LOGARITHM AND ANTILOGARITHM CALCULATIONS

By: Dr. Sayanti Poddar

Prior to the invention of calculators, logarithms were used to simplify computations in various fields of knowledge, such as navigation, surveying, astronomy, and later on, engineering.

LOGARITHMS

- Invented by John Napier a Scottish mathematician.
- Developed in 16th century

LOGARITHMS

 $\hfill \square$ Consider the following calculation $3.142 \times 12.05 \times (3.142)^2$

This calculation is quite complex without a calculator.

One way is to do multiplication by manual way Second way => use calculator (NOT ALLOWED) Third way => use logarithmic tables In mathematics, the **logarithm table** is used to find the value of the logarithmic function. The simplest way to find the value of the given logarithmic function is by using the **log table**. Here the definition of the logarithmic function and procedure to use the logarithm table is given in detail.

Logarithmic Function Definition

The logarithmic function is defined as an inverse function to exponentiation. The logarithmic function is stated as follows

For x, a > 0, and $a \neq 1$,

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y = \log_a x, if x = a^y
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Then the logarithmic function is written as:

 $f(x) = \log_a x$

The most 2 common bases used in logarithmic functions are base e and base 10. The log function with base 10 is called the common logarithmic function and it is denoted by \log_{10} or simply log.

 $\mathbf{f}(\mathbf{x}) = \mathbf{log}_{10}$

The log function to the base e is called the natural logarithmic function and it is denoted by \log_{e} .

 $f(x) = \log_e x$

To find the logarithm of a number, we can use the logarithm table instead of using mere calculation. Before finding the logarithm of a number, we should know about the characteristics and mantissa part of a given number

• Characteristic Part – The whole part of a number is called the characteristic part. The characteristic of any number greater than one is positive, and if it is one less than the number of digits to the left of the decimal point in a given number. If the number is less than one, the characteristic is negative and is one more than the number of zeros to the right of the decimal point.

• Mantissa Part – The decimal part of the logarithm number is said to be the mantissa part and it should always be a positive value. If the mantissa part is in a negative value, then convert into the positive value.

LOGARITHMIC FUNCTION DEFINITION

	0	1	2	3	4	5	6	7	8	9	Mean Difference								
											1	2	3	4	5	6	7	8	9
10	0000	0043	0086	0128	0170	0212	0253	0294	0334	0374	4	8	12	17	21	25	29	33	37
11	0414	0453	0492	0531	0569	0607	0645	0682	0719	0755	4	8	11	15	19	23	26	30	34
12	0792	0828	0864	0899	0934	0969	1004	1038	1072	1106	3	7	10	14	17	21	24	28	31
13	1139	1173	1206	1239	1271	1303	1335	1367	1399	1430	3	6	10	13	16	19	23	26	29
14	1461	1492	1523	1553	1584	1614	1644	1673	1703	1732	3	6	9	12	15	18	21	24	27
15	1761	1790	1818	1847	1875	1903	1931	1959	1987	2014	3	6	8	11	14	17	20	22	25
16	2041	2068	2095	2122	2148	2175	2201	2227	2253	2279	3	5	8	11	13	16	18	21	24
17	2304	2330	2355	2380	2405	2430	2455	2480	2504	2529	2	5	7	10	12	15	17	20	22
18	2553	2577	2601	2625	2648	2672	2695	2718	2742	2765	2	5	7	9	12	14	16	19	21
19	2788	2810	2833	2856	2878	2900	2923	2945	2967	2989	2	4	7	9	11	13	16	18	20
20	3010	3032	3054	3075	3096	3118	3139	3160	3181	3201	2	4	6	8	11	13	15	17	19
21	3222	3243	3263	3284	3304	3324	3345	3365	3385	3404	2	4	6	8	10	12	14	16	18
22	3424	3444	3464	3483	3502	3522	3541	3560	3579	3598	2	4	6	8	10	12	14	15	17
23	3617	3636	3655	3674	3692	3711	3729	3747	3766	3784	2	4	6	7	9	11	13	15	17
24	3802	3820	3838	3856	3874	3892	3909	3927	3945	3962	2	4	5	7	9	11	12	14	16
25	3979	3997	4014	4031	4048	4065	4082	4099	4116	4133	2	3	5	7	9	10	12	14	15
26	4150	4166	4183	4200	4216	4232	4249	4265	4281	4298	2	3	5	17	8	10	11	13	15
27	4314	4330	4346	4362	4378	4393	4409	4425	4440	4456	2	3	5	6	8	9	11	13	14
28	4472	4487	4502	4518	4533	4548	4564	4579	4594	4609	2	3	5	6	8	9	11	12	14
29	4624	4639	4654	4669	4683	4698	4713	4728	4742	4757	1	3	4	6	7	9	10	12	13
30	4771	4786	4800	4814	4829	4843	4857	4871	4886	4900	î.	3	4	6	7	9	10	11	13
31	4914	4928	4942	4955	4969	4983	4997	5011	5024	5038	1	3	4	6	7	8	10	11	12
32	5051	5065	5079	5092	5105	5119	5132	5145	5159	5172	i	3	4	5	7	8	9	11	12
33	5185	5198	5211	5224	5237	5250	5263	5276	5289	5302	1	3	4	5	6	8	9	10	12
34	5315	5328	5340	5353	5366	5378	5391	5403	5416	5428	i	3	4	5	6	8	9	10	11
35	5441	5453	5465	5478	5490	5502	5514	5527	5539	5551	1	2	4	5	6	7	9	10	11
36	5563	5575	5587	5599	5611	5623	5635	5647	5658	5670	i	2	4	5	6	7	8	10	11
37	5682	5694	5705	5717	5729	5740	5752	5763	5775	5786	î	2	3	5	6	7	8	9	10
38	5798	5809	5821	5832	5843	5855	5866	5877	5888	5899	i	2	3	5	6	7	8	9	10
39	5911	5922	5933	5944	5955	5966	5977	5988	5999	6010	i	2	3	4	5	7	8	9	10
40	6021	6031	6042	6053	6064	6075	6085	6096	6107	6117	î	2	3	4	5	6	8	9	10
41	6128	6138	6149	6160	6170	6180	6191	6201	6212	6222	î	2	3	4	5	6	7	8	9
42	6232	6243	6253	6263	6274	6284	6294	6304	6314	6325	î	2	3	4	5	6	7	8	9
43	6335	6345	6355	6365	6375	6385	6395	6405	6415	6425	î	2	3	4	5	6	7	8	9
44	6435	6444	6454	6464	6474	6484	6493	6503	6513	6522	î	2	3	4	5	6	7	8	9
45	6532	6542	6551	6561	6571	6580	6590	6599	6609	6618	i	2	3	4	5	6	7	8	9
46	6628	6637	6646	6656	6665	6675	6684	6693	6702	6712	i	2	3	4	5	6	7	7	8
47	6721	6730	6739	6749	6758	6767	6776	6785	6794	6803	î	2	3	4	5	5	6	7	8
48	6812	6821	6830	6839	6848	6857	6866	6875	6884	6893	î	2	3	4	4	5	6	7	8
49	6902	6911	6920	6928	6937	6946	6955	6964	6972	6981	i	2	3	4	4	5	6	7	8
50	6990	6998	7007	7016	7024	7033	7042	7050	7059	7067	î	2	3	3	4	5	6	7	8
50	0990	0776	1007	1010	1024	1033	1042	1030	1039	1001	1	2	2	2	4	2	0	1	0

HOW TO FIND LOG OF A NUMBER?

Consider the number 12.

- _ To find the logarithm of this number:
- Step 1: Find the characteristic Step 2: Find the mantissa

FINDING CHARACTERISTIC Consider the number 235.7 This can be written as 2.357 x 10² Therefore, the decimal point had to be shifted to the left by 2 decimal places so that the number is between 1 and 10. 2 3 5 . 7 2 . 3 5 7 x 10²

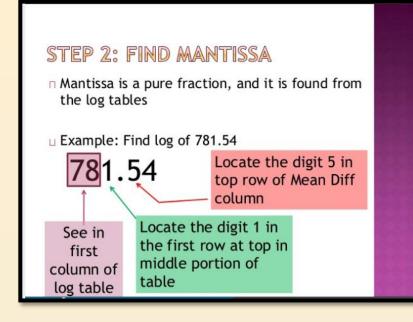
FINDING CHARACTERISTIC

n Step 1: Find characteristic

- Write the number by shifting the decimal point so that the number is between 1 and 10
 Shift the decimal point and multiply by the
- appropriate power of 10.

 E.g. Consider the no. 12
 12 = 12.0 = 1.2 x 10¹ (shift decimal point to left by 1 place)
 The power of 10 is the characteristic
 Therefore, characteristic is 1

FIND THE CHARACTERISTIC IN EACH
EXAMPLE78123Characteristic ?781.54Characteristic?3.142Characteristic?0.0067Characteristic?1538.2Characteristic?



FINDING LOG OF 781.54

- 1: Find characteristic (Characteristic = 2)
- 2: Find Mantissa
- \sqcap In log table, see **78** in 1st column
- \square Locate the digit 1 in the first row at top
- The number at intersection is 8927
- Locate digit 5 in Mean Difference column. The number is 3
- **8927 + 3 = 8930**
- □ So log(781.54) = 2.8930

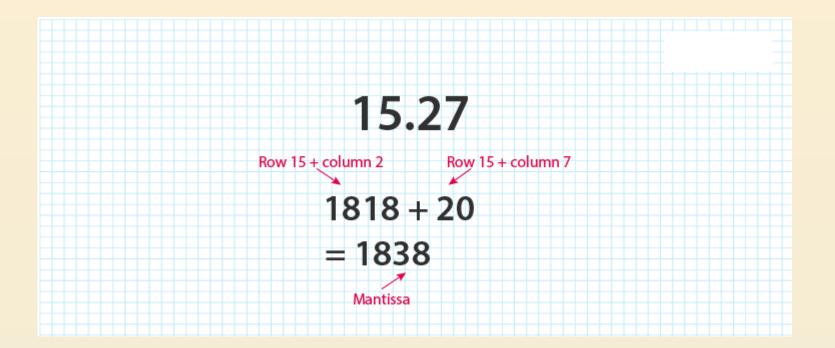
How to Use the Log Table?

The procedure is given below to find the log value of a number using the log table. First, you have to know how to use the log table. The log table is given for the reference to find the values.

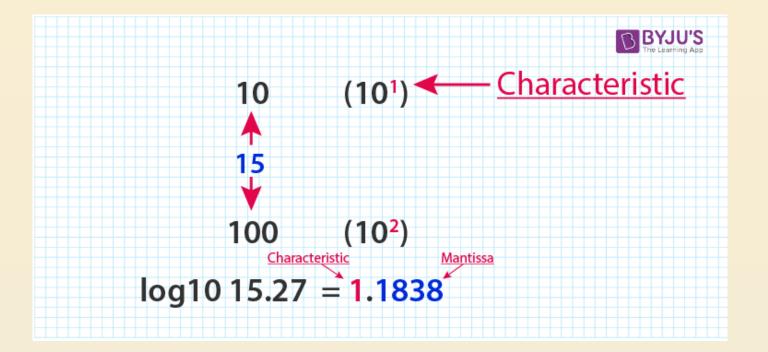
- **Step 1**: Understand the concept of the logarithm. Each log table is only usable with a certain base. The most common type of logarithm table is used is log base 10.
- Step 2: Identify the characteristics and mantissa part of the given number. For example, if you want to find the value of $\log_{10} (15.27)$, first separate the characteristic part and the mantissa part.
- Characteristic Part = 15
- Mantissa part = 27
- Step 3: Use a common log table. Now, use row number 15 and check column number 2 and write the corresponding value. So the value obtained is 1818.
- Step 4: Use the logarithm table with a mean difference. Slide your finger in the mean difference column number 7 and row number 15, and write down the corresponding value as 20.

						1	5.	27									\downarrow	
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13	1139	1173	1206	1239	- - 1271	1303	1335	1367	1399	1430	3	6	10	13	16	19	23	
14	1431	1492	1523	1553	1584	1614	1644	1673	1703	1732	3	6	9	12		18		
15	1761	1790	1818	1847	1875	1903	1931	1959	1987	2014	3	6	8	11	14	16	20)
16	2041	2068	2095	2122	2148	2175	2201	2227	2253	2279	3	5	8	11	13	16	7	
17	2304	2330	2355	2380	2405	2430	2455	2480	2504	2529	2	5	7	9	12	6	7	

• Step 5: Add both the values obtained in step 3 and step 4. That is 1818+20= 1838. Therefore, the value 1838 is the mantissa part.



- **Step 6**: Find the characteristic part. Since the number lies between 10 and 100, (10¹ and 10²), the characteristic part should be 1.
- **Step 7**: Finally combine both the characteristic part and the mantissa part, it becomes 1.1838.



Sample Example

Here the sample example to find the value of the logarithmic function using the logarithm table is given.

Question:

Find the value of $\log_{10} 2.872$

Solution:

- Step 1: Characteristic Part= 2 and mantissa part= 872
- Step 2: Check the row number 28 and column number 7. So the value obtained is 4579.
- Step 3: Check the mean difference value for row number 28 and mean difference column 2. The value corresponding to the row and column is 3
- Step 4: Add the values obtained in step 2 and 3, we get 4582. This is the mantissa part.
- Step 5: Since the number of digits to the left side of the decimal part is 1, the characteristic part is less than 1. So the characteristic part is 0
- Step 6: Finally combine the characteristic part and the mantissa part. So it becomes 0.4582.

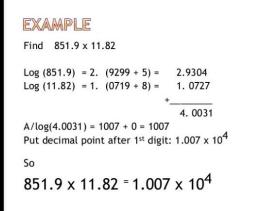
Therefore the value of log 2.872 is 0.4582.

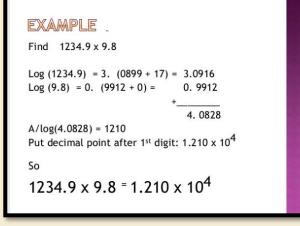
LAWS OF LOGARITHMS

Log(m x n) = Log M + log N

$$Log\left(\frac{M}{N}\right) = Log M - Log N$$

$$Log N^M = M Log N$$





EXAMPLE

Find 1234.9 / 9.8

Log (1234.9) = 3. (0899 + 17) = 3.0916 Log (9.8) = 0. (9912 + 0) = 0. 9912

2.1004

A/log(2.1004) = 1259 + 1 = 1260 Put decimal point after 1st digit: 1.260 x 10²

Use of Antilog

What Is an Antilog?

- An **antilog** is the result of raising the base being used to the logarithm given or calculated. Put another way, it "undoes" what calculating the logarithm of a number does and simply returns that number. In an equation of the form $\log_b x = y$, it is the "x" term, called the argument of the log function.
- "Antilog" can also be written \log_b^{-1} or just \log^{-1} where base 10 is implied by default.
- In summary, then:
- Antilog $x = \log_b^{-1}x = y = b^x$

A log number can then be returned to its original number. This can be done using **antilogarithm** (antilog). Thus, the antilog is the **inverse function** of log. Likewise, antilog functions to **exponentiate** a simplified log value.

To compute the antilog of a number y, you must raise the logarithm base b (usually 10, sometimes the constant e) to the power that will generate the number y.

 Here is the equation for antilog using base 10: 10^x = y Where x is the exponent and y is the antilog value.

• For instance, if we take this equation, log(5) = x, its antilog will be 10x = 5.

- Log: log(5) = 0.698970004336019
- Antilog: $10^{0.698970004336019} = 5$
- Now let's try it with a larger number.
- If we take log(150,000,000,000) = x, its antilog will be 10x = 150,000,000,000.
- Log: $\log_{10}(150,000,000,000) = 11.1760912590557$
- Antilog: $10^{11.1760912590557} = 150,000,000,000$

How to Calculate Antilog

Before finding the antilog of a number, we should know about the parts like characteristic and mantissa part.

Characteristic Part – The whole part is called the characteristic part. If the characteristic of any number greater than one is positive and one less than the number of digits to the left of the decimal point in a given number. If the number is less than one, its characteristics is negative and is one more than the number of zeros to the right of the decimal point.

Mantissa Part – The decimal part of the logarithm number for a given number is called the mantissa part and it should always be a positive value. If the mantissa part is in negative value, convert into the positive value.

Procedure to Find the Antilog of a Number

Method 1 : Using an Antilog Table

Consider a number, 2.6452

- Step 1: Separate the characteristic part and the mantissa part. From the given example the characteristic part is 2 and the mantissa part is 6452.
- Step 2: To find a corresponding value of the mantissa part uses the antilog table. Using the antilog table, find the corresponding value. Now, find the row number that starts with .64, then the column for 5. Now, you get the corresponding value as 4416.
- Step 3: From mean difference columns find the value. Again use the same row number .64 and find the value for column 2. Now, the value corresponding to this is 2.
- Step 4: Add the values obtained in step 2 and 3, we get 4416 + 2 = 4418.
- Step 5: Now insert the decimal point. The decimal point always goes the designated place. For this, you have to add 1 to the characteristic value. Now you get 3. Then add the decimal point after 3 digits, we get 441.8
- So the antilog value of 2.6452 is 441.8.

Method 2 : Antilog calculation

- Step 1 : Separate the characteristic part and the mantissa part. From the above example given, the characteristic part is 2 and the mantissa part is 6452.
- Step 2 : Know the base. For numerical computations, the base is always 10 . Therefore for computing the antilog use base 10.
- Step 3 : Calculate the 10^{X} . x is the number which you are using. If the mantissa of the number is 0, then the computation is easy. Calculate the value $10^{2.6452}$. Use calculator to find the value. Finally it comes 441.7
- Both the methods produces the same result.

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.01	1023	1026	1028 1052	1030 1054	1033	1035	1038 1062	1040	1042	1045	0	0	1	1	1	1	2	2	
03	1072	1074	1076	1079	1081	1084	1086	1089	1091	1094	0	0	1	1	1	1	2	2	
.04	1096 1122	1099	1102	1104	1107	1109	1112	1114	1117	1119	0	1	1	1	1	2	2 2	2	
.05		1125	1127	1130	1132	1135	1138	1140	1143	1146	0	1	1	1	1				
.06	1148	1151	1153	1156	1159	1161	1164	1167	1169	1172	0	1	1	1	1	2 2	2 2	2	
07	1175 1202	1178 1205	1180 1208	1183 1211	1186 1213	1189 1216	1191 1219	1194 1222	1197	1199 1227	0	1	1	1	1	2	2	2	
.09	1230	1233	1236	1239	1242	1245	1247	1250	1225 1253	1256	0	î	i	i.	1	22	2 2 2	2	
10	1259	1262	1265	1268	1271	1274	1276	1279	1282	1285	0	1	1	1	1	2	2	2	
.11	1288	1291	1294	1297	1300	1303	1306	1309	1312	1315	0	1	1	1	2	2	2	2	
.12	1318	1321	1324	1327	1330	1334	1337	1340	1343	1346	0	1	1	1	2	22	2	2	
.13	1349 1380	1352 1384	1355 1387	1358 1390	1361 1393	1365 1396	1368 1400	1371 1403	1374 1406	1377 1409	0	1	1	1	2	2 2	22	3	
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21	1622	1626	1667	1633	1675	1679	1683	1687	1690	1694 1734	Ő	î	î	2 2	2	22	3	3	
23	1698	1702	1706	1710	1714	1718	1722	1726	1730	1734	0	1	1	2	2	2	3	3	
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26	1820	1824	1828 1871	1832 1875	1837 1879	1841 1884	1845 1888	1849 1892	1854 1897	1858	0	1	1	2	2	3	3	3	
28	1905	1910	1914	1919	1923	1928	1932	1936	1941	1945	0	1	i	2	2	3	3	4	
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34	2188	2193	2198	2203	2208	2213	2218	2223	2228	2234	1	1	2	2	3	3	4	4	
.35	2239	2244	2249	2254	2259	2265	2270	2275	2280	2286	1	1	2	E	3	3	1	4	
.36	2291	2296	2301	2307	2312	2317	2323	2328	2333	2339	1	1	2	2	3	3	4	4	
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.40	2512	2518	2523	2529	2535	2541	2547	2553	2559	2564	1	1	2	2	3	4	4	5	
.41	2570	2576	2582	2588	2594	2600	2606	2612	2618	2624	1	1	2	2	3	4	4	5	
.42	2630	2636	2642	2649	2655	2661	2667	2673	2679	2685	11	1	2		3	4	4	5	
.43	2692 2754	2698 2761	2704	2710 2773	2716	2723	2729	2735	2742	2748	1	1	2	3	3	4	4	5	
.44	2754 2818	2761 2825	2767 2831	2773 2838	2780	2786	2793 2858	2799 2864	2805	2812 2877	li	i	2	3	3	4	5	5	
46	2884	2891	2897	2904	2911	2917	2924	2931	2938	2944	1.	1	2	3	3	4	5	5	
.47	2951	2958	2965	2972	2979	2985	2924 2992 3062	2931 2999 3069	3006	3013	1	1	2 2 2	3	3	4 4 4	5	5 6	
48	3020	3027	3034 3105	3041	3048	3055	3062	3069 3141	3076	3083 3155	1	1	2	3	4	4	5	6	
.49	3090 3162	3097 3170	3105 3177	3112 3184	3119 3192	3126 3199	3133 3206	3141 3214	3148 3221	3155 3228	1	1	2	3	4	4	5	6	
51	3236	3243	3251	3258	3266	3273	3281	3289	3296	3304		2	2	3	4	5	5	6	
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.53 .54	3388	3396	3404	3412	3420	3428	3436	3443	3451	3459	1		2 2	3	4	5	6	6	
.54	3467	3475	3483 3565	3491 3573	3499 3581	3508 3589	3516 3597	3524 3606	3532 3614	3540 3622	1	22	22	3	4 4	5 5	6	67	
	112.0	1.01	10.72	10.75	10.1	1.011	1000	100	1.1511	1000	13								
.56	3631 3715	3639 3724	3648 3733	3656 3741	3664 3750	3673 3758	3681 3767	3690 3776	3698 3784	3707 3793	1	2 2	3	3	4	5 5	6	7 7	
58	3802 3890	3811	3819	3828	3837	3846	3855	3864	3873	3882	1	2	3	4	4	5	6	7	
.59	3890	3899	3908	3917	3926	3936	3945	3954	3963	3972	1	22	3 3	4	5	5	6	7	
.60	3981	3990	3999	4009	4018	4027	4036	4046	4055	4064	1	2					0		
.61	4074	4083	4093	4102	4111	4121	4130	4140	4150	4159	1	22	3	4	5	6	7	8	
.62	4169 4266	4178 4276	4188 4285	4198 4295	4207 4305	4217 4315	4227 4325	4236 4335	4246 4345	4256 4355	li	2	3	4	5	6	77	8 8	
.64	4365	4375	4385	4395	4406	4416	4426	4436	4446	4457	11	2		4	5	6		8	
.65	4467	4477	4487	4498	4508	4519	4529	4539	4550	4560	i	2	3	4	5	6	777	8	
.66	4571	4581	4592	4603	4613	4624	4634	4645	4656	4667	1	2	3	4	5	6	7	9	
.67	4677	4688 4797	4699	4710	4721	4732	4742	4753	4764	4775	li	2	3	4	5	7	8	9 9	
.68	4786 4898	4909	4808 4920	4819 4932	4831 4943	4842 4955	4853	4864 4977	4875 4989	4887 5000	11	2	3	4	5	7	8	9	
.70	5012	5023	5035	5047	5058	5070	5082	5093	4989	5117	li	2	3	4	5	7	8	9	
.71	5129	5140	5152	5164	5176	5188	5200	5212	5224	5236	1.	2							
.72	5248	5260	5272	5284	5297	\$309	5321	5333	5346	5236	11	22	4	5	6	777	8	10 10	
.73	\$370	5383 5508	5395 5521	5408	5420	5433 5559	5445	5458	5470	5483	i	3	4	5	6	8	9	10	
74	5495 5623	5508	5521	5534 5662	5546 5675	5559	5572 5702	5585 5715	5598 5728	5610 5741		3	4	5	6 7	8 8	9	10 10	
.76	5754	5768	5781	5794	5808						1						1		
.77	5888	5902	5916	5970	5943	5821 5957	5834 5970	5848 5984	5861 5998	5875 6012	11	3	4	5	7	8 8	9 10	11 11	
.78	6026	6039 6180	6053	6067 6209	6081	6095	6109	6124	6138	6012 6152	i	3	4	6	7	8	10	11	
.79 .80	6166 6310	6180 6324	6194 6339	6209 6353	6223 6368	6237	6252 6397	6266 6412	6281 6427	6295 6442	1	3	4	6	77	9 9	10	11	
81	6457	10.00					1.11		1.00	1.0							10	12	
81 82	6457 6607	6471 6622	6486 6637	6501 6653	6516	6531	6546	6561 6714	6577 6730	6592	2	3	5	6	8	9	11	12	
83	6761	6776	6792	6808	6823	6839	6855	6871	6887	6745 6902	2	3	5	6	8	9	11	12	
84	6918	6934	6950	6966	6982	6998	7015	7031	7047	7063	2	3	5	6	8	10	ii	13	
85	7079	7096	7112	7129	7145	7161	7178	7194	7211	7228	2	3	5	17	8	10	12	13	
86	7244	7261	7278	7295	7311	7328	7345	7362	7379	7396	2	3		2	8	10	12		
87 88	7413	7430	7447	7464 7638	7482 7656	7499 7674	7516	7534 7709	7551	7396 7568	2	3	5	7	89	10	12	13 14	
89	7586	7603 7780	7621 7798	7638 7816	7656 7834	7674 7852	7691 7870	7709 7889	7727		2	4	5	7	9	11	12	14	ł
90	7943	7962	7980	7998	8017	8035	8054	7889 8072	7907 8091	7925 8110	22	4	5	777	9	11	13 13	14 15	
91	8128	8147	8166	8185	8204	8222	8241	8260	8279	8299	2	1	6	1.		'n	13		1
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25	8913	8933	8954	8974	8995	9016	8831 9036	8851 9057	8872 9078	8892 9099	2 2 2	4	6	8	10 10	12 12	14 15	16 17	1
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	9333 9550	9354 9572	9376 9594	9397 9616	9419 9638 9863	9441 9661 9886	9462 9683 9908	9484 9705 9931	9506 9727 9954	9528 9750 9977	2 2 2 2	4 4 5	6 7	99	n	13	15 15	17 17	1 11
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.10 .11 .12 .13 .14	1259 1288 1318 1349 1380 1413	1262 1291 1321 1352 1384 1416	1265 1294 1324 1355 1387 1419	1268 1297 1327 1358 1390 1422	1271 1300 1330 1361 1393 1426	1274 1303 1334 1365 1396 1429	1276 1306 1337 1368 1400 1432	1279 1309 1340 1371 1403 1435	1282 1312 1343 1374 1406 1439	1285 1315 1346 1377 1409 1442	0000000	1 1 1 1 1 1 1 1		1 2 2 2 2 2 2 2 2 2 2	2 2 2 2 2 2 2 2 2	2 2 2 2 2 2 2	
.15 .16 .17 .18 .19 .20	1413 1445 1479 1514 1549 1585	1415 1449 1483 1517 1552 1589	1419 1452 1486 1521 1556 1592	1455 1489 1524 1560 1596	1426 1459 1493 1528 1563 1600	1429 1462 1496 1531 1567 1603	1466 1500 1535 1570 1607	1469 1503 1538 1574 1611	1472 1507 1542 1578 1614	1442 1476 1510 1545 1581 1618	000000	1 1 1 1 1 1		2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	2 2 2 3 3	
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31 32 33 34 35	2042 2089 2138 2188 2239	2046 2094 2143 2193 2244	2051 2099 2148 2198 2249	2056 2104 2153 2203 2254	2061 2109 2158 2208 2259	2065 2113 2163 2213 2265	2070 2118 2168 2218 2270	2075 2123 2173 2223 2275	2080 2128 2178 2228 2280	2084 2133 2183 2234 2286	0 0 0 1 1		1 2 1 2 1 2 2 2 2 2	2 2 2 3 3	33333	33344	
.36 .37 .38 .39 .40	2291 2344 2399 2455 2512	2296 2350 2404 2460 2518	2301 2355 2410 2466 2523	2307 2360 2415 2472 2529	2312 2366 2421 2477 2535	2317 2371 2427 2483 2541	2323 2377 2432 2489 2547	2328 2382 2438 2495 2553	2333 2388 2443 2500 2559	2339 2393 2449 2506 2564	1 1 1 1 1 1	1 1 1 1 1 1	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	3333	33334	4 4 4 4 4	
.41 .42 .43 .44 .45	2570 2630 2692 2754 2818	2576 2636 2698 2761 2825	2582 2642 2704 2767 2831	2588 2649 2710 2773 2838	2594 2655 2716 2780 2844	2600 2661 2723 2786 2851	2606 2667 2729 2793 2858	2612 2673 2735 2799 2864	2618 2679 2742 2805 2871	2624 2685 2748 2812 2877	1 1 1 1 1 1	1 1 1 1 1 1 1	2 2 2 2 2 3 2 3 2 3	33	4 4 4 4	4 4 4 5	
.46 .47 .48 .49 .50	2884 2951 3020 3090 3162	2891 2958 3027 3097 3170	2897 2965 3034 3105 3177	2904 2972 3041 3112 3184	2911 2979 3048 3119 3192	2917 2985 3055 3126 3199	2924 2992 3062 3133 3206	2931 2999 3069 3141 3214	2938 3006 3076 3148 3221	2944 3013 3083 3155 3228	1 1 1 1 1	1 1 1 1	2 3 2 3 2 3 2 3 2 3 2 3	3 4 4 4	4 4 4 4 4	5 5 5 5 5 5	
.51 .52 .53 .54 .55	3236 3311 3388 3467 3548	3243 3319 3396 3475 3556	3251 3327 3404 3483 3565	3258 3334 3412 3491 3573	3266 3342 3420 3499 3581	3273 3350 3428 3508 3589	3281 3357 3436 3516 3597	3289 3365 3443 3524 3606	3296 3373 3451 3532 3614	3304 3381 3459 3540 3622	1 1 1 1 1	2 2 2 2 2 2 2	2 3 2 3 2 3 2 3 2 3 2 3	4	55555	5 5 6 6 6	
.56 .57 .58 .59 .60	3631 3715 3802 3890 3981	3639 3724 3811 3899 3990	3648 3733 3819 3908 3999	3656 3741 3828 3917 4009	3664 3750 3837 3926 4018	3673 3758 3846 3936 4027	3681 3767 3855 3945 4036	3690 3776 3864 3954 4046	3698 3784 3873 3963 4055	3707 3793 3882 3972 4064	1 1 1 1 1	2 2 2 2 2 2	3 3 3 3 3 4 3 4 3 4	5	55556	66666	
.61 .62 .63 .64 .65	4074 4169 4266 4365 4467	4083 4178 4276 4375 4477	4093 4188 4285 4385 4487	4102 4198 4295 4395 4498	4111 4207 4305 4406 4508	4121 4217 4315 4416 4519	4130 4227 4325 4426 4529	4140 4236 4335 4436 4539	4150 4246 4345 4446 4550	4159 4256 4355 4457 4560	1 1 1 1 1 1	2 2 2 2 2 2	3 4 3 4 3 4	5	666 66	777777777777777777777777777777777777777	
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.71 .72 .73 .74 .75	5129 5248 5370 5495 5623	5140 5260 5383 5508 5636	5152 5272 5395 5521 5649	5164 5284 5408 5534 5662	5176 5297 5420 5546 5675	5188 5309 5433 5559 5689	5200 5321 5445 5572 5702	5212 5333 5458 5585 5715	5224 5346 5470 5598 5728	5236 5358 5483 5610 5741	1 1 1 1 1 1	2 2 3 3 3	4 5 4 5 4 5	6 6 6 7	7 7 8 8 8	89999	
.76 .77 .78 .79 .80	5754 5888 6026 6166 6310	5768 5902 6039 6180 6324	5781 5916 6053 6194 6339	5794 5929 6067 6209 6353	5808 5943 6081 6223 6368	5821 5957 6095 6237 6383	5834 5970 6109 6252 6397	5848 5984 6124 6266 6412	5861 5998 6138 6281 6427	5875 6012 6152 6295 6442	1 1 1 1 1 1	3 3 3 3 3	4 5 6 6 4 6	77777	88899	9 10 10 10	
.81 .82 .83 .84 .85	6457 6607 6761 6918 7079	6471 6622 6776 6934 7096	6486 6637 6792 6950 7112	6501 6653 6808 6966 7129	6516 6668 6823 6982 7145	6531 6683 6839 6998 7161	6546 6699 6855 7015 7178	6561 6714 6871 7031 7194	6577 6730 6887 7047 7211	6592 6745 6902 7063 7228	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	3 3 3	5 6 5 6 5 6 5 6	8 8 8 8 8 8	9 9 9 10 10	11 11 11 11	
.86 .87 .88 .89 .90	7244 7413 7586 7762 7943	7261 7430 7603 7780 7962	7278 7447 7621 7798 7980	7295 7464 7638 7816 7998	7311 7482 7656 7834 8017	7328 7499 7674 7852 8035	7345 7516 7691 7870 8054	7362 7534 7709 7889 8072	7379 7551 7727 7907 8091	7396 7568 7745 7925 8110	2 2 2 2 2 2 2	3	5 7 7 5 7 7 7 5 7 7	8 9 9 9 9	10 10 11 11	12 12 12 13 13	
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COMMON ANTILOGARITHM TABLE

Sample Example

Question : Find the antilog of 3.3010

Solution:

- Given, antilog (3.3010)
- Step 1 : Characteristics part = 3 and mantissa part = 3010
- Step 2 : Use antilog table for the row .30 , then the column for 1, you get 2000.
- Step 3 : Find the value from mean difference column for the row .30 and column 0, it gives the value 0
- Step 4 : Add the values obtained in step 2 and 3, 2000 + 0 = 2000.
- Step 5 : Now insert the decimal place. We know that the characteristic part is 3 and we have to add it with 1. Therefore we get the value 4. Insert the decimal point after 4 places, we get 2000.
- Therefore, the solution of the antilog 3.3010 is 2000

- If $\log M = x$, then M is called the antilogarithm of x and is written as M = antilog x.
- For example, if log 39.2 = 1.5933, then antilog 1.5933 = 39.2.
- If the logarithmic value of a number be given then the number can be determined from the antilog-table. Antilog-table is similar to log-table; only difference is in the extreme left-hand column which ranges from .00 to .99.

• Example on antilogarithm:

1. Find antilog 2.5463.

Solution:

Clearly, we are to find the number whose logarithm is 2.5463. For this consider the mantissa .5463. Now find .54 in the extreme left-hand column of the antilog-table (see four-figure antilog-table) and then move horizontally to the right to the column headed by 6 of the top-most row and read the number 3516. Again we move along the same horizontal line further right to the column headed by 3 of mean difference and read the number 2 there. This 2 is now added to the previous number 3516 to give 3518. Since the characteristic is 2, there should be three digits in the integral part of the required number.

Therefore, antilog 2.5463 = 351.8.

• **2.** If log x = -2.0258, find x.

• Solution:

In order to find the value of x using antilog-table, the decimal part (i.e., the mantissa) must be made positive. For this we proceed as follows:

 $\log x = -2.0258 = -3 + 3 - 2.0258$

= - 3 + .9742 = 3.9742

Therefore, x = antilog 3.9742.

Now, from antilog table we get the number corresponding to the mantissa .9742 as (9419 + 4) = 9423. Again the characteristic in log x is (- 3).

Hence, there should be two zeroes between the decimal point and the first significant digit in the value of x. Therefore, x = .009423.

FINDING SQUARE ROOT

- Find square root of 320
- □ (320)^{1/2}
- □ = ½ log (320)
- □ = ½ x (2.5051)
- □ = 1.2525
- □ A/Log(1.2525)

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⊔ 1786 + 2 = 1788
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 \Box 1.788 x10¹ = 17.88

Therefore square root of 320 is 17.88