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**LOGARITHMS OF FACTORIALS
FROM 1 TO 2000**

by

D B OWEN

and

C M WILLIAMS

DECEMBER 1959

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ABSTRACT

A table of logarithms, to the base 10, of factorial n is given for values of $n = 1(1)2000$ to 15 decimal places. The table has applications in acceptance sampling for attributes, among other uses. The logarithms of the factorials are also available on magnetic tape No. 128 for the Sandia Corporation IBM 704 Data Processing System.

LOGARITHMS OF FACTORIALS FROM 1 TO 2000

Tables of logarithms of factorials up to 1000 are available in many places. See, for example, References 1, 2, and 3. Tables going up to 1200 are also not unusual. See, for example, References 4 and 5, the latter of which gives the logarithms to 18 decimal places. The most extensive table, listed in Reference 6, of the logarithms of factorials was prepared by F. J. Duarte (Reference 7). This table gives the logarithms of factorials to 33 decimal places from $n = 1$ to $n = 3000$. Another table by F. J. Duarte (Reference 8) gives the logarithms of factorials for $n = 3050(50)10,000(10,000)100,000$ and 10^6 to 36 decimal places.

Unfortunately Duarte's tables are out of print, and the authors of the present paper were unable to locate copies of them. The Sandia Corporation Reliability Department requested more extensive tables than those given in References 4 and 5. Therefore a computing program was developed on the Sandia Corporation IBM 704 Data Processing System. Table II gives logarithms to the base 10 of $n!$ for $n = 1$ to $n = 2000$ to 15 decimal places and was reproduced directly from the print-out of the IBM 704. These values are also available on magnetic tape No. 128 for the IBM 704 Data Processing System. Instructions on the use of the tape are with the tape and will not be repeated here.

Table II was checked against Reference 5 up to $n = 1200$ and found to agree exactly. As a further check on the accuracy of the table, the Stirling Approximation to factorials was computed for a few values of n . The Stirling formula is given in Reference 9, where the first power of e should obviously be changed from n to $-n$ giving:

$$n! = \sqrt{2\pi n} n^n e^{-n} e^{\omega(n)},$$

where

$$\frac{1}{12n+6} < \omega(n) < \frac{1}{12n}.$$

Translated to logarithms, this becomes

$$\log_{10} n! = \frac{1}{2} \log_{10} 2\pi + (n + \frac{1}{2}) \log_{10} n - [n - \omega(n)] \log_{10} e.$$

This formula was used to compute the lower limit and upper limit on $\log n!$ as in Table I. An examination of Table I indicates that 12 decimal places of accuracy are obtainable for $\log_{10} n!$ using the upper limit in Stirling's formula when n is 2000 or more.

The method of computation of Table II was as follows. The logarithms to the base 10 to 20 decimal places of all prime numbers up to 2000 from Reference 10 were punched on cards. Table III is a print-out of these logarithms. The IBM 704 factored each integer from 1 to 2000 into prime factors. The appropriate logarithms were then summed to give $\log_{10} n!$.

Now it will be shown that the maximum error that could have occurred in computing Table II is one in the 16th decimal place.

A number N can have at most $[\log_2 N]$ prime factors where $[N]$ means the greatest integer in N . Also, if numbers are incorrect by $\pm a$, then the total arrived at by m additions can be in error by at most $\pm ma$.

Since

$$\log n! = \sum_{i=1}^n \log i,$$

and for each i there are at most $[\log_2 i]$ factors, the total number of additions required in computing $\log n!$ is at most k , where

$$\begin{aligned} k &\leq [\log_2 n] + [\log_2(n-1)] + \dots + [\log_2 1] \\ &\leq \int_1^{n+1} \log_2 x \, dx = \log_2 e [(n+1) \log_e(n+1) - n]. \end{aligned}$$

For $n = 2000$, $k \leq 19,045$. If it is assumed that the logarithms of primes are correct to 20 decimal places, the total error of k additions to arrive at $\log 2000!$ is at the very most $\pm 0.00000000000000005k$ or ± 0.000000000000095225 . In other words, the maximum error introduced by the addition of the logarithms for Table II is at most one in the 16th decimal place. This analysis, of course, assumes no cancellation of errors. In addition, the number of additions required is grossly overestimated. Consequently the actual error must be considerably less than the estimated maximum.

Example of the Use of the Table. Suppose a lot contains 1800 items and 1 percent of these items are defective. What is the probability (p) that in a sample of 200 items no defectives are found?

TABLE I

Comparison of Tabulated Values of Log n! with Stirling's Limits

n	Lower limit			Value from table			Upper limit			Difference times 10^{15} *
1200	3175.80282	76772	28335	3175.80282	76897	88793	3175.80282	76897	89493	700
1500	4114.68232	54117	82428	4114.68232	54198	21879	4114.68232	54198	22238	359
1750	4917.32187	15036	29312	4917.32187	15095	36166	4917.32187	15095	36393	227
1900	5406.51081	19718	44307	5406.51081	19768	55443	5406.51081	19768	55621	178
1950	5570.73737	82402	64970	5570.73737	82450	22456	5570.73737	82450	22620	164
1999	5732.21962	05488	81721	5732.21962	05534	09064	5732.21962	05534	09217	153
2000	5735.52065	05445	50428	5735.52065	05490	73045	5735.52065	05490	73198	153

* Difference times 10^{15} = (upper limit - value from table) 10^{15}

The solution to this problem is given by the following probability from the hypergeometric distribution:

$$p = \frac{\binom{1620}{200} \binom{180}{0}}{\binom{1800}{200}} = \frac{1620! \cdot 1600!}{1420! \cdot 1800!}$$

where the braces indicate the combinations of n things taken r at a time and $\binom{n}{r} = \frac{n!}{r! (n-r)!}$.

From Table II,

$$\log_{10} 1620! = 4497.86113$$

$$\log_{10} 1420! = 3861.52654$$

$$\log_{10} 1600! = \frac{4433.72197}{8931.58310}$$

$$\log_{10} 1800! = \frac{5079.78719}{8941.31373}$$

$$\log_{10} p = 8931.58310 - 8941.31373 = 0.26937 - 10,$$

or

$$p = 0.1859 \times 10^{-8},$$

and hence it is almost sure that there will be at least one defective item in the sample of 200.

Uses of the hypergeometric distribution in sampling are further illustrated in

Reference 11.

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TABLE II

Logarithms of Factorials to 2000

N	LOG N!		
1	0.00000	00000	00000
2	0.30102	99956	63981
3	0.77815	12503	83644
4	1.38021	12417	11606
5	2.07918	12460	47625
6	2.85733	24964	31268
7	3.70243	05364	45525
8	4.60552	05234	37469
9	5.55976	30328	76794
10	6.55976	30328	76794
11	7.60115	57180	35019
12	8.68033	69640	82644
13	9.79428	03163	89480
14	10.94040	83520	67718
15	12.11649	96111	23400
16	13.32061	95937	79324
17	14.55106	85151	57598
18	15.80634	10202	60904
19	17.08509	46212	13733
20	18.38612	46168	77715
21	19.70834	39116	11634
22	21.05076	65924	33840
23	22.41249	44284	51433
24	23.79270	56701	63039
25	25.19064	56788	35077
26	26.60561	90268	05895
27	28.03698	27909	64882
28	29.48414	08223	07101
29	30.94653	88202	06057
30	32.42366	00749	25720
31	33.91502	17687	59992
32	35.42017	17470	79898
33	36.93868	56869	57786
34	38.47016	46040	00041
35	40.01423	26483	50317
36	41.57053	51491	17604
37	43.13873	68731	84599
38	44.71852	04698	01409
39	46.30958	50768	27908
40	47.91164	50681	55871
41	49.52442	89248	75606
42	51.14767	82152	73506
43	52.78114	66708	53093
44	54.42459	93473	39280
45	56.07781	18611	14624
46	57.74056	96927	96198
47	59.41266	75507	31916
48	61.09390	87881	07503
49	62.78410	48681	36017
50	64.48307	48724	72035

N	LOG N!		
51	66.19064	50485	69972
52	67.90664	83922	04771
53	69.63092	42618	05560
54	71.36331	80216	28528
55	73.10368	07111	22772
56	74.85186	87381	28973
57	76.60774	35938	01464
58	78.37117	15873	64401
59	80.14202	35990	06546
60	81.92017	48493	90189
61	83.70550	46844	00956
62	85.49789	63738	99210
63	87.29723	69233	52792
64	89.10341	68973	36679
65	90.91633	02539	79535
66	92.73587	41895	21403
67	94.56194	89922	22230
68	96.39445	79049	28466
69	98.23330	69956	65721
70	100.07840	50356	79978
71	101.92966	33843	99053
72	103.78699	58808	30322
73	105.65031	87409	50778
74	107.51955	04606	81754
75	109.39461	17240	73454
76	111.27542	53163	54245
77	113.16191	60415	26727
78	115.05401	06442	17208
79	116.95163	77355	07649
80	118.85472	77224	99593
81	120.76321	27413	78242
82	122.67702	65937	61959
83	124.59610	46861	38033
84	126.52038	39721	99915
85	128.44980	28979	14207
86	130.38430	13491	57775
87	132.32382	06017	76394
88	134.26830	32739	26562
89	136.21769	32805	71475
90	138.17193	57900	10800
91	140.13097	71823	31894
92	142.09476	50096	77449
93	144.06324	79582	31384
94	146.03637	58118	31083
95	148.01409	94171	19930
96	149.99637	06501	59499
97	151.98314	23844	25744
98	153.97436	84601	18238
99	155.97000	36547	15788
100	157.97000	36547	15788

N	LOG N!			N	LOG N!		
101	159.97432	50284	98431	151	264.93587	03582	19209
102	161.98292	52002	60349	152	267.11771	39461	63981
103	163.99576	24249	65521	153	269.30240	53769	81580
104	166.01279	57642	64301	154	271.48992	60978	18043
105	168.03398	50633	34239	155	273.68025	77959	88335
106	170.05929	09285	99009	156	275.87338	23943	42796
107	172.08867	47062	84219	157	278.06928	20467	52030
108	174.12209	84617	71169	158	280.26793	91337	06453
109	176.15952	49597	11792	159	282.46933	62580	26904
110	178.20091	76448	70017	160	284.67345	62406	82829
111	180.24624	06236	56675	161	286.88028	21167	14679
112	182.29545	86463	26856	162	289.08979	71312	57310
113	184.34853	70898	10276	163	291.30198	47356	61267
114	186.40544	19411	46749	164	293.51682	85837	08965
115	188.46613	97815	00360	165	295.73431	25279	22871
116	190.53059	77707	27279	166	297.95442	06159	62927
117	192.59878	36324	73441	167	300.17713	70871	10510
118	194.67066	56397	79566	168	302.40244	63688	36373
119	196.74621	26011	72097	169	304.63033	30734	50046
120	198.82539	38472	19722	170	306.86078	19948	28320
121	200.90817	92175	36172	171	309.09377	81052	20474
122	202.99453	90482	10920	172	311.32930	65521	28023
123	205.08444	41596	50318	173	313.56735	26552	56818
124	207.17786	58448	12553	174	315.80790	19035	39418
125	209.27477	58578	20609	175	318.05093	99522	25713
126	211.37514	64029	38172	176	320.29645	26200	39862
127	213.47895	01238	94129	177	322.54442	58864	01669
128	215.58616	00935	41997	178	324.79484	58887	10563
129	217.69674	98038	41246	179	327.04769	89196	90456
130	219.81069	31561	48083	180	329.30297	14247	93762
131	221.92796	44518	03847	181	331.56064	99996	62947
132	224.04853	83830	09697	182	333.82072	13876	48021
133	226.17239	00239	76783	183	336.08317	24773	78451
134	228.29949	48223	41591	184	338.34799	03003	87987
135	230.42982	85908	36597	185	340.61516	20287	91001
136	232.56336	74992	06814	186	342.88467	49730	08918
137	234.70008	80663	63221	187	345.15651	65795	45417
138	236.83996	71527	64458	188	347.43067	44288	09096
139	238.98298	19530	18553	189	349.70713	62329	82341
140	241.12910	99886	96791	190	351.98588	98339	35169
141	243.27832	91013	52171	191	354.26692	32011	82897
142	245.43061	74457	35227	192	356.55022	44298	86447
143	247.58595	34832	00289	193	358.83578	17388	94220
144	249.74431	59752	95539	194	361.12358	34688	24446
145	251.90568	39775	30513	195	363.41361	80801	86964
146	254.07003	68333	14951	196	365.70587	41515	43440
147	256.23735	41680	63127	197	368.00034	03777	05033
148	258.40761	58834	58084	198	370.29700	55679	66565
149	260.58080	21518	70358	199	372.59585	86443	76271
150	262.75689	34109	26039	200	374.89688	86400	40252

N	LOG N!			N	LOG N!		
201	377.20008	46974	60741	251	494.90926	01169	42653
202	379.50543	60669	07365	252	497.31066	06577	24198
203	381.81293	21048	20578	253	499.71378	11789	00015
204	384.12256	22722	46477	254	502.11861	48955	19954
205	386.43431	61333	02231	255	504.52515	50759	53909
206	388.74818	33536	71384	256	506.93339	50412	65758
207	391.06415	36991	28302	257	509.34332	81645	97053
208	393.38221	70340	91064	258	511.75494	78705	60283
209	395.70236	33202	02118	259	514.16824	76346	41535
210	398.02458	26149	36037	260	516.58322	09826	12353
211	400.34886	50702	33730	261	518.99986	14899	50634
212	402.67520	09311	62481	262	521.41816	27812	70379
213	405.00358	05346	01219	263	523.83811	85297	60137
214	407.33399	43079	50410	264	526.25972	24566	29968
215	409.66643	27678	66015	265	528.68296	83305	66776
216	412.00088	65190	16946	266	531.10784	99671	97843
217	414.33734	62528	65475	267	533.53436	12285	62418
218	416.67580	27464	70080	268	535.96249	60225	91207
219	419.01624	68613	10199	269	538.39224	83025	93615
220	421.35866	95421	32405	270	540.82361	20667	52602
221	423.70306	18158	17515	271	543.25658	13576	27008
222	426.04941	47902	68154	272	545.69115	02616	61207
223	428.39771	96533	16315	273	548.12731	29087	01963
224	430.74796	76716	50478	274	550.56506	34715	22351
225	433.10015	01897	61840	275	553.00439	61653	52613
226	435.45425	86289	09241	276	555.44530	52474	17831
227	437.81028	44861	02364	277	557.88778	50164	82280
228	440.16821	93331	02817	278	560.33182	98124	00356
229	442.52805	48154	42705	279	562.77743	40156	73953
230	444.88978	26514	60298	280	565.22459	20470	16173
231	447.25339	46313	52443	281	567.67329	83669	21253
232	449.61888	26162	43342	282	570.12354	74752	40614
233	451.98623	85372	69361	283	572.57533	39107	64904
234	454.35545	43946	79504	284	575.02865	22508	11942
235	456.72652	22569	51240	285	577.48349	71108	20452
236	459.09943	42599	21347	286	579.93986	31439	49495
237	461.47418	26059	31451	287	582.39774	50406	83487
238	463.85075	95629	87963	288	584.85713	75284	42718
239	466.22915	74639	36101	289	587.31803	53711	99266
240	468.60936	87056	47707	290	589.78043	33690	98222
241	470.99138	57482	22575	291	592.24432	63580	84129
242	473.37520	11142	03006	292	594.70970	92095	32548
243	475.76080	73878	01318	293	597.17657	68298	86657
244	478.14819	72141	40048	294	599.64492	41602	98814
245	480.53736	32985	04580	295	602.11474	61762	76977
246	482.92829	84056	07959	296	604.58603	78873	35916
247	485.32099	53588	67625	297	607.05879	43366	53128
248	487.71544	70396	93841	298	609.53301	06007	29383
249	490.11164	63867	89578	299	612.00868	17890	53813
250	492.50958	63954	61615	300	614.48580	30437	73476

N	LOG N!			N	LOG N!		
301	616.96436	95393	67319	351	742.63728	13326	98287
302	619.44437	64823	24470	352	745.18382	39961	76418
303	621.92581	91108	26775	353	747.73159	87015	64241
304	624.40869	26944	35528	354	750.28060	19635	90029
305	626.89299	25337	82314	355	752.83083	03166	45123
306	629.37871	39602	63894	356	755.38228	03146	17998
307	631.86585	23357	41081	357	757.93494	85307	30191
308	634.35440	30522	41525	358	760.48883	15573	74066
309	636.84436	15316	66359	359	763.04392	60059	52385
310	639.33572	32255	00632	360	765.60022	85067	19672
311	641.82848	36145	27470	361	768.15773	57086	25330
312	644.32263	82085	45912	362	770.71644	42791	58496
313	646.81818	25460	92361	363	773.27635	09041	94608
314	649.31511	21941	65576	364	775.83745	22878	43664
315	651.81342	27479	55176	365	778.39974	51523	00139
316	654.31310	98305	73580	366	780.96322	62376	94550
317	656.81416	90927	91332	367	783.52789	23019	46639
318	659.31659	62127	75764	368	786.09374	01206	20157
319	661.82038	68958	32946	369	788.66076	64867	79217
320	664.32553	68741	52851	370	791.22896	82108	46212
321	666.83204	19065	57724	371	793.79834	21204	61258
322	669.33989	77782	53554	372	796.36888	50603	43155
323	671.84910	03005	84657	373	798.94059	38921	51843
324	674.35964	53107	91269	374	801.51346	54943	52323
325	676.87152	86717	70144	375	804.08749	67620	80042
326	679.38474	62718	38083	376	806.66268	46070	07703
327	681.89929	40244	98369	377	809.23902	59572	13496
328	684.41516	78682	10048	378	811.81651	77570	50721
329	686.93236	37661	60022	379	814.39515	69670	18794
330	689.45087	77060	37910	380	816.97494	05636	35604
331	691.97070	56998	13629	381	819.55586	55393	11223
332	694.49184	37835	17665	382	822.13792	89022	22932
333	697.01428	80170	23985	383	824.72112	76761	91554
334	699.53803	44838	35549	384	827.30545	89005	59085
335	702.06307	92908	72394	385	829.89091	96300	67586
336	704.58941	85682	62238	386	832.47750	69347	39341
337	707.11704	84691	33577	387	835.06521	78997	58252
338	709.64596	51694	11232	388	837.65404	96253	52460
339	712.17616	48676	14314	389	840.24399	92266	78167
340	714.70764	37846	56569	390	842.83506	38337	04667
341	717.24039	81636	49067	391	845.42724	05911	00533
342	719.77442	42697	05202	392	848.02052	66581	20991
343	722.30971	83897	47972	393	850.61491	92084	96417
344	724.84627	68323	19502	394	853.21041	54303	21991
345	727.38409	59273	92777	395	855.80701	25259	48452
346	729.92317	20261	85553	396	858.40470	77118	73964
347	732.46350	15009	76427	397	861.00349	82186	37079
348	735.00508	07449	23008	398	863.60338	12907	10767
349	737.54790	61718	82188	399	866.20435	41863	97515
350	740.09197	42162	32463	400	868.80641	41777	25477

N	LOG N!		
401	871.40955	85503	45660
402	874.01378	46034	30130
403	876.61908	96495	71239
404	879.22547	10146	81844
405	881.83292	60378	96513
406	884.44145	20714	73707
407	887.05104	64806	98927
408	889.66170	66437	88807
409	892.27342	99517	96149
410	894.88621	38085	15884
411	897.50005	56303	91953
412	900.11495	28464	25088
413	902.73090	28980	81489
414	905.34790	32392	02388
415	907.96595	13359	14481
416	910.58504	46665	41223
417	913.20518	07215	14981
418	915.82635	70032	90016
419	918.44857	10262	36311
420	921.07182	03166	54212
421	923.69610	24124	89880
422	926.32141	48634	51554
423	928.94775	52308	26596
424	931.57512	10874	19329
425	934.20351	00174	69641
426	936.83291	96165	72360
427	939.46334	74915	97383
428	942.09479	12606	10555
429	944.72724	85527	95280
430	947.36071	70083	74866
431	949.99519	42785	35598
432	952.63067	80253	50510
433	955.26716	59217	03875
434	957.90465	56512	16386
435	960.54314	49081	71023
436	963.18263	13974	39609
437	965.82311	28344	10031
438	968.46458	69449	14131
439	971.10705	14651	56252
440	973.75050	41416	42440
441	976.39494	27311	10278
442	979.04036	50004	59370
443	981.68676	87266	82440
444	984.33415	16967	97059
445	986.98251	17077	77991
446	989.63184	65664	90133
447	992.28215	40896	22069
448	994.93343	21036	20213
449	997.58567	84446	23536
450	1000.23889	09583	98880

N	LOG N!		
451	1002.89306	75002	76841
452	1005.54820	59350	88223
453	1008.20430	41371	01055
454	1010.86135	99899	58159
455	1013.51937	13866	15271
456	1016.17833	62292	79706
457	1018.83825	24293	49556
458	1021.49911	79073	53425
459	1024.16093	05928	90687
460	1026.82368	84245	72261
461	1029.48738	93499	61909
462	1032.15203	13255	18034
463	1034.81761	23165	35987
464	1037.48413	02970	90868
465	1040.15158	32499	80822
466	1042.81996	91666	70822
467	1045.48928	60472	36935
468	1048.15953	19003	11059
469	1050.83070	47430	26143
470	1053.50280	26009	61859
471	1056.17582	35080	90756
472	1058.84976	55067	24843
473	1061.52462	66474	62655
474	1064.20040	49891	36740
475	1066.87709	85987	61607
476	1069.55470	55514	82100
477	1072.23322	39305	22214
478	1074.91265	18271	34332
479	1077.59298	73405	48896
480	1080.27422	85779	24483
481	1082.95637	36542	93315
482	1085.63942	06925	37164
483	1088.32336	78232	88676
484	1091.00821	31849	33089
485	1093.69395	49235	35353
486	1096.38059	11927	97646
487	1099.06812	01540	12280
488	1101.75653	99760	14991
489	1104.44584	88351	38611
490	1107.13604	49151	67125
491	1109.82712	64072	90093
492	1112.51909	15100	57454
493	1115.21193	84293	34684
494	1117.90566	53782	58331
495	1120.60027	05771	91899
496	1123.29575	22536	82097
497	1125.99210	86424	15429
498	1128.68933	79851	75146
499	1131.38743	85307	98536
500	1134.08640	85351	34555

N	LOG N!		
501	1136.78624	62610	01801
502	1139.48694	99781	46820
503	1142.18851	79632	02748
504	1144.89094	84996	48273
505	1147.59423	98777	66934
506	1150.29839	03946	06733
507	1153.00339	83539	40069
508	1155.70926	20662	23989
509	1158.41597	98485	60747
510	1161.12355	00246	58684
511	1163.83197	09247	93396
512	1166.54124	08857	69227
513	1169.25135	82508	81043
514	1171.96232	13698	76319
515	1174.67412	85989	17510
516	1177.38677	83005	44721
517	1180.10026	88436	38664
518	1182.81459	86033	83897
519	1185.52976	59612	32355
520	1188.24576	93048	67154
521	1190.96260	70281	66679
522	1193.68027	75311	68941
523	1196.39877	92200	36215
524	1199.11811	05070	19942
525	1201.83826	98104	25898
526	1204.55925	55545	79637
527	1207.28106	61697	92184
528	1210.00370	00923	25996
529	1212.72715	57643	61182
530	1215.45143	16339	61971
531	1218.17652	61550	43440
532	1220.90243	77873	38488
533	1223.62916	49963	65061
534	1226.35670	62533	93617
535	1229.08506	00354	14846
536	1231.81422	48251	07616
537	1234.54419	91108	07171
538	1237.27498	13864	73560
539	1240.00657	01516	60299
540	1242.73896	39114	83268
541	1245.47216	11765	89837
542	1248.20616	04631	28224
543	1250.94096	02927	17071
544	1253.67655	91924	15251
545	1256.41295	56946	91893
546	1259.15014	83373	96630
547	1261.88813	56637	30061
548	1264.62691	62222	14430
549	1267.36648	85666	64522
550	1270.10685	12561	58766

N	LOG N!		
551	1272.84800	28550	10551
552	1275.58994	19327	39750
553	1278.33266	70640	44448
554	1281.07617	68287	72878
555	1283.82046	98118	95554
556	1286.56554	46034	77612
557	1289.31139	97986	51341
558	1292.05803	39975	88919
559	1294.80544	58054	75343
560	1297.55363	38324	81543
561	1300.30259	66937	37705
562	1303.05233	30093	06766
563	1305.80284	14041	58112
564	1308.55412	05081	41454
565	1311.30616	89559	60893
566	1314.05898	53871	49164
567	1316.81256	84460	42071
568	1319.56691	67817	53090
569	1322.32202	90481	48161
570	1325.07790	39038	20652
571	1327.83454	00120	66500
572	1330.59193	60408	59524
573	1333.35009	06628	26914
574	1336.10900	25552	24888
575	1338.86867	03999	14518
576	1341.62909	28833	37730
577	1344.39026	86964	93462
578	1347.15219	65349	13991
579	1349.91487	50986	41427
580	1352.67830	30922	04364
581	1355.44247	92245	94695
582	1358.20740	22092	44584
583	1360.97307	07640	03598
584	1363.73948	36111	15997
585	1366.50663	94771	98178
586	1369.27453	70932	16268
587	1372.04317	51944	63883
588	1374.81255	25205	40021
589	1377.58266	78153	27123
590	1380.35351	98269	69267
591	1383.12510	73078	50522
592	1385.89742	90145	73442
593	1388.67048	37079	37705
594	1391.44427	01529	18898
595	1394.21878	71186	47448
596	1396.99403	33783	87684
597	1399.77000	77095	17053
598	1402.54670	88935	05464
599	1405.32413	57158	94776
600	1408.10228	69662	78419

N	LOG N!		
601	1410.88116	14382	81159
602	1413.66075	79295	38983
603	1416.44107	52416	79135
604	1419.22211	21803	00267
605	1422.00386	75549	52735
606	1424.78634	01791	19022
607	1427.56952	88701	94279
608	1430.35343	24494	67014
609	1433.13804	97420	99889
610	1435.92337	95771	10657
611	1438.70942	07873	53211
612	1441.49617	22094	98772
613	1444.28363	26840	17187
614	1447.07180	10551	58355
615	1449.86067	61709	33771
616	1452.65025	68830	98197
617	1455.44054	20471	31439
618	1458.23153	05222	20254
619	1461.02322	11712	40372
620	1463.81561	28607	38626
621	1466.60870	44609	15206
622	1469.40249	48456	06025
623	1472.19698	28922	65195
624	1474.99216	74819	47619
625	1477.78804	74992	91694
626	1480.58462	18325	02124
627	1483.38188	93733	32840
628	1486.17984	90170	70036
629	1488.97849	96625	15305
630	1491.77784	02119	68887
631	1494.57786	95712	13021
632	1497.37858	66494	95406
633	1500.17999	03595	12761
634	1502.98207	96173	94494
635	1505.78485	33426	86470
636	1508.58831	04583	34883
637	1511.39244	98906	70234
638	1514.19727	05693	91396
639	1517.00277	14275	49796
640	1519.80895	14015	33684
641	1522.61580	94310	52501
642	1525.42334	44591	21354
643	1528.23155	54320	45576
644	1531.04044	12994	05388
645	1533.85000	10140	40656
646	1536.66023	35320	35740
647	1539.47113	78127	04441
648	1542.28271	28185	75034
649	1545.09495	75153	75403
650	1547.90787	08720	18259

N	LOG N!		
651	1550.72145	18605	86451
652	1553.53569	94563	18371
653	1556.35061	26375	93445
654	1559.16619	03859	17712
655	1561.98243	16859	09495
656	1564.79933	55252	85155
657	1567.61690	08948	44936
658	1570.43512	67884	58892
659	1573.25401	22030	52902
660	1576.07355	61385	94770
661	1578.89375	75980	80411
662	1581.71461	55875	20110
663	1584.53612	91159	24884
664	1587.35829	71952	92901
665	1590.18111	88405	96006
666	1593.00459	30697	66307
667	1595.82871	89036	82856
668	1598.65349	53661	58401
669	1601.47892	14839	26225
670	1604.30497	62866	27051
671	1607.13171	88067	96043
672	1609.95908	80798	49868
673	1612.78710	31440	73845
674	1615.61576	30406	09165
675	1618.44506	68134	40190
676	1621.27501	35093	81826
677	1624.10560	21780	66970
678	1626.93683	18719	34033
679	1629.76870	16462	14535
680	1632.60121	05589	20771
681	1635.43435	76708	33557
682	1638.26814	20454	90036
683	1641.10256	27491	71568
684	1643.93761	88508	91684
685	1646.77330	94223	84110
686	1649.60963	35380	90862
687	1652.44659	02751	50412
688	1655.28417	87133	85923
689	1658.12239	79352	93549
690	1660.96124	70260	30804
691	1663.80072	50734	05003
692	1666.64083	11678	61761
693	1669.48156	44024	73567
694	1672.32292	38729	28422
695	1675.16490	86775	18536
696	1678.00751	79171	29098
697	1680.85075	06952	27108
698	1683.69460	61178	50269
699	1686.53908	32935	95950
700	1689.38418	13336	10207

N	LOG N!			
701	1692.22989	93515	76866	
702	1695.07623	64637	06671	
703	1697.92319	17887	26495	
704	1700.77076	44478	68607	
705	1703.61895	35648	60006	
706	1706.46775	82659	11810	
707	1709.31717	76797	08709	
708	1712.16721	09373	98478	
709	1715.01785	71725	81545	
710	1717.86911	55213	00620	
711	1720.72098	51220	30386	
712	1723.57346	51156	67243	
713	1726.42655	46455	19108	
714	1729.28025	28572	95283	
715	1732.13455	88990	96363	
716	1734.98947	19214	04219	
717	1737.84499	10770	72019	
718	1740.70111	55213	14319	
719	1743.55784	44116	97202	
720	1746.41517	69081	28470	
721	1749.27311	21728	47899	
722	1752.13164	93704	17538	
723	1754.99078	76677	12069	
724	1757.85052	62339	09216	
725	1760.71086	42404	80210	
726	1763.57180	08611	80304	
727	1766.43333	52720	39341	
728	1769.29546	66513	52379	
729	1772.15819	41796	70353	
730	1775.02151	70397	90809	
731	1777.88543	44167	48670	
732	1780.74994	54978	07061	
733	1783.61504	94724	48189	
734	1786.48074	55323	64260	
735	1789.34703	28714	48455	
736	1792.21391	06857	85954	
737	1795.08137	81736	45005	
738	1797.94943	45354	68047	
739	1800.81807	89738	62872	
740	1803.68731	06935	93849	
741	1806.55712	89015	73177	
742	1809.42753	28068	52204	
743	1812.29852	16206	12779	
744	1815.17009	45561	58658	
745	1818.04225	08289	06951	
746	1820.91498	96563	79619	
747	1823.78831	02581	95018	
748	1826.66221	18560	59480	
749	1829.53669	36737	58946	
750	1832.41175	49371	50646	

N	LOG N!			
751	1835.28739	48741	54814	
752	1838.16361	27147	46457	
753	1841.04040	76909	47157	
754	1843.91777	90368	16931	
755	1846.79572	59884	46120	
756	1849.67424	77839	47326	
757	1852.55334	36634	47399	
758	1855.43301	28690	79452	
759	1858.31325	46449	74933	
760	1861.19406	82372	55724	
761	1864.07545	28940	26297	
762	1866.95740	78653	65897	
763	1869.83993	24033	20778	
764	1872.72302	57618	96468	
765	1875.60668	71970	50085	
766	1878.49091	59666	82689	
767	1881.37571	13306	31670	
768	1884.26107	25506	63182	
769	1887.14699	88904	64613	
770	1890.03348	96156	37095	
771	1892.92054	39936	88052	
772	1895.80816	12940	23788	
773	1898.69634	07879	42113	
774	1901.58508	17486	25006	
775	1904.47438	34511	31316	
776	1907.36424	51723	89505	
777	1910.25466	61911	90419	
778	1913.14564	57881	80108	
779	1916.03718	32458	52672	
780	1918.92927	78485	43153	
781	1921.82192	88824	20453	
782	1924.71513	56354	80301	
783	1927.60889	73975	38244	
784	1930.50321	34602	22683	
785	1933.39808	31169	67935	
786	1936.29350	56630	07343	
787	1939.18948	03953	66408	
788	1942.08600	66128	55963	
789	1944.98308	36160	65383	
790	1947.88071	07073	55825	
791	1950.77888	71908	53501	
792	1953.67761	23724	42995	
793	1956.57688	55597	60599	
794	1959.47670	60621	87695	
795	1962.37707	31908	44165	
796	1965.27798	62585	81834	
797	1968.17944	45799	77947	
798	1971.08144	74713	28676	
799	1973.98399	42506	42668	
800	1976.88708	42376	34611	

N	LOG N!		
801	1979.79071	67537	18849
802	1982.69489	11220	03012
803	1985.59960	66672	81693
804	1988.50486	27160	30144
805	1991.41065	85963	98013
806	1994.31699	36382	03104
807	1997.22386	71729	25174
808	2000.13127	85336	99760
809	2003.03922	70553	12033
810	2005.94771	20741	90682
811	2008.85673	29284	01838
812	2011.76628	89576	43014
813	2014.67637	95032	37082
814	2017.58700	39081	26283
815	2020.49816	15168	66260
816	2023.40985	16756	20121
817	2026.32207	37321	52536
818	2029.23482	70358	23859
819	2032.14811	09375	84278
820	2035.06192	47899	67994
821	2037.97626	79470	87435
822	2040.89113	97646	27486
823	2043.80653	95998	39755
824	2046.72246	68115	36871
825	2049.63892	07600	86796
826	2052.55590	08074	07179
827	2055.47340	63169	59725
828	2058.39143	66537	44605
829	2061.30999	11842	94879
830	2064.22906	92766	70953
831	2067.14867	03004	55064
832	2070.06879	36267	45788
833	2072.98943	86281	52575
834	2075.91060	46787	90314
835	2078.83229	11542	73916
836	2081.75449	74317	12932
837	2084.67722	28897	06192
838	2087.60046	69083	36469
839	2090.52422	88691	65169
840	2093.44850	81552	27051
841	2096.37330	41510	24963
842	2099.29861	62425	24613
843	2102.22444	38171	49355
844	2105.15078	62637	75010
845	2108.07764	29727	24702
846	2111.00501	33357	63726
847	2113.93289	67460	94433
848	2116.86129	25983	51147
849	2119.79020	02885	95099
850	2122.71961	92143	09392

N	LOG N!		
851	2125.64954	87743	93980
852	2128.57998	83691	60680
853	2131.51093	74003	28203
854	2134.44239	52710	17208
855	2137.37436	13857	45381
856	2140.30683	51504	22534
857	2143.23981	59723	45732
858	2146.17330	32601	94438
859	2149.10729	64240	25680
860	2152.04179	48752	69248
861	2154.97679	80267	22902
862	2157.91230	52925	47615
863	2160.84831	60882	62825
864	2163.78482	98307	41718
865	2166.72184	59382	06532
866	2169.65936	38302	23819
867	2172.59738	29277	00089
868	2175.53590	26528	76581
869	2178.47492	24293	25248
870	2181.41444	16819	49866
871	2184.35445	98369	51529
872	2187.29497	63218	84096
873	2190.23599	05655	89666
874	2193.17750	19982	24069
875	2196.11951	00512	46383
876	2199.06201	41574	14463
877	2202.00501	37507	80504
878	2204.94850	82666	86606
879	2207.89249	71417	60378
880	2210.83697	98139	10547
881	2213.78195	57223	22595
882	2216.72742	43074	54414
883	2219.67338	50110	31983
884	2222.61983	72760	45056
885	2225.56678	05467	42882
886	2228.51421	42686	29932
887	2231.46213	78884	61659
888	2234.41055	08542	40260
889	2237.35945	26152	10473
890	2240.30884	26218	55386
891	2243.25872	03258	92261
892	2246.20908	51802	68384
893	2249.15993	66391	56931
894	2252.11127	41579	52848
895	2255.06309	71932	68760
896	2258.01540	52029	30885
897	2260.96819	76459	74977
898	2263.92147	39826	42282
899	2266.87523	36743	75511
900	2269.82947	61838	14835

N	LOG N!		
901	2272.78420	09747	93898
902	2275.73940	75123	35840
903	2278.69509	52626	49346
904	2281.65126	36931	24709
905	2284.60791	22723	29913
906	2287.56504	04700	06726
907	2290.52264	77570	66821
908	2293.48073	36055	87906
909	2296.43929	74888	09873
910	2299.39833	88811	30967
911	2302.35785	72581	03965
912	2305.31785	20964	32381
913	2308.27832	28739	66680
914	2311.23926	90697	00512
915	2314.20069	01637	66960
916	2317.16258	56374	34811
917	2320.12495	49731	04832
918	2323.08779	76543	06074
919	2326.05111	31656	92185
920	2329.01490	09930	37741
921	2331.97916	06232	34589
922	2334.94389	15442	88219
923	2337.90909	32453	14131
924	2340.87476	52165	34238
925	2343.84090	69492	73270
926	2346.80751	79359	55205
927	2349.77459	76700	99702
928	2352.74214	56463	18564
929	2355.71016	13603	12205
930	2358.67864	43088	66141
931	2361.64759	39898	47483
932	2364.61700	99022	01465
933	2367.58689	15459	47964
934	2370.55723	84221	78058
935	2373.52805	00330	50576
936	2376.49932	58817	88681
937	2379.47106	54726	76459
938	2382.44326	83110	55524
939	2385.41593	39033	21634
940	2388.38906	17569	21333
941	2391.36265	13803	48590
942	2394.33670	22831	41467
943	2397.31121	39758	78796
944	2400.28618	59701	76865
945	2403.26161	77786	86128
946	2406.23750	89150	87920
947	2409.21385	88940	91194
948	2412.19066	72314	29260
949	2415.16793	34438	56553
950	2418.14565	70491	45401

N	LOG N!		
951	2421.12383	75660	82815
952	2424.10247	45144	67289
953	2427.08156	74151	05615
954	2430.06111	57898	09710
955	2433.04111	91613	93457
956	2436.02157	70536	69557
957	2439.00248	89914	46400
958	2441.98385	45005	24945
959	2444.96567	31076	95608
960	2447.94794	43407	35177
961	2450.93066	77284	03722
962	2453.91384	28004	41535
963	2456.89746	90875	66070
964	2459.88154	61214	68900
965	2462.86607	34348	12693
966	2465.85105	05612	28186
967	2468.83647	70353	11188
968	2471.82235	23926	19582
969	2474.80867	61696	70347
970	2477.79544	79039	36592
971	2480.78266	71338	44597
972	2483.77033	33987	70871
973	2486.75844	62390	39223
974	2489.74700	51959	17839
975	2492.73600	98116	16376
976	2495.72545	96292	83067
977	2498.71535	41930	01840
978	2501.70569	30477	89442
979	2504.69647	57395	92580
980	2507.68770	18152	85075
981	2510.67937	08226	65023
982	2513.67148	23104	51973
983	2516.66403	58282	84108
984	2519.65703	09267	15450
985	2522.65046	71572	13062
986	2525.64434	40721	54273
987	2528.63866	12248	23910
988	2531.63341	81694	11538
989	2534.62861	44610	08717
990	2537.62424	96556	06267
991	2540.62032	33100	91542
992	2543.61683	49822	45721
993	2546.61378	42307	41102
994	2549.61117	06151	38415
995	2552.60899	36958	84141
996	2555.60725	30343	07840
997	2558.60594	81926	19495
998	2561.60507	87339	06866
999	2564.60464	42221	32849
1000	2567.60464	42221	32849

N	LOG N!			N	LOG N!		
1001	2570.60507	82996	12167	1051	2721.17087	97925	77808
1002	2573.60594	60211	43394	1052	2724.19289	55323	95528
1003	2576.60724	69541	63812	1053	2727.21532	39035	81015
1004	2579.60898	06669	72813	1054	2730.23816	45144	57543
1005	2582.61114	67287	29321	1055	2733.26141	69740	91254
1006	2585.61374	47094	49229	1056	2736.28508	08922	89048
1007	2588.61677	41800	02847	1057	2739.30915	58795	96474
1008	2591.62023	47121	12354	1058	2742.33364	15472	95641
1009	2594.62412	58783	49264	1059	2745.35853	75074	03126
1010	2597.62844	72521	31907	1060	2748.38384	33726	67896
1011	2600.63319	84077	22908	1061	2751.40955	87565	69237
1012	2603.63837	89202	26688	1062	2754.43568	32733	14687
1013	2606.64398	83655	86969	1063	2757.46221	65378	37984
1014	2609.65002	63205	84286	1064	2760.48915	81657	97013
1015	2612.65649	23628	33518	1065	2763.51650	77735	71770
1016	2615.66338	60707	81418	1066	2766.54426	49782	62323
1017	2618.67070	70237	04163	1067	2769.57242	93976	86793
1018	2621.67845	48017	04903	1068	2772.60100	06503	79331
1019	2624.68662	89057	11929	1069	2775.62997	03555	88109
1020	2627.69522	91574	73246	1070	2778.65936	21332	73318
1021	2630.70425	48995	60157	1071	2781.68915	16041	05174
1022	2633.71370	57953	58851	1072	2784.71934	63894	61925
1023	2636.72358	14290	71011	1073	2787.74994	61114	27876
1024	2639.73388	13857	10823	1074	2790.78095	03927	91413
1025	2642.74460	52511	02596	1075	2793.81235	88570	43037
1026	2645.75575	26118	78393	1076	2796.84417	11283	73408
1027	2648.76732	30554	75672	1077	2799.87638	68316	71389
1028	2651.77931	61701	34928	1078	2802.90900	55925	22109
1029	2654.79173	15448	97361	1079	2805.94202	70372	05020
1030	2657.80456	87696	02534	1080	2808.97545	07926	91969
1031	2660.81782	74348	86050	1081	2812.00927	64866	45280
1032	2663.83150	71321	77243	1082	2815.04350	37474	15830
1033	2666.84560	74536	96863	1083	2818.07813	22040	41151
1034	2669.86012	79924	54787	1084	2821.11316	14862	43519
1035	2672.87506	83422	47724	1085	2824.14859	12244	28067
1036	2675.89042	80976	56938	1086	2827.18442	10496	80895
1037	2678.90620	68540	45979	1087	2830.22065	05937	67190
1038	2681.92240	42075	58418	1088	2833.25727	94891	29351
1039	2684.93901	97551	15595	1089	2836.29430	73688	85126
1040	2687.95605	30944	14376	1090	2839.33173	38668	25750
1041	2690.97350	38239	24912	1091	2842.36955	86174	14091
1042	2693.99137	15428	88417	1092	2845.40778	12557	82810
1043	2697.00965	58513	14948	1093	2848.44640	14177	32513
1044	2700.02835	63499	81192	1094	2851.48541	87397	29925
1045	2703.04747	26404	28264	1095	2854.52483	28589	06062
1046	2706.06700	43249	59520	1096	2857.56464	34130	54412
1047	2709.08695	10066	38362	1097	2860.60485	00406	29123
1048	2712.10731	22892	86070	1098	2863.64545	23807	43196
1049	2715.12808	77774	79628	1099	2866.68645	00731	66687
1050	2718.14927	70765	49566	1100	2869.72784	27583	24912

N	LOG N!			
1101	2872.76963	00772	96664	
1102	2875.81181	16718	12430	
1103	2878.85438	71842	52621	
1104	2881.89735	62576	45801	
1105	2884.94071	85356	66930	
1106	2887.98447	36626	35610	
1107	2891.02862	12835	14332	
1108	2894.07316	10439	06743	
1109	2897.11809	25900	55903	
1110	2900.16341	55688	42561	
1111	2903.20912	96277	83429	
1112	2906.25523	44150	29467	
1113	2909.30172	95793	64175	
1114	2912.34861	47702	01886	
1115	2915.39588	96375	86065	
1116	2918.44355	38321	87625	
1117	2921.49160	70053	03234	
1118	2924.54004	88088	53639	
1119	2927.58887	88953	81989	
1120	2930.63809	69180	52170	
1121	2933.68770	25306	47143	
1122	2936.73769	53875	67286	
1123	2939.78807	51438	28744	
1124	2942.83884	14550	61786	
1125	2945.88999	39775	09167	
1126	2948.94153	23680	24495	
1127	2951.99345	62840	70601	
1128	2955.04576	53837	17925	
1129	2958.09845	93256	42893	
1130	2961.15153	77691	26312	
1131	2964.20500	03740	51768	
1132	2967.25884	68009	04020	
1133	2970.31307	67107	67418	
1134	2973.36768	97653	24305	
1135	2976.42268	56268	53447	
1136	2979.47806	39582	28447	
1137	2982.53382	44229	16182	
1138	2985.58996	66849	75234	
1139	2988.64649	04090	54334	
1140	2991.70339	52603	90807	
1141	2994.76068	09048	09022	
1142	2997.81834	70087	18851	
1143	3000.87639	32391	14133	
1144	3003.93481	92635	71138	
1145	3006.99362	47502	47045	
1146	3010.05280	93678	78416	
1147	3013.11237	27857	79684	
1148	3016.17231	46738	41638	
1149	3019.23263	47025	29924	
1150	3022.29333	25428	83535	

N	LOG N!			
1151	3025.35440	78665	13327	
1152	3028.41586	03456	00520	
1153	3031.47768	96528	95219	
1154	3034.53989	54617	14932	
1155	3037.60247	74459	43095	
1156	3040.66543	52800	27605	
1157	3043.72876	86389	79355	
1158	3046.79247	71983	70772	
1159	3049.85656	06343	34368	
1160	3052.92101	86235	61287	
1161	3055.98585	08432	99861	
1162	3059.05105	69713	54172	
1163	3062.11663	66860	82621	
1164	3065.18258	96663	96491	
1165	3068.24891	55917	58528	
1166	3071.31561	41421	81524	
1167	3074.38268	49982	26894	
1168	3077.45012	78410	03274	
1169	3080.51794	23521	65115	
1170	3083.58612	82139	11276	
1171	3086.65468	51089	83639	
1172	3089.72361	27206	65711	
1173	3092.79291	07327	81240	
1174	3095.86257	88296	92836	
1175	3098.93261	66963	00591	
1176	3102.00302	40180	40711	
1177	3105.07380	04808	84146	
1178	3108.14494	57713	35228	
1179	3111.21645	95764	30318	
1180	3114.28834	15837	36443	
1181	3117.36059	14813	49958	
1182	3120.43320	89578	95194	
1183	3123.50619	37025	23125	
1184	3126.57954	54049	10026	
1185	3129.65326	37552	56148	
1186	3132.72734	84442	84392	
1187	3135.80179	91632	38983	
1188	3138.87661	56038	84158	
1189	3141.95179	74585	02850	
1190	3145.02734	44198	95380	
1191	3148.10325	61813	78158	
1192	3151.17953	24367	82376	
1193	3154.25617	28804	52717	
1194	3157.33317	72072	46068	
1195	3160.41054	51125	30224	
1196	3163.48827	62921	82616	
1197	3166.56637	04425	89027	
1198	3169.64482	72606	42319	
1199	3172.72364	64437	41168	
1200	3175.80282	76897	88793	

N	LOG N!			N	LOG N!		
1201	3178.88237	06971	91699	1251	3333.31424	50843	47082
1202	3181.96227	51648	58420	1252	3336.41184	94132	21493
1203	3185.04254	07921	98264	1253	3339.50980	04842	15643
1204	3188.12316	72791	20070	1254	3342.60809	80207	10340
1205	3191.20415	43260	30957	1255	3345.70674	17465	27397
1206	3194.28550	16338	35090	1256	3348.80573	13859	28574
1207	3197.36720	89039	32439	1257	3351.90506	66636	14532
1208	3200.44927	58382	17552	1258	3355.00474	73047	23182
1209	3203.53170	21390	78324	1259	3358.10477	30348	31645
1210	3206.61448	75093	94774	1260	3361.20514	35799	49208
1211	3209.69763	16525	37826	1261	3364.30585	86665	22289
1212	3212.78113	42723	68094	1262	3367.40691	80214	30405
1213	3215.86499	50732	34667	1263	3370.50832	13719	85736
1214	3218.94921	37599	73906	1264	3373.61006	84459	32102
1215	3222.03379	00379	08236	1265	3376.71215	89714	43939
1216	3225.11872	36128	44953	1266	3379.81459	26771	25275
1217	3228.20401	41910	75018	1267	3382.91736	92920	08716
1218	3231.28966	14793	71874	1268	3386.02048	85455	54430
1219	3234.37566	51849	90256	1269	3389.12395	01676	49135
1220	3237.46202	50156	65004	1270	3392.22775	38886	05092
1221	3240.54874	06796	09887	1271	3395.33189	94391	59100
1222	3243.63581	18855	16422	1272	3398.43638	65504	71495
1223	3246.72323	83425	52708	1273	3401.54121	49541	25150
1224	3249.81101	97603	62250	1274	3404.64638	43821	24482
1225	3252.89915	58490	62801	1275	3407.75189	45668	94456
1226	3255.98764	63192	45198	1276	3410.85774	52412	79599
1227	3259.07649	08819	72202	1277	3413.96393	61385	43015
1228	3262.16568	92487	77351	1278	3417.07046	69923	65396
1229	3265.25524	11316	63805	1279	3420.17733	75368	44050
1230	3268.34514	62431	03203	1280	3423.28454	75064	91918
1231	3271.43540	42960	34519	1281	3426.39209	66362	36605
1232	3274.52601	50038	62926	1282	3429.49998	46614	19403
1233	3277.61697	80804	58657	1283	3432.60821	13177	94332
1234	3280.70829	32401	55880	1284	3435.71677	63415	27166
1235	3283.79996	01977	51565	1285	3438.82567	94691	94480
1236	3286.89197	86685	04362	1286	3441.93492	04377	82683
1237	3289.98434	83681	33482	1287	3445.04449	89846	87070
1238	3293.07706	90128	17582	1288	3448.15441	48477	10863
1239	3296.17014	03191	93645	1289	3451.26466	77650	64266
1240	3299.26356	20043	55880	1290	3454.37525	74753	63515
1241	3302.35733	37858	54610	1291	3457.48618	37176	29935
1242	3305.45145	53816	95171	1292	3460.59744	62312	89000
1243	3308.54592	65103	36816	1293	3463.70904	47561	69395
1244	3311.64074	68906	91616	1294	3466.82097	90325	02076
1245	3314.73591	62421	23371	1295	3469.93324	88009	19347
1246	3317.83143	42844	46522	1296	3473.04585	38024	53921
1247	3320.92730	07379	25065	1297	3476.15879	37785	38001
1248	3324.02351	53232	71470	1298	3479.27206	84710	02352
1249	3327.12007	77616	45605	1299	3482.38567	76220	75380
1250	3330.21698	77746	53662	1300	3485.49962	09743	82216

N	LOG N!			
1301	3488.61389	82709	43803	
1302	3491.72850	92551	75976	
1303	3494.84345	36708	88561	
1304	3497.95873	12622	84462	
1305	3501.07434	17739	58762	
1306	3504.19028	49508	97817	
1307	3507.30556	05384	78361	
1308	3510.42316	82824	66610	
1309	3513.54010	79290	17365	
1310	3516.65737	92246	73130	
1311	3519.77498	19163	63214	
1312	3522.89291	57514	02855	
1313	3526.01118	04774	92335	
1314	3529.12977	58427	16097	
1315	3532.24870	15955	41873	
1316	3535.36795	74848	19810	
1317	3538.48754	32597	81594	
1318	3541.60745	86700	39585	
1319	3544.72770	34655	85950	
1320	3547.84827	73967	91800	
1321	3550.96918	02144	06327	
1322	3554.09041	16695	55949	
1323	3557.21197	15137	43450	
1324	3560.33385	94988	47131	
1325	3563.45607	53771	19957	
1326	3566.57861	89011	88712	
1327	3569.70148	98240	53147	
1328	3572.82468	78990	85146	
1329	3575.94821	28800	27878	
1330	3579.07206	45209	94964	
1331	3582.19624	25764	69639	
1332	3585.32074	68013	03921	
1333	3588.44557	69507	17780	
1334	3591.57073	27802	98311	
1335	3594.69621	40459	98905	
1336	3597.82202	05041	38431	
1337	3600.94815	19114	00416	
1338	3604.07460	80248	32220	
1339	3607.20138	86018	44229	
1340	3610.32849	34002	09037	
1341	3613.45592	21780	60636	
1342	3616.58367	46938	93609	
1343	3619.71175	07065	62324	
1344	3622.84014	99752	80131	
1345	3625.96887	22596	18557	
1346	3629.09791	73195	06515	
1347	3632.22728	49152	29501	
1348	3635.35697	48074	28802	
1349	3638.48698	67571	00706	
1350	3641.61732	05255	95712	

N	LOG N!			
1351	3644.74797	58746	17743	
1352	3647.87895	25662	23360	
1353	3651.01025	03628	20983	
1354	3654.14186	90271	70109	
1355	3657.27380	83223	80533	
1356	3660.40606	80119	11578	
1357	3663.53864	78595	71315	
1358	3666.67154	76295	15798	
1359	3669.80476	70862	48292	
1360	3672.93830	59946	18510	
1361	3676.07216	41198	21844	
1362	3679.20634	12273	98611	
1363	3682.34083	70832	33284	
1364	3685.47565	14535	53744	
1365	3688.61078	41049	30519	
1366	3691.74623	48042	76033	
1367	3694.88200	33188	43855	
1368	3698.01808	94162	27953	
1369	3701.15449	28643	61943	
1370	3704.29121	34315	18349	
1371	3707.42825	08863	07862	
1372	3710.56560	49976	78595	
1373	3713.70327	55349	15350	
1374	3716.84126	22676	38882	
1375	3719.97956	49658	05163	
1376	3723.11818	33997	04656	
1377	3726.25711	73399	61579	
1378	3729.39636	65575	33186	
1379	3732.53593	08237	09036	
1380	3735.67580	99101	10273	
1381	3738.81600	35886	88904	
1382	3741.95651	16317	27083	
1383	3745.09733	38118	36394	
1384	3748.23846	99019	57133	
1385	3751.37991	96753	57600	
1386	3754.52168	29056	33388	
1387	3757.66375	93667	06673	
1388	3760.80614	88328	25509	
1389	3763.94885	10785	63125	
1390	3767.09186	58788	17220	
1391	3770.23519	30088	09266	
1392	3773.37883	22440	83810	
1393	3776.52278	33605	07773	
1394	3779.66704	61342	69764	
1395	3782.81162	03418	79380	
1396	3785.95650	57601	66522	
1397	3789.10170	21662	80704	
1398	3792.24720	93376	90367	
1399	3795.39302	70521	82195	
1400	3798.53915	50878	60433	

N	LOG N!		
1401	3801.68559	32231	46207
1402	3804.83234	12367	76847
1403	3807.97939	89078	05207
1404	3811.12676	60155	98993
1405	3814.27444	23398	40092
1406	3817.42242	76605	23897
1407	3820.57072	17579	58643
1408	3823.71932	44127	64736
1409	3826.86823	54058	74093
1410	3830.01745	45185	29473
1411	3833.16698	15322	83820
1412	3836.31681	62289	99605
1413	3839.46695	83908	48164
1414	3842.61740	78003	09045
1415	3845.76816	42401	69354
1416	3848.91922	74935	23104
1417	3852.07059	73437	70564
1418	3855.22227	35746	17612
1419	3858.37425	59700	75086
1420	3861.52654	43144	58143
1421	3864.67913	83923	85612
1422	3867.83203	79887	79360
1423	3870.98524	28888	63644
1424	3874.13875	28781	64482
1425	3877.29256	77425	09011
1426	3880.44668	72680	24857
1427	3883.60111	12411	39504
1428	3886.75583	94485	79660
1429	3889.91087	16773	70630
1430	3893.06620	77148	35692
1431	3896.22184	73485	95468
1432	3899.37779	03665	67305
1433	3902.53403	65569	64650
1434	3905.69058	57082	96431
1435	3908.84743	76093	66442
1436	3912.00459	20492	72724
1437	3915.16204	88174	06949
1438	3918.31980	77034	53813
1439	3921.47786	84973	90418
1440	3924.63623	09894	85668
1441	3927.79489	49702	99657
1442	3930.95386	02306	83067
1443	3934.11312	65617	76562
1444	3937.27269	37550	10182
1445	3940.43256	16021	02749
1446	3943.59272	98950	61261
1447	3946.75319	84261	80298
1448	3949.91396	69880	41426
1449	3953.07503	53735	12601
1450	3956.23640	33757	47576

N	LOG N!		
1451	3959.39807	07881	85312
1452	3962.56003	74045	49386
1453	3965.72230	30188	47408
1454	3968.88486	74253	70427
1455	3972.04773	04186	92353
1456	3975.21089	17936	69372
1457	3978.37435	13454	39362
1458	3981.53810	88694	21317
1459	3984.70216	41613	14769
1460	3987.86651	70170	99206
1461	3991.03116	72330	33503
1462	3994.19611	46056	55345
1463	3997.36135	89317	80655
1464	4000.52690	00085	03028
1465	4003.69273	76331	93157
1466	4006.85887	16034	98266
1467	4010.02530	17173	41549
1468	4013.19202	77729	21600
1469	4016.35904	95687	11857
1470	4019.52636	69034	60033
1471	4022.69397	95761	87563
1472	4025.86188	73861	89043
1473	4029.03009	01330	31674
1474	4032.19858	76165	54707
1475	4035.36737	96368	68888
1476	4038.53646	59943	55911
1477	4041.70584	64896	67861
1478	4044.87552	09237	26668
1479	4048.04548	90977	23560
1480	4051.21575	08131	18517
1481	4054.38630	58716	39726
1482	4057.55715	40752	83035
1483	4060.72829	52263	11417
1484	4063.89972	91272	54426
1485	4067.07145	55809	07657
1486	4070.24347	43903	32213
1487	4073.41578	53588	54167
1488	4076.58838	82900	64027
1489	4079.76128	29878	16203
1490	4082.93446	92562	28478
1491	4086.10794	68996	81472
1492	4089.28171	57228	18122
1493	4092.45577	55305	43147
1494	4095.63012	61280	22527
1495	4098.80476	73206	82976
1496	4101.97969	89142	11418
1497	4105.15492	07145	54471
1498	4108.33043	25279	17918
1499	4111.50623	41607	66198
1500	4114.68232	54198	21879

N	LOG N!		
1501	4117.85870	61120	65150
1502	4121.03537	60447	33299
1503	4124.21233	50253	20207
1504	4127.38958	28615	75831
1505	4130.56711	93615	05693
1506	4133.74494	43333	70375
1507	4136.92305	75856	85007
1508	4140.10145	89272	18762
1509	4143.28014	81669	94352
1510	4146.45912	51142	87521
1511	4149.63838	95786	26546
1512	4152.81794	13697	91734
1513	4155.99778	02978	14921
1514	4159.17790	61729	78975
1515	4162.35831	88058	17299
1516	4165.53901	80071	13333
1517	4168.72000	35879	00064
1518	4171.90127	53594	59525
1519	4175.08283	31333	22312
1520	4178.26467	67212	67084
1521	4181.44680	59353	20083
1522	4184.62922	05877	54637
1523	4187.81192	04910	90679
1524	4190.99490	54580	94261
1525	4194.17817	53017	77066
1526	4197.36172	98353	95927
1527	4200.54556	88724	52348
1528	4203.72969	22266	92020
1529	4206.91409	97121	04340
1530	4210.09879	11429	21939
1531	4213.28376	63336	20200
1532	4216.46902	50989	16785
1533	4219.65456	72537	71160
1534	4222.84039	26133	84122
1535	4226.02650	09931	97327
1536	4229.21289	22088	92820
1537	4232.39956	60763	92566
1538	4235.58652	24118	57978
1539	4238.77376	10316	89457
1540	4241.96128	17525	25920
1541	4245.14908	43912	44339
1542	4248.33716	87649	59277
1543	4251.52553	46910	22425
1544	4254.71418	19870	22143
1545	4257.90311	04707	82996
1546	4261.09231	99603	65302
1547	4264.28181	02740	64670
1548	4267.47158	12304	11544
1549	4270.66163	26481	70750
1550	4273.85196	43463	41041

N	LOG N!		
1551	4277.04257	61441	54646
1552	4280.23346	78610	76816
1553	4283.42463	93168	05374
1554	4286.61609	03312	70270
1555	4289.80782	07246	33126
1556	4292.99983	03172	86796
1557	4296.19211	89298	54916
1558	4299.38468	63831	91462
1559	4302.57753	24983	80304
1560	4305.77065	70967	34765
1561	4308.96405	99997	97183
1562	4312.15774	10293	38464
1563	4315.35170	00073	57651
1564	4318.54593	67560	81480
1565	4321.74045	10979	63948
1566	4324.93524	28556	85872
1567	4328.13031	18521	54462
1568	4331.32565	79105	02882
1569	4334.52128	08540	89819
1570	4337.71718	05064	99052
1571	4340.91335	66915	39026
1572	4344.10980	92332	42415
1573	4347.30653	79558	65702
1574	4350.50354	26838	88748
1575	4353.70082	32420	14367
1576	4356.89837	94551	67903
1577	4360.09621	11484	96806
1578	4363.29431	81473	70208
1579	4366.49270	02773	78502
1580	4369.69135	73643	32925
1581	4372.89028	92342	65134
1582	4376.08949	57134	26791
1583	4379.28897	66282	89147
1584	4382.48873	18055	42622
1585	4385.68876	10720	96392
1586	4388.88906	42550	77977
1587	4392.08964	11818	32825
1588	4395.29049	16799	23903
1589	4398.49161	55771	31282
1590	4401.69301	27014	51734
1591	4404.89468	28810	98315
1592	4408.09662	59444	99966
1593	4411.29884	17203	01097
1594	4414.50133	00373	61191
1595	4417.70409	07247	54391
1596	4420.90712	36117	69101
1597	4424.11042	85279	07584
1598	4427.31400	53028	85557
1599	4430.51785	37666	31792
1600	4433.72197	37492	87716

N	LOG N!		
1601	4436.92636	50812	07016
1602	4440.13102	75929	55235
1603	4443.33596	11153	09380
1604	4446.54116	54792	57524
1605	4449.74664	05159	98415
1606	4452.95238	60569	41077
1607	4456.15840	19337	04422
1608	4459.36468	79781	16854
1609	4462.57124	40222	15884
1610	4465.77806	98982	47734
1611	4468.98516	54386	66952
1612	4472.19253	04761	36024
1613	4475.40016	48435	24985
1614	4478.60806	83739	11037
1615	4481.81624	09005	78158
1616	4485.02468	22570	16726
1617	4488.23339	22769	23127
1618	4491.44237	07941	99380
1619	4494.65161	76429	52754
1620	4497.86113	26574	95385
1621	4501.07091	56723	43900
1622	4504.28096	65222	19037
1623	4507.49128	50420	45269
1624	4510.70187	10669	50426
1625	4513.91272	44322	65319
1626	4517.12384	49735	23368
1627	4520.33523	25264	60227
1628	4523.54688	69270	13409
1629	4526.75880	80113	21919
1630	4529.97099	56157	25877
1631	4533.18344	95767	66152
1632	4536.39616	97311	83995
1633	4539.60915	59159	20663
1634	4542.82240	79681	17060
1635	4546.03592	57251	13364
1636	4549.24970	90244	48669
1637	4552.46375	77038	60610
1638	4555.67807	16012	85010
1639	4558.89265	05548	55509
1640	4562.10749	44029	03207
1641	4565.32260	29839	56300
1642	4568.53797	61367	39722
1643	4571.75361	37001	74784
1644	4574.96951	55133	78815
1645	4578.18568	14156	64808
1646	4581.40211	12465	41059
1647	4584.61880	48457	10814
1648	4587.83576	20530	71911
1649	4591.05298	27087	16429
1650	4594.27046	66529	30336

N	LOG N!		
1651	4597.48821	37261	93129
1652	4600.70622	37691	77493
1653	4603.92449	66227	48940
1654	4607.14303	21279	65468
1655	4610.36183	01260	77206
1656	4613.58089	04585	26067
1657	4616.80021	29669	45404
1658	4620.01979	74931	59659
1659	4623.23964	38791	84019
1660	4626.45975	19672	24074
1661	4629.68012	15996	75469
1662	4632.90075	26191	23561
1663	4636.12164	48683	43080
1664	4639.34279	81902	97705
1665	4642.56421	24281	40124
1666	4645.78588	74252	10893
1667	4649.00782	30250	38898
1668	4652.23001	90713	40618
1669	4655.45247	54080	19865
1670	4658.67519	18791	67448
1671	4661.89816	83290	60839
1672	4665.12140	46021	63837
1673	4668.34490	05431	26231
1674	4671.56865	59967	83473
1675	4674.79267	08081	56337
1676	4678.01694	48224	50594
1677	4681.24147	78850	56680
1678	4684.46626	98415	49362
1679	4687.69132	05376	87410
1680	4690.91662	98194	13273
1681	4694.14219	75328	52744
1682	4697.36802	35243	14638
1683	4700.59410	76402	90461
1684	4703.82044	97274	54092
1685	4707.04704	96326	61450
1686	4710.27390	72029	50173
1687	4713.50102	22855	39298
1688	4716.72839	47278	28935
1689	4719.95602	43773	99943
1690	4723.18391	10820	13617
1691	4726.41205	46896	11359
1692	4729.64045	50483	14363
1693	4732.86911	20064	23298
1694	4736.09802	54124	17987
1695	4739.32719	51149	57088
1696	4742.55662	09628	77783
1697	4745.78630	28051	95458
1698	4749.01624	04911	03392
1699	4752.24643	38699	72438
1700	4755.47688	27913	50712

N	LOG N!		
1701	4758.70758	71049	63281
1702	4761.93854	66607	11850
1703	4765.16976	13086	74451
1704	4768.40123	08991	05132
1705	4771.63295	52824	33649
1706	4774.86493	43092	65153
1707	4778.09716	78303	79887
1708	4781.32965	56967	32873
1709	4784.56239	77594	53610
1710	4787.79539	38698	45764
1711	4791.02864	38793	86864
1712	4794.26214	76397	27998
1713	4797.49590	50026	93509
1714	4800.72991	58202	80688
1715	4803.96417	99446	59477
1716	4807.19869	72281	72164
1717	4810.43346	75233	33080
1718	4813.66849	06828	28304
1719	4816.90376	65595	15356
1720	4820.13929	50064	22905
1721	4823.37507	58767	50466
1722	4826.61110	90238	68102
1723	4829.84739	43013	16130
1724	4833.08393	15628	04824
1725	4836.32072	06622	14117
1726	4839.55776	14535	93308
1727	4842.79505	37911	60767
1728	4846.03259	75293	03641
1729	4849.27039	25225	77564
1730	4852.50843	86257	06359
1731	4855.74673	56935	81753
1732	4858.98528	35812	63081
1733	4862.22408	21439	76998
1734	4865.46313	12371	17189
1735	4868.70243	07162	44082
1736	4871.94198	04370	84555
1737	4875.18178	02555	31653
1738	4878.42183	00276	44301
1739	4881.66212	96096	47014
1740	4884.90267	88579	29613
1741	4888.14347	76290	46944
1742	4891.38452	57797	18589
1743	4894.62582	31668	28582
1744	4897.86736	96474	25130
1745	4901.10916	50787	20329
1746	4904.35120	93180	89880
1747	4907.59350	22230	72811
1748	4910.83604	36513	71195
1749	4914.07883	34608	49872
1750	4917.32187	15095	36166

N	LOG N!		
1751	4920.56515	76556	19612
1752	4923.80869	17574	51674
1753	4927.05247	36735	45469
1754	4930.29650	32625	75491
1755	4933.54078	03833	77334
1756	4936.78530	48949	47418
1757	4940.03007	66564	42713
1758	4943.27509	55271	80466
1759	4946.52036	13666	37927
1760	4949.76587	40344	52077
1761	4953.01163	33904	19354
1762	4956.25763	92944	95383
1763	4959.50389	16067	94705
1764	4962.75039	01875	90506
1765	4965.99713	48973	14347
1766	4969.24412	55965	55897
1767	4972.49136	21460	62661
1768	4975.73884	44067	39715
1769	4978.98657	22396	49438
1770	4982.23454	55060	11245
1771	4985.48276	40672	01320
1772	4988.73122	77847	52352
1773	4991.97993	65203	53269
1774	4995.22889	01358	48977
1775	4998.47808	84932	40090
1776	5001.72753	14546	82672
1777	5004.97721	88824	87974
1778	5008.22715	06391	22169
1779	5011.47732	65872	06094
1780	5014.72774	65895	14988
1781	5017.97841	05089	78231
1782	5021.22931	82086	79087
1783	5024.48046	95518	54442
1784	5027.73186	44018	94546
1785	5030.98350	26223	42758
1786	5034.23538	40768	95286
1787	5037.48750	86294	00930
1788	5040.73987	61438	60829
1789	5043.99248	64844	28202
1790	5047.24533	95154	08095
1791	5050.49843	51012	57126
1792	5053.75177	31065	83233
1793	5057.00535	33961	45416
1794	5060.25917	58348	53489
1795	5063.51324	02877	67827
1796	5066.76754	66200	99112
1797	5070.02209	46972	08086
1798	5073.27688	43846	05296
1799	5076.53191	55479	50848
1800	5079.78718	80530	54154

N	LOG N!			
1801	5083.04270	17658	73687	
1802	5086.29845	65525	16731	
1803	5089.55445	22792	39133	
1804	5092.81068	88124	45056	
1805	5096.06716	60186	86733	
1806	5099.32388	37646	64220	
1807	5102.58084	19172	25152	
1808	5105.83804	03433	64496	
1809	5109.09547	89102	24310	
1810	5112.35315	74850	93494	
1811	5115.61107	59354	07553	
1812	5118.86923	41287	48347	
1813	5122.12763	19328	43856	
1814	5125.38626	92155	67932	
1815	5128.64514	58449	40063	
1816	5131.90426	16891	25130	
1817	5135.16361	66164	33164	
1818	5138.42321	04953	19113	
1819	5141.68304	31943	82596	
1820	5144.94311	45823	67671	
1821	5148.20342	45281	62591	
1822	5151.46397	29007	99571	
1823	5154.72475	95694	54547	
1824	5157.98578	44034	46944	
1825	5161.24704	72722	39438	
1826	5164.50854	80454	37718	
1827	5167.77028	65927	90256	
1828	5171.03226	27841	88068	
1829	5174.29447	64896	64485	
1830	5177.55692	75793	94915	
1831	5180.81961	59236	96611	
1832	5184.08254	13930	28443	
1833	5187.34570	38579	90659	
1834	5190.60910	31893	24662	
1835	5193.87273	92579	12770	
1836	5197.13661	19347	77993	
1837	5200.40072	10910	83802	
1838	5203.66506	65981	33894	
1839	5206.92964	83273	71972	
1840	5210.19446	61503	81508	
1841	5213.45951	99388	85523	
1842	5216.72480	95647	46353	
1843	5219.99033	48999	65427	
1844	5223.25609	58166	83037	
1845	5226.52209	21871	78116	
1846	5229.78832	38838	68010	
1847	5233.05479	07793	08251	
1848	5236.32149	27461	92339	
1849	5239.58842	96573	51512	
1850	5242.85560	13857	54526	

N	LOG N!			
1851	5246.12300	78045	07430	
1852	5249.39064	87868	53345	
1853	5252.65852	42061	72243	
1854	5255.92663	39359	80721	
1855	5259.19497	78499	31786	
1856	5262.46355	58218	14629	
1857	5265.73236	77255	54410	
1858	5269.00141	34352	12033	
1859	5272.27069	28249	83931	
1860	5275.54020	57692	01848	
1861	5278.80995	21423	32615	
1862	5282.07993	18189	77938	
1863	5285.35014	46738	74181	
1864	5288.62059	05818	92144	
1865	5291.89126	94180	36850	
1866	5295.16218	10574	47331	
1867	5298.43332	53753	96409	
1868	5301.70470	22472	90484	
1869	5304.97631	15486	69316	
1870	5308.24815	31552	05815	
1871	5311.52022	69427	05825	
1872	5314.79253	27871	07911	
1873	5318.06507	05644	83149	
1874	5321.33784	01510	34908	
1875	5324.61084	14230	98646	
1876	5327.88407	42571	41691	
1877	5331.15753	85297	63038	
1878	5334.43123	41176	93130	
1879	5337.70516	08977	93655	
1880	5340.97931	87470	57335	
1881	5344.25370	75426	07714	
1882	5347.52832	71616	98952	
1883	5350.80317	74817	15617	
1884	5354.07825	83801	72476	
1885	5357.35356	97347	14287	
1886	5360.62911	14231	15597	
1887	5363.90488	33232	80528	
1888	5367.18088	53132	42578	
1889	5370.45711	72711	64412	
1890	5373.73357	90753	37656	
1891	5377.01027	06041	82696	
1892	5380.28719	17362	48470	
1893	5383.56434	23502	12267	
1894	5386.84172	23248	79521	
1895	5390.11933	15391	83612	
1896	5393.39716	98721	85660	
1897	5396.67523	72030	74322	
1898	5399.95353	34111	65596	
1899	5403.23205	83759	02614	
1900	5406.51081	19768	55443	

N	LOG N!			
1901	5409.78979	40937	20886	
1902	5413.06900	46063	22281	
1903	5416.34844	33946	09301	
1904	5419.62811	03386	57757	
1905	5422.90800	53186	69395	
1906	5426.18812	82149	71703	
1907	5429.46847	89080	17708	
1908	5432.74905	72783	85785	
1909	5436.02986	32067	79451	
1910	5439.31089	65740	27179	
1911	5442.59215	72610	82192	
1912	5445.87364	51490	22273	
1913	5449.15536	01190	49569	
1914	5452.43730	20524	90394	
1915	5455.71947	08307	95035	
1916	5459.00186	63355	37561	
1917	5462.28448	84484	15623	
1918	5465.56733	70512	50268	
1919	5468.85041	20259	85740	
1920	5472.13371	32546	89289	
1921	5475.41724	06195	50983	
1922	5478.70099	40028	83510	
1923	5481.98497	32871	21989	
1924	5485.26917	83548	23784	
1925	5488.55360	90886	68303	
1926	5491.83826	53714	56819	
1927	5495.12314	70861	12272	
1928	5498.40825	41156	79084	
1929	5501.69358	63433	22968	
1930	5504.97914	36523	30742	
1931	5508.26492	59261	10137	
1932	5511.55093	30481	89611	
1933	5514.83716	49022	18164	
1934	5518.12362	13719	65147	
1935	5521.41030	23413	20077	
1936	5524.69720	76942	92452	
1937	5527.98433	73150	11563	
1938	5531.27169	10877	26310	
1939	5534.55926	88968	05015	
1940	5537.84707	06267	35241	
1941	5541.13509	61621	23604	
1942	5544.42334	53876	95590	
1943	5547.71181	81882	95372	
1944	5551.00051	44488	85628	
1945	5554.28943	40545	47355	
1946	5557.57857	68904	79688	
1947	5560.86794	28419	99719	
1948	5564.15753	17945	42316	
1949	5567.44734	36336	59938	
1950	5570.73737	82450	22456	

N	LOG N!			
1951	5574.02763	55144	16974	
1952	5577.31811	53277	47647	
1953	5580.60881	75710	35501	
1954	5583.89974	21304	18255	
1955	5587.19088	88921	50141	
1956	5590.48225	77426	01724	
1957	5593.77384	85682	59725	
1958	5597.06566	12557	26844	
1959	5600.35769	56917	21580	
1960	5603.64995	17630	78056	
1961	5606.94242	93567	45840	
1962	5610.23512	83597	89770	
1963	5613.52804	86593	89776	
1964	5616.82119	01428	40707	
1965	5620.11455	26975	52153	
1966	5623.40813	62110	48269	
1967	5626.70194	05709	67606	
1968	5629.99596	56650	62929	
1969	5633.29021	13812	01047	
1970	5636.58467	76073	62640	
1971	5639.87936	42316	42083	
1972	5643.17427	11422	47276	
1973	5646.46939	82274	99467	
1974	5649.76474	53758	33085	
1975	5653.06031	24757	95564	
1976	5656.35609	94160	47173	
1977	5659.65210	60853	60845	
1978	5662.94833	23726	22006	
1979	5666.24477	81668	28402	
1980	5669.54144	33570	89933	
1981	5672.83832	78326	28480	
1982	5676.13543	14827	77737	
1983	5679.43275	41969	83040	
1984	5682.73029	58648	01199	
1985	5686.02805	63759	00333	
1986	5689.32603	56200	59696	
1987	5692.62423	34871	69511	
1988	5695.92264	98672	30805	
1989	5699.22128	46503	55241	
1990	5702.52013	77267	64948	
1991	5705.81920	89867	92357	
1992	5709.11849	83208	80037	
1993	5712.41800	56195	80525	
1994	5715.71773	07735	56162	
1995	5719.01767	36735	78929	
1996	5722.31783	42105	30281	
1997	5725.61821	22754	00983	
1998	5728.91880	77592	90947	
1999	5732.21962	05534	09064	
2000	5735.52065	05490	73045	

TABLE III

Logarithms of Prime Numbers to 1999

N.	LOG N				N	LOG N			
2	0.30102	99956	63981	19521	233	2.36735	59210	26018	97219
3	0.47712	12547	19662	43730	239	2.37839	79009	48137	68500
5	0.69897	00043	36018	80479	241	2.38201	70425	74868	38408
7	0.84509	80400	14256	83071	251	2.39967	37214	81038	13934
11	1.04139	26851	58225	04075	257	2.40993	31233	31294	53716
13	1.11394	33523	06836	76921	263	2.41995	57484	89757	86897
17	1.23044	89213	78273	92854	269	2.42975	22800	02407	98009
19	1.27875	36009	52828	96154	271	2.43296	92908	74405	72952
23	1.36172	78360	17592	87887	277	2.44247	97690	64448	55378
29	1.46239	79978	98956	08733	281	2.44870	63199	05079	89286
31	1.49136	16938	34272	67967	283	2.45178	64355	24290	23556
37	1.56820	17240	66994	99681	293	2.46686	76203	54109	45624
41	1.61278	38567	19735	49451	307	2.48713	83754	77186	48475
43	1.63346	84555	79586	52641	311	2.49276	03890	26837	50555
47	1.67209	78579	35717	46441	313	2.49554	43375	46448	48481
53	1.72427	58696	00789	04563	317	2.50105	92622	17751	49455
59	1.77085	20116	42144	19026	331	2.51982	79937	75718	73861
61	1.78532	98350	10767	03389	337	2.52762	99008	71338	62619
67	1.82607	48027	00826	43415	347	2.54032	94747	90873	71854
71	1.85125	83487	19075	28609	349	2.54282	54269	59179	09654
73	1.86332	28601	20455	90107	353	2.54777	47053	87822	56550
79	1.89762	70912	90441	42799	359	2.55509	44485	78319	14782
83	1.91907	80923	76073	90383	367	2.56466	60642	52089	33799
89	1.94939	00066	44912	78472	373	2.57170	88318	08687	60551
97	1.98677	17342	66244	85178	379	2.57863	92099	68072	34193
101	2.00432	13737	82642	57428	383	2.58319	87739	68622	74038
103	2.01283	72247	05172	20517	389	2.58994	96013	25707	73624
107	2.02938	37776	85209	64083	397	2.59879	05067	63115	06588
109	2.03742	64979	40623	63520	401	2.60314	43726	20182	30654
113	2.05307	84434	83419	72280	409	2.61172	33080	07341	80361
127	2.10380	37209	55956	86425	419	2.62221	40229	66295	30985
131	2.11727	12956	55764	26081	421	2.62428	20958	35668	30744
137	2.13672	05671	56406	76856	431	2.63447	72701	60731	60075
139	2.14301	48002	54095	08046	433	2.63648	78963	53365	44270
149	2.17318	62684	12274	03826	439	2.64246	45202	42121	37063
151	2.17897	69472	93169	43687	443	2.64640	37262	23069	56023
157	2.19589	96524	09233	73676	449	2.65224	63410	03323	17492
163	2.21218	76044	03957	80764	457	2.65991	62000	69850	22235
167	2.22271	64711	47583	27998	461	2.66370	09253	89648	14507
173	2.23804	61031	28795	41456	463	2.66558	09910	17953	13567
179	2.25285	30309	79893	16957	467	2.66931	68805	66112	16309
181	2.25767	85748	69184	51029	479	2.68033	55134	14563	22010
191	2.28103	33672	47727	53764	487	2.68752	89612	14634	33246
193	2.28555	73090	07773	76060	491	2.69108	14921	22968	47275
197	2.29446	62261	61592	92737	499	2.69810	05456	23389	91417
199	2.29885	30764	09706	65010	503	2.70156	79850	55927	39710
211	2.32428	24552	97692	66508	509	2.70671	77823	36758	74657
223	2.34830	48630	48160	67348	521	2.71683	77232	99524	47424
227	2.35602	58571	93122	72010	523	2.71850	16888	67274	23926
229	2.35983	54823	39887	99413	541	2.73319	72651	06569	43688

N	LOG N			
547	2.73798	73263	33430	77381
557	2.74585	51951	73728	90044
563	2.75050	83948	51346	22909
569	2.75511	22663	95071	17229
571	2.75663	61082	45848	05004
577	2.76117	58131	55731	42849
587	2.76863	81012	47614	47606
593	2.77305	46933	64262	60640
599	2.77742	68223	89311	37983
601	2.77887	44720	02739	52089
607	2.78318	86910	75257	58096
613	2.78746	04745	18415	03774
617	2.79028	51640	33241	68205
619	2.79169	06490	20117	97680
631	2.80002	93592	44134	31302
641	2.80685	80295	18817	42225
643	2.80821	09729	24222	07249
647	2.81090	42806	68700	38446
653	2.81491	31812	75073	92143
659	2.81888	54145	94009	86128
661	2.82020	14594	85640	23665
673	2.82801	50642	23976	84648
677	2.83058	86686	85144	31601
683	2.83442	07036	81532	56340
691	2.83947	80473	74198	40758
701	2.84571	80179	66658	65706
709	2.85064	62351	83066	54285
719	2.85672	88903	82882	60777
727	2.86153	44108	59037	83621
733	2.86510	39746	41127	94317
739	2.86864	44383	94825	73669
743	2.87098	88137	60575	29242
751	2.87563	99370	04168	38975
757	2.87909	58795	00072	75709
761	2.88138	46567	70572	82637
769	2.88592	63398	01431	03960
773	2.88817	94939	18324	90897
787	2.89597	47323	59064	55847
797	2.90145	83213	96112	34727
809	2.90794	85216	12272	30432
811	2.90902	08542	11156	03069
821	2.91434	31571	19440	77180
823	2.91539	98352	12269	83977
827	2.91750	55095	52546	67071
829	2.91855	45305	50273	55312
839	2.92376	19608	28700	27500
853	2.93094	90311	67523	03000
857	2.93298	08219	23198	16429
859	2.93399	31638	31242	30263
863	2.93601	07957	15209	59266

N	LOG N			
877	2.94299	95933	66040	51823
881	2.94497	59084	12047	91274
883	2.94596	07035	77568	58562
887	2.94792	36198	31726	39220
907	2.95760	72870	60095	25585
911	2.95951	83769	72998	24763
919	2.96331	55113	86111	26520
929	2.96801	57139	93641	76318
937	2.97173	95908	87778	26303
941	2.97358	96234	27256	90834
947	2.97634	99790	03273	41875
953	2.97909	29006	38326	40853
967	2.98542	64740	83001	67360
971	2.98721	92299	08004	86280
977	2.98989	45637	18773	07091
983	2.99255	35178	32135	62275
991	2.99607	36544	85275	32836
997	2.99869	51583	11655	71988
1009	3.00389	11662	36910	52172
1013	3.00560	94453	60280	42845
1019	3.00817	41840	06426	39490
1021	3.00902	57420	86910	24725
1031	3.01325	86652	83516	54691
1033	3.01410	03215	19620	57904
1039	3.01661	55475	57177	41240
1049	3.02077	54881	93557	85991
1051	3.02160	27160	28242	22008
1061	3.02571	53839	01340	66612
1063	3.02653	32645	23296	75697
1069	3.02897	77052	08778	01749
1087	3.03622	95440	86294	53993
1091	3.03782	47505	88341	87761
1093	3.03862	01619	49702	79227
1097	3.04020	66275	74711	13222
1103	3.04257	55124	40190	59866
1109	3.04493	15461	49160	06471
1117	3.04805	31731	15609	05702
1123	3.05037	97562	61457	78469
1129	3.05269	39419	24967	86114
1151	3.06107	53236	29791	80185
1153	3.06182	93072	94699	02164
1163	3.06557	97147	28448	41139
1171	3.06855	68950	72363	12990
1181	3.07224	98976	13514	79908
1187	3.07445	07189	54591	22047
1193	3.07664	04436	70341	87278
1201	3.07954	30074	02906	04893
1213	3.08386	08008	66572	97420
1217	3.08529	05782	30064	98887
1223	3.08742	64570	36285	46333

N	LOG N			
1229	3.08955	18828	86454	08564
1231	3.09025	80529	31316	30782
1237	3.09236	96996	29120	65363
1249	3.09656	24383	74135	51204
1259	3.10002	57301	07862	59755
1277	3.10619	08972	63415	28661
1279	3.10687	05444	78653	92264
1283	3.10822	66563	74928	50366
1289	3.11025	29173	53403	02417
1291	3.11092	62422	66420	30880
1297	3.11293	99760	84080	08150
1301	3.11427	72965	61586	25440
1303	3.11494	44157	12584	69062
1307	3.11627	55875	80544	29789
1319	3.12024	47955	46365	29649
1321	3.12090	28176	14527	20408
1327	3.12287	09228	64435	51193
1361	3.13385	81252	03334	69097
1367	3.13576	85145	67822	27897
1373	3.13767	05372	36755	11141
1381	3.14019	36785	78631	28438
1399	3.14581	77144	91827	62866
1409	3.14891	09931	09356	42717
1423	3.15320	49000	84284	33245
1427	3.15442	39731	14646	95302
1429	3.15503	22287	90970	23029
1433	3.15624	61903	97344	47599
1439	3.15806	07939	36605	19489
1447	3.16046	85311	19037	47114
1451	3.16166	74124	37735	87366
1453	3.16226	56142	98021	52915
1459	3.16405	52918	93451	61412
1471	3.16761	26727	27530	11122
1481	3.17055	50585	21208	47946
1483	3.17114	11510	28382	02544
1487	3.17231	09685	21954	21350
1489	3.17289	46977	52176	14619
1493	3.17405	98077	25025	40498
1499	3.17580	16328	48279	46656
1511	3.17926	44643	39025	36972
1523	3.18269	99033	36042	57885
1531	3.18497	51906	98261	02747
1543	3.18836	59260	63148	26759
1549	3.19005	14177	59206	00266
1553	3.19117	14557	28558	52440
1559	3.19284	61151	88841	68076
1567	3.19506	89964	68590	13100
1571	3.19617	61850	39973	33052
1579	3.19838	21300	08294	23351
1583	3.19948	09148	62355	91148

N	LOG N			
1597	3.20330	49161	38482	93226
1601	3.20439	13319	19299	73319
1607	3.20601	58767	63344	53624
1609	3.20655	60440	99029	54984
1613	3.20763	43673	88961	52060
1619	3.20924	68487	53373	73689
1621	3.20978	30148	48514	94471
1627	3.21138	75529	36858	78769
1637	3.21404	86794	11941	43947
1657	3.21932	25084	19336	74213
1663	3.22089	22492	19519	23969
1667	3.22193	55998	28005	32472
1669	3.22245	63366	79246	71116
1693	3.22865	69581	08935	24242
1697	3.22968	18423	17675	79743
1699	3.23019	33788	69045	60781
1709	3.23274	20627	20736	83466
1721	3.23578	08703	27560	25936
1723	3.23628	52774	48028	49149
1733	3.23879	85627	13917	00093
1741	3.24079	87711	17331	20298
1747	3.24229	29049	82930	93972
1753	3.24378	19160	93794	93237
1759	3.24526	58394	57461	26128
1777	3.24968	74278	05301	52549
1783	3.25115	13431	75354	60160
1787	3.25212	45525	05644	23678
1789	3.25261	03405	67372	99898
1801	3.25551	37128	19533	32605
1811	3.25791	84503	14058	40769
1823	3.26078	66686	54976	30146
1831	3.26268	83443	01696	47100
1847	3.26646	68954	40241	40760
1861	3.26974	63731	30767	01147
1867	3.27114	43179	49078	30619
1871	3.27207	37875	00009	91904
1873	3.27253	77773	75237	37081
1877	3.27346	42726	21346	31541
1879	3.27392	67801	00525	60944
1889	3.27623	19579	21833	58520
1901	3.27898	21168	65443	13829
1907	3.28035	06930	46005	62303
1913	3.28171	49700	27295	85696
1931	3.28578	22737	79394	70907
1933	3.28623	18540	28553	01133
1949	3.28981	18391	17621	43519
1951	3.29025	72693	94518	06938
1973	3.29512	70852	52191	18753
1979	3.29644	57942	06396	26587
1987	3.29819	78671	09815	15096
1993	3.29950	72987	00487	60356
1997	3.30037	80648	70702	56981
1999	3.30081	27941	18116	93941