34.0	52.5775	35.0	55.8594
.1	43.6185	.1	46.6140	.1	49.7082	.1	52.9012	.1	56.1930
.2	43.9136	.2	46.9190	.2	50.0231	.2	53.2260	.2	56.5276
.3	44.2097	.3	47.2249	.3	50.3389	.3	53.5517	.3	56.8632
.4	44.5068	.4	47.5319	.4	50.6558	.4	53.8784	.4	57.1998
.5	44.8048	.5	47.8398	.5	50.9736	.5	54.2061	.5	57.5373
.6	45.1039	.6	48.1488	.6	51.2924	.6	54.5348	.6	57.8759
.7	45.4039	.7	48.4587	.7	51.6122	.7	54.8644	.7	58.2154
.8	45.7050	.8	48.7696	.8	51.9330	.8	55.1951	.8	58.5560
.9	46.0070	.9	49.0815	.9	52.2547	.9	55.5267	.9	58.8975
36-40 inch diameter									
36.0	59.2400	37.0	62.7194	38.0	66.2975	39.0	69.9744	40.0	73.7500
.1	59.5835	.1	63.0727	.1	66.6607	.1	70.3475		
.2	59.9280	.2	63.4271	.2	67.0250	.2	70.7216		
.3	60.2734	.3	63.7824	.3	67.3902	.3	71.0967		
.4	60.6199	.4	64.1388	.4	67.7564	.4	71.4728		
.5	60.9673	.5	64.4961	.5	68.1236	.5	71.8498		
.6	61.3158	.6	64.8544	.6	68.4918	.6	72.2279		
.7	61.6652	.7	65.2137	.7	68.8609	.7	72.6069		
.8	62.0156	.8	65.5740	.8	69.2311	.8	72.9870		
.9	62.3670	.9	65.9352	.9	69.6022	.9	73.3680		

Table 2.--Formula Scribner log rule
Volumes for logs 8- to 40-feet long by 1-inch diameter classes

Top diameter of log inside bark	Volume of log by length								Top diameter of log inside bark
	8 feet	10 feet	12 feet	14 feet	16 feet	18 feet	20 feet	22 feet	
Inches	Board feet								Inches
6	6	8	9	11	12	14	16	17	6
7	10	13	16	18	21	23	26	28	7
8	15	19	23	27	31	34	38	42	8
9	21	26	31	37	42	47	52	58	9
10	28	34	41	48	55	62	69	76	10
11	35	43	52	61	70	78	87	96	11
12	43	54	64	75	86	96	107	118	12
13	52	65	78	91	104	116	129	142	13
14	61	77	92	107	123	138	154	169	14
15	72	90	108	126	144	162	180	198	15
16	83	104	125	145	166	187	208	229	16
17	95	119	143	167	190	214	238	262	17
18	108	135	162	189	216	243	270	297	18
19	122	152	182	213	243	274	304	334	19
20	136	170	204	238	272	306	340	374	20
21	151	189	227	265	302	340	378	416	21
22	167	209	251	293	334	376	418	460	22
23	184	230	276	322	368	414	460	506	23
24	202	252	302	353	403	453	504	554	24
25	220	275	330	385	440	495	550	605	25
26	239	299	359	418	478	538	598	657	26
27	259	324	388	453	518	583	647	712	27
28	280	350	420	489	559	629	699	769	28
29	301	376	452	527	602	678	753	828	29
30	324	404	485	566	647	728	809	890	30
31	347	433	520	607	693	780	866	953	31
32	370	463	556	648	741	834	926	1019	32
33	395	494	593	692	790	889	988	1087	33
34	421	526	631	736	841	946	1052	1157	34
35	447	559	670	782	894	1005	1117	1229	35
36	474	592	711	829	948	1066	1185	1303	36
37	502	627	753	878	1004	1129	1254	1380	37
38	530	663	796	928	1061	1193	1326	1459	38
39	560	700	840	980	1120	1260	1399	1539	39
40	590	738	885	1032	1180	1328	1475	1622	40

Table 2.--(Continued)

Top diameter of log inside bark	Volume of log by length									Top diameter of log inside bark
	24 feet	26 feet	28 feet	30 feet	32 feet	34 feet	36 feet	38 feet	40 feet	
Inches	Board feet									Inches
6	19	20	22	23	25	26	28	30	31	6
7	31	34	36	39	41	44	47	49	52	7
8	46	50	53	57	61	65	69	73	76	8
9	63	68	73	79	84	89	94	100	105	9
10	82	89	96	103	110	117	124	131	138	10
11	104	113	122	130	139	148	157	165	174	11
12	129	139	150	161	172	182	193	204	214	12
13	155	168	181	194	207	220	233	246	259	13
14	184	200	215	230	246	261	276	292	307	14
15	216	234	252	270	288	305	323	341	359	15
16	249	270	291	312	332	353	374	395	416	16
17	285	309	333	357	381	404	428	452	476	17
18	324	351	378	405	432	459	486	513	540	18
19	365	395	426	456	486	517	547	578	608	19
20	408	442	476	510	544	578	612	646	680	20
21	454	491	529	567	605	643	680	718	756	21
22	502	543	585	627	669	711	752	794	836	22
23	552	598	644	690	736	782	828	874	920	23
24	605	655	705	756	806	856	907	957	1008	24
25	660	715	770	825	880	934	989	1044	1099	25
26	717	777	837	896	956	1016	1076	1135	1195	26
27	777	842	906	971	1036	1101	1165	1230	1295	27
28	839	909	979	1049	1119	1189	1259	1328	1398	28
29	904	979	1054	1129	1205	1280	1355	1431	1506	29
30	970	1051	1132	1231	1294	1375	1456	1537	1618	30
31	1040	1126	1213	1300	1386	1473	1560	1646	1733	31
32	1111	1204	1297	1389	1482	1575	1667	1760	1852	32
33	1185	1284	1383	1482	1581	1679	1778	1877	1976	33
34	1262	1367	1472	1577	1682	1788	1893	1998	2103	34
35	1341	1452	1564	1676	1788	1899	2011	2123	2234	35
36	1422	1540	1659	1777	1896	2014	2133	2251	2370	36
37	1505	1631	1756	1882	2007	2132	2258	2383	2509	37
38	1591	1724	1856	1989	2122	2254	2387	2519	2652	38
39	1679	1819	1959	2099	2239	2379	2519	2659	2799	39
40	1770	1918	2065	2212	2360	2508	2655	2802	2950	40