

M. F. Gilmullin, “Logarithm Tables: Their Evolution,” *Mathematics with Mansur*, Jan. 12, 2025. [Online]. Available: <https://history-math.org/publications/hm-tt-5cbde4c21638-en/>.

INSTRUMENT

Logarithm Tables: Their Evolution

From Napier and Bürgi to Briggs, Vega and Bradis, logarithm tables transformed laborious multiplication and division into simpler operations.

Mansur Gilmullin · 12.01.2025 · EN

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Gr. 35

min	Sines	Logarithmi	Differentia	Logarithmi	Sines
35	5807030	5435156	3378626	2056530	8141155
36	5809308	5431079	3372471	2058606	8139465
37	5811756	5427001	3366421	2060681	8137775
38	5814131	5422911	3360178	2062761	8136084
39	5816499	5418864	3354024	2064840	8134393
40	5818865	5414797	3347877	2066920	8132704
41	5821230	5410711	3341711	2069004	8131008
42	5823595	5406671	3335586	2071085	8129314
43	5825959	5402612	3329443	2073169	8127620
44	5828323	5398555	3323300	2075255	8125925
45	5830687	5394501	3317159	2077342	8124229
46	5833050	5390449	3311019	2079430	8122532
47	5835412	5386400	3304880	2081520	8120835
48	5837774	5382351	3298742	2083611	8119137
49	5840136	5378308	3292605	2085702	8117439
50	5842497	5374266	3286470	2087796	8115740
51	5844858	5370226	3280331	2089891	8114040
52	5847218	5366189	3274201	2091987	8112339
53	5849578	5362144	3268070	2094084	8110638
54	5851937	5358111	3261939	2096181	8108936
55	5854295	5354093	3255810	2098281	8107234
56	5856653	5350077	3249683	2100384	8105531
57	5859010	5346061	3243557	2102486	8103827
58	5861367	5342021	3237431	2104590	8102122
59	5863724	5338000	3231307	2106695	8100417
60	5866080	5333981	3225184	2108801	8098713
61	5868436	5329970	3219061	2110909	8097008
62	5870791	5325958	3212940	2113018	8095303
63	5873145	5321948	3206820	2115128	8093598
64	5875499	5317940	3200700	2117240	8091893
65	5877852	5313935	3194582	2119353	8090187

54

Page from John Napier’s A Description of the Admirable Table of Logarithms, with trigonometric and logarithmic data for 35 degrees. The left column gives the minutes to add to the page’s angle, 35 degrees. The subsequent columns give the sines of the angles and the absolute values of the natural logarithms of those sines · [Source](#)

A school pupil’s mathematical “prayer”: *“The logarithm of a number b to base a is the exponent to which the base a must be raised to obtain b.”*

Logarithms have distinctive properties that account for their wide use both in simplifying laborious practical calculations and in scientific research.

For example, their properties imply that instead of multiplying numbers with many digits, one need only look up and add their logarithms, then use an antilogarithm table to exponentiate: find the result from its logarithm. Division differs only in that the logarithms are subtracted.

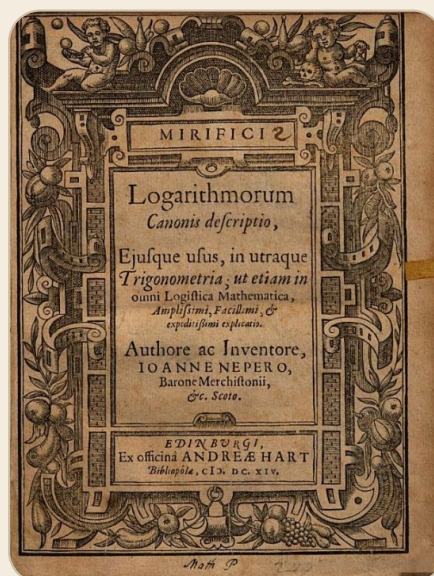
Logarithm tables

For more than three centuries, until the 19th century, logarithm tables were the principal means of scientific and engineering calculation. In the 20th century they were displaced by slide rules, arithmometers, and then calculators and computers.

The Scottish mathematician John Napier published the first logarithm tables in 1614 in *A Description of the Admirable Table of Logarithms* (Latin *Mirifici Logarithmorum Canonis Descriptio*). His central idea was to construct two sequences of numbers related so that, as one increased in arithmetic progression, the other decreased in geometric progression. The product of two numbers in the second sequence then depended simply on the sum of the corresponding numbers in the first, allowing multiplication to be reduced to addition.



John Napier (1550–1617), inventor of logarithms. This portrait, dated 1616, was given to the University of Edinburgh by his great-granddaughter, Baroness Margaret Napier, in 1686 · [Source](#)



Title page of John Napier's *A Description of the Admirable Table of Logarithms* (*Mirifici Logarithmorum Canonis Descriptio*), 1614, in which logarithm tables were first published · [Source](#)

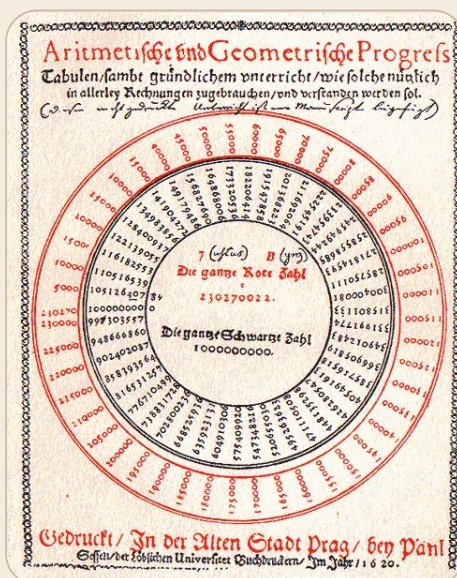
Because they served particular purposes, his tables contained logarithms of trigonometric quantities. Napier did not introduce the concept of a logarithm's base. His proposed term “logarithm” became established in science, from Ancient Greek λόγος, “ratio”, and ἀριθμός, “number”.

Johannes Kepler included an enthusiastic dedication to Napier in an astronomical handbook he published in 1620. Logarithms enabled Kepler to complete relatively quickly his many years of work compiling the Rudolphine Tables, which consolidated the success of heliocentric astronomy.

The Swiss mathematician Jost Bürgi published tables similar to Napier's in 1620. They were the first antilogarithm table. Tables at that time were compiled using the property that numbers in a geometric progression have logarithms in an arithmetic progression. The cover of Bürgi's collection accordingly reads “Arithmetic and Geometric Progressions”.

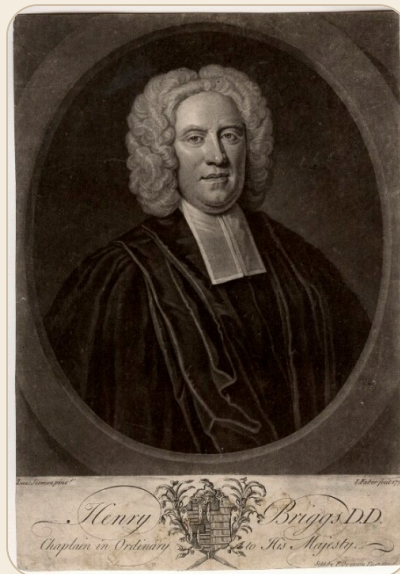


Jost Bürgi (1552–1632), Swiss and German mathematician, astronomer, clockmaker and instrument maker. He discovered logarithms independently of John Napier in 1588, but published his tables later · [Source](#)

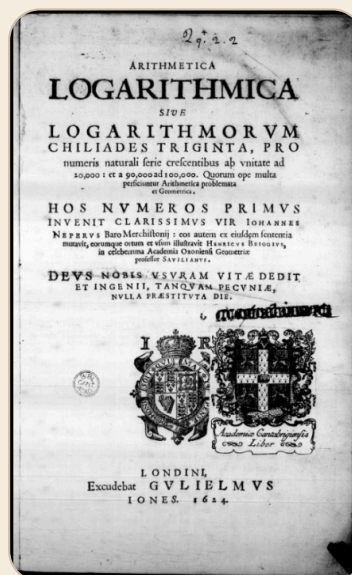


Cover of Bürgi's logarithm-table collection (1620). The inscription reads “Arithmetic and Geometric Progressions” · [Source](#)

In 1617 the Oxford mathematics professor Henry Briggs published (1624) *Arithmetica logarithmica*, or *Logarithmic Arithmetic*, containing 8-digit common-logarithm tables for the first thousand numbers, followed by 14-digit tables for numbers from 1 to 20000 and from 90000 to 100000. Common logarithms are sometimes called Briggsian logarithms after him.



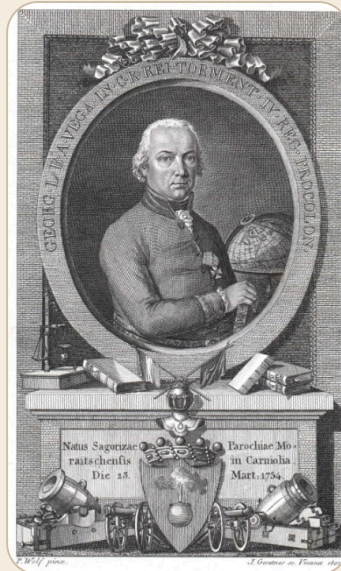
Henry Briggs (1561–1630), English mathematician, professor of mathematics at Gresham College, London, and later at Oxford University. Creator of the first common-logarithm tables · [Source](#)



Title page of Henry Briggs' *Logarithmic Arithmetic*, 1624, containing common-logarithm tables · [Source](#)

The Dutch mathematician Adriaan Vlacq published a second edition of Briggs' 10-digit tables in 1628, supplying the missing numbers from 20000 to 90000.

Of the many logarithm tables published by different authors in various countries, the most widespread were the Austrian mathematician Georg Vega's 7-digit tables of 1783: *Logarithmic, Trigonometric and Other Tables and Formulas, with Instructions for Use* (German *Logarithmische, trigonometrische, und andere zum Gebrauche der Mathematik eingerichtete Tafeln und Formeln*). They went through more than 100 editions in 100 years.



Georg Bartholomäus Vega (1754–1802), Austrian mathematician and artillery officer. His principal work concerned numerical analysis. He is best known for publishing the classic collection of seven-digit logarithms (1783), repeatedly reissued in many countries · [Source](#)



Title page of Georg Vega's Logarithmic, Trigonometric and Other Tables and Formulas, with Instructions for Use, 1783, an example of a classic logarithm collection · [Source](#)

Common-logarithm tables exist with differing numbers of mantissa digits. The most widespread are 4-digit and 5-digit tables. Sometimes 7-digit tables are used; rarely, tables allowing logarithms to be calculated to more digits are needed.

The first Russian-language logarithm tables appeared in 1703 with the involvement of L. F. Magnitsky and A. D. Farquharson.

Vladimir Modestovich Bradis' Four-Figure Mathematical Tables, repeatedly published from 1921 onwards, were used in educational institutions and engineering calculations that did not require high precision. They contained 4-digit mantissas of common logarithms of numbers and trigonometric functions, natural logarithms, and several other useful computational tools.



Vladimir Modestovich Bradis (1890–1975), Soviet mathematics educator and author of Bradis' Tables, used for practical calculations · [Source](#)

Common logarithms

Tables of common logarithms were thus the most widespread. The common logarithm of an integer power of 10 is an integer. The common logarithm of any number not equal to an integer power of 10 is fractional, and generally irrational.

The integer part of a logarithm is called its characteristic, and the fractional part its mantissa. For example, $\lg 253 = 2.4031$: the characteristic is 2 and the mantissa 0.4031.

Since the common logarithms of N and $10^k N$, for integer k , differ only in their characteristics and have identical mantissas, $\lg 10^k N = k + \lg N$, tables of common logarithms give only the mantissas of logarithms of integers.

The characteristic of any positive number's logarithm can be found exactly without tables. The following rules are used.

1. For a number greater than 1, the characteristic is one less than the number of digits in its integer part. For example, $\lg 20\,000 = 4.3010$.
2. For a decimal fraction less than 1, the characteristic is the negative of the number of zeros before the first nonzero digit in the fraction. For example, $\lg 0.0002 = -4 + 0.3010$. Thus common logarithms of fractions are written as the sum of a positive mantissa and a negative characteristic.

The mantissa is generally taken from tables, such as Bradis' tables.

Таблица XIII. МАНТИССЫ ДЕСЯТИЧНЫХ ЛОГАРИФМОВ.

N	0	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
10	0000	0043	0086	0128	0170	0212	0253	0294	0334	0374	4	9	13	17	22	26	30	35	39
11	0414	0453	0492	0531	0569	0607	0645	0682	0719	0755	4	9	13	17	22	26	30	35	39
12	0792	0828	0864	0899	0934	0969	1004	1038	1072	1106	4	9	13	17	22	26	30	35	39
13	1139	1173	1206	1239	1271	1303	1335	1367	1399	1430	4	9	13	17	22	26	30	35	39
14	1461	1492	1522	1553	1584	1614	1644	1673	1700	1732	4	9	13	17	22	26	30	35	39
15	1761	1790	1818	1847	1875	1903	1931	1959	1987	2014	4	9	13	17	22	26	30	35	39
16	2041	2068	2095	2122	2148	2175	2201	2227	2253	2279	4	9	13	17	22	26	30	35	39
17	2304	2330	2355	2380	2405	2430	2455	2480	2504	2529	4	9	13	17	22	26	30	35	39
18	2553	2577	2601	2625	2648	2672	2695	2718	2742	2765	4	9	13	17	22	26	30	35	39
19	2788	2810	2833	2856	2878	2900	2923	2945	2967	2989	4	9	13	17	22	26	30	35	39
20	3010	3032	3054	3075	3096	3118	3139	3160	3181	3201	4	9	13	17	22	26	30	35	39
21	3222	3243	3263	3284	3304	3324	3345	3365	3385	3404	4	9	13	17	22	26	30	35	39
22	3424	3444	3464	3483	3502	3522	3541	3560	3579	3598	4	9	13	17	22	26	30	35	39
23	3617	3635	3653	3674	3692	3711	3729	3747	3766	3784	4	9	13	17	22	26	30	35	39
24	3802	3820	3838	3856	3874	3892	3910	3927	3945	3962	4	9	13	17	22	26	30	35	39
25	3979	3997	4014	4031	4048	4065	4082	4099	4116	4133	4	9	13	17	22	26	30	35	39
26	4150	4166	4183	4200	4216	4232	4249	4265	4281	4298	4	9	13	17	22	26	30	35	39
27	4314	4330	4346	4362	4378	4393	4409	4425	4440	4455	4	9	13	17	22	26	30	35	39
28	4472	4487	4502	4518	4533	4548	4564	4579	4594	4609	4	9	13	17	22	26	30	35	39
29	4624	4639	4654	4669	4683	4698	4713	4728	4742	4757	4	9	13	17	22	26	30	35	39

Mantissas of common logarithms in Bradis' tables · [Source](#)

One remarkable property should be used: moving a number's decimal point any number of places to the left or right leaves the mantissa of its common logarithm unchanged. Only the characteristic changes.

Logarithm tables often include antilogarithm tables: numbers whose logarithms are the given numbers.

Таблица XIV. ЗНАЧЕНИЯ ФУНКЦИИ 10^x (ДЕСЯТИЧНЫЕ АНТИЛОГАРИФМЫ).

x	0	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
0,0	1000	1020	1040	1060	1080	1100	1120	1140	1160	1180	0	1	1	1	1	1	1	1	1
0,1	1259	1296	1332	1368	1403	1438	1472	1506	1540	1574	0	1	1	1	1	1	1	1	1
0,2	1738	1796	1853	1909	1964	2019	2073	2127	2180	2232	0	1	1	1	1	1	1	1	1
0,3	2754	2839	2922	3003	3083	3162	3239	3315	3391	3466	0	1	1	1	1	1	1	1	1
0,4	4467	4571	4673	4773	4871	4968	5064	5159	5252	5344	0	1	1	1	1	1	1	1	1
0,5	6456	6576	6693	6808	6921	7032	7141	7248	7353	7457	0	1	1	1	1	1	1	1	1
0,6	8493	8618	8740	8860	8978	9094	9208	9320	9431	9540	0	1	1	1	1	1	1	1	1
0,7	1059	1075	1091	1106	1121	1136	1151	1165	1179	1193	0	1	1	1	1	1	1	1	1
0,8	1290	1318	1346	1374	1401	1428	1455	1481	1508	1534	0	1	1	1	1	1	1	1	1
0,9	1778	1818	1857	1896	1934	1972	2010	2047	2084	2121	0	1	1	1	1	1	1	1	1
1,0	2590	2646	2701	2756	2810	2863	2916	2968	3020	3071	0	1	1	1	1	1	1	1	1
1,1	3596	3661	3725	3788	3851	3913	3974	4035	4095	4155	0	1	1	1	1	1	1	1	1
1,2	5208	5279	5349	5418	5487	5555	5623	5690	5757	5823	0	1	1	1	1	1	1	1	1
1,3	7093	7169	7244	7318	7391	7463	7535	7606	7677	7747	0	1	1	1	1	1	1	1	1
1,4	9333	9404	9473	9542	9610	9678	9745	9812	9878	9944	0	1	1	1	1	1	1	1	1
1,5	1122	1136	1150	1164	1178	1191	1205	1218	1231	1244	0	1	1	1	1	1	1	1	1
1,6	1445	1469	1492	1515	1537	1559	1581	1603	1625	1646	0	1	1	1	1	1	1	1	1
1,7	1903	1936	1968	1999	2030	2060	2090	2120	2149	2178	0	1	1	1	1	1	1	1	1
1,8	2512	2550	2587	2624	2660	2696	2731	2766	2801	2835	0	1	1	1	1	1	1	1	1
1,9	3162	3200	3237	3274	3310	3346	3381	3416	3451	3485	0	1	1	1	1	1	1	1	1
2,0	4169	4216	4262	4308	4353	4398	4442	4486	4530	4573	0	1	1	1	1	1	1	1	1
2,1	5623	5676	5728	5779	5830	5880	5930	5979	6028	6076	0	1	1	1	1	1	1	1	1
2,2	7586	7643	7699	7754	7808	7861	7914	7966	8018	8069	0	1	1	1	1	1	1	1	1
2,3	9549	9601	9652	9702	9752	9801	9850	9898	9946	9993	0	1	1	1	1	1	1	1	1
2,4	1122	1136	1150	1164	1178	1191	1205	1218	1231	1244	0	1	1	1	1	1	1	1	1
2,5	1445	1469	1492	1515	1537	1559	1581	1603	1625	1646	0	1	1	1	1	1	1	1	1
2,6	1903	1936	1968	1999	2030	2060	2090	2120	2149	2178	0	1	1	1	1	1	1	1	1
2,7	2512	2550	2587	2624	2660	2696	2731	2766	2801	2835	0	1	1	1	1	1	1	1	1
2,8	3162	3200	3237	3274	3310	3346	3381	3416	3451	3485	0	1	1	1	1	1	1	1	1
2,9	4169	4216	4262	4308	4353	4398	4442	4486	4530	4573	0	1	1	1	1	1	1	1	1
3,0	5623	5676	5728	5779	5830	5880	5930	5979	6028	6076	0	1	1	1	1	1	1	1	1
3,1	7586	7643	7699	7754	7808	7861	7914	7966	8018	8069	0	1	1	1	1	1	1	1	1
3,2	9549	9601	9652	9702	9752	9801	9850	9898	9946	9993	0	1	1	1	1	1	1	1	1
3,3	1122	1136	1150	1164	1178	1191	1205	1218	1231	1244	0	1	1	1	1	1	1	1	1
3,4	1445	1469	1492	1515	1537	1559	1581	1603	1625	1646	0	1	1	1	1	1	1	1	1

Common antilogarithms in Bradis' tables · [Source](#)

Besides logarithms of numbers, logarithm tables usually contain logarithms of trigonometric quantities.

Further reading

1. Bradis, V. M. Four-Figure Mathematical Tables for Secondary School. — Moscow: Prosveshcheniye, 1976. — 96 pp.

2. Bradis, V. M. Means and Methods of Elementary Computation. — Moscow: Uchpedgiz, 1954. — 230 pp.
3. Vega, G. Tables of Seven-Digit Logarithms. — Moscow: Nedra, 1971. — 559 pp.
4. Manturov, O. V. Explanatory Dictionary of Mathematical Terms / O. V. Manturov, Yu. K. Solntsev, Yu. I. Sorkin, N. G. Fedin. — Moscow: Prosveshcheniye, 1965. — 540 pp.