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TITANIC PRIMES

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The most striking feature of a table of the 319 largest known primes is the fact that they can all be described by simple compact mathematical expressions. It is not necessary to list all of the 1000 or more decimal digits that each of them contains in order to identify them.

There were 56 primes in an earlier published tabulation of known primes 1000 or more digits long [1,p.87]. Table 1 includes 55 of those 56 (a correction eliminated one) as well as those which were reported later. In the table, the number k is never more than nine digits in length.

The notation $A(k,n)$ denotes 1 *more* than the product of k and the nth power of 2. There are 171 such entries, the largest of which (entry 7) was found on Christmas Eve by A.O.L. Atkin and N. Ruckert [5]. Most of the others were reported by Wilfred Keller of West Germany [2]. None of them is of the form $A(1,n)$. If it were, it would be a Fermat prime, and n would be a power of 2. The largest known Fermat number is $A(1,16)$, which is equal to 65537, a 5-digit number.

$B(k,n)$ is 1 *less* than the product of k and the nth power of 2. There are 25 of these, including the 11 Mersenne primes that occur when k is 1. Of those that are not Mersenne primes, 11 were found by Wlater Borho and Jurgen Buhl of West Germany [3].

There are 88 entries of the form $C(k,n)$, which is 1 *more* than the difference between $K \cdot 2^n$ and k, but only two entries of the form $D(k,n)$, which is 1 *less* than the difference bween $k \cdot 2^n$ and k.

If $A(k,n)$ and $B(k,n)$ have the same arguments, or if $C(k,n)$ and $D(k,n)$ have the same arguments, the two are a pair of twin primes, since their difference is 2. Table 1 contains four such pairs of twin primes. The largest pair (entries 129-130) was discovered on December 30, 1983 by A.O.L Atkin and N. Rickert of the University of Chicago [5]. They had previously found the smallest pair in the table (entries 298-299) in 1980. The other two pairs are Keller's (entries 194-195), reported in 1983 [4].

$G(k,n)$ is 1 more than the product of k and the nth power of 10. Dubner found the nine primes of this type in January 1984. $H(k,n)$ is 1 more than the product of k and the nth power of 3. There is only one of this type (entry 90) discovered by G. Jaeschke in 1983.

$J(k,n)$ is 1 more than the product of k and the square of (2^n-1). All ten entries in the table were found by Keller in 1983.

The largest of the remaining three entries is the 2188-digit prime 872!+1 (entry 54), a number that is 1 *more* than a factorial. There are no larger numbers of this type with less than 3000 digits. One of the other two very large primes is 1 more

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than the product of an ascending set of consecutive primes beginning with 2. The last is 1 *less* than a factorial.

When J.P. Buhler, R.E. Crandall, and M.A. Penk reported their discovery of the last two entries (270 and 293) [6], they stated the extent to which they had gone in testing. In general, they tested up to and beyond 1000-digit numbers that are 1 more and 1 less than factorials, or 1 more or 1 less than products of consecutive primes. No prime of the form with p as high as 2377 has been tested. "The number $2 \cdot 3 \cdot 5 \cdots 2377 - 1$ is a pseudoprime whose primality has not been tested." [6]

The principal testing procedure by which large composite numbers are detected and eliminated from a list of prime candidates is the pseudoprime test, performed after disposing of numbers that are readily divisible by at least one of a set of smaller primes. Failure to pass the pseudoprime test is sufficient evidence that a number is composite. If b and N are relatively prime, and if $b^{N-1}-1$ is not divisible by N, then N is composite, according to the converse of Fermat's theorem. A small value of b, 3 or 13 for example, is usually a convenient base. If b^{N-1} is divisible by N, N is called a *probably prime base b*. The usual practice is then to test again for divisibility with several other bases. If divisibility does not occur with any one base, N is composite. If N does not fail the test with any of the bases that are tried, it is more probable that N is prime. Other appropriate tests are then undertaken to determine the primality status of N with certainty. Numbers of the types listed in Table 1 lend themselves more readily, in general, to successful application of such tests than numbers chosen at random.

Working at him home in Ridgewood, New Jersey, with an Intel 8080 microcomputer equipped with a bit slice computer designed by his company, Harvey Dubner found that $n! + 1$ is composite for all n between 546 and 1150, with the exception that it is prime when $n = 872$. The reader may have reason to recall the pertinence of Wilson's theorem, which states that if $n+1$ is prime, it divides $n!+1$. So, $n!+1$ is immediately known to be composite if n is 1 less than a prime number.

A slightly larger number, the repunit R_{1031}, is also waiting for final approval in order to be placed in Table 1. A repunit $R_n = (10^n - 1)/9$ is a number written decimally with n 1's. R_2 (that is, 11), R_{19}, and R_{23} are repunit primes, but the largest one known is R_{317} (317 1's). H.C. Williams found that R_{1031} is a probable prime with all of the bases with which it was tested [1,p. 126], but it has not yet been proved to be prime. Proceeding farther, he showed that all repunits above R_{317} and below R_{3000}, except for R_{1031}, are composite [7]. In 1983, Dubner verified that all larger repunits up through R_{4000}, a 4000-digit number, are composite [8]. Table 1 shows that all presently known primes with more than 4005 digits are Mersenne primes.

The testing of repunits and factorial-related primes has been continuous in the sense that all of the primes in each of these sets less than the largest reported one are known. That is not the situation that exists with Mersenne primes at the time of this writing. Slowinkski has indicated that, in finding $2^{132049} - 1$ to be prime, he tested candidates with greater likelihood of being prime, skipping others. Although this technique has its advantages, we do not know whether or not there are any Mersenne primes between the top two in Table 1. The Mersenne numbers from $B(1, 100000)$ to $B(1, 132048)$ have not yet been tested.

1. Acknowledgements

I wish to express my appreciation to Harvey Dubner, A.O.L. Atkin, and Hugh C. Williams for their interest and for supplying significant parts of the basis for this article. Dubner's results and some of the work of Atkin and Rickert are reported here for the first time. I also thank Rudolph Ondrejka for his advice and consistent cooperation in obtaining information about specific large primes. The foremost collector on this planet of large and interesting primes, he now has recorded about 1500 primes with more than 100 or more digits.

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Addendum to "Titanic Primes" added in proof:

Several more primes containing over 1000 digits have been discovered since this article was prepared:

Prime	Digits	Discoverer	Year
$A(7, 13496)^\star$	4064	K	1984
$A(89, 4237)$	1278	SU	1984
$A(159, 4155)$	1253	SU	1984
$A(51, 4121)$	1243	SU	1984
$A(183, 4084)$	1232	SU	1984
$A(177, 4010)$	1210	SU	1984

$^\star A(7, 13496)$ is now the largest non-Mersenne prime known.

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TABLE 1. Known Primes with 1000 or More Digits

$A(k,n) = k \cdot 2^n + 1$	$E(k,n) = k^2 \cdot 2^n + 1$
$B(k,n) = k \cdot 2^n 11$	$F(k,n) = k^4 \cdot 2^n + 1$
$C(k,n) = k \cdot 2^n + 1 - k$	$G(k,n) = k \cdot 10^n + 1$
$D(k,n) = k \cdot 2^n - 1 - k$	$H(k,n) = k \cdot 3^n + 1$
	$J(k,n) = k \cdot (2^n - 1)^2 + 1$

No.	Prime	Digits	Discoverer[a]	Year
1	$B(1, 132049)$	39751	S	1983
2	$B(1, 86243)$	25962	S	1982
3	$B(1, 44497)$	13395	SN	1979
4	$B(1, 23209)$	6987	N	1979
5	$B(1, 21701)$	6533	NN	1978
6	$B(1, 19937)$	6002	T	1971
7	$A(4549545, 13281)$	4005	AR	1983
8	$A(5, 13165)$	3964	K	1979
9	$E(6485, 12674)$	3823	AR	1983
10	$B(3, 12676)$	3817	BB	1979
11	$A(139, 12614)$	3800	K	1979
12	$B(9, 12495)$	3763	BR	1981
13	$A(19, 11980)$	3581	K	1980
14	$B(9, 11547)$	3477	BB	1979
15	$A(70195125, 11202)$	3380	AR	1980
16	$B(1, 11213)$	3376	G	1963
17	$A(111, 10883)$	3279	K	1981
18	$A(167, 10183)$	3068	K	1979
19	$A(11, 10179)$	3066	K	1979
20	$F(6952, 9952)$	3012	AR	1983
21	$F(5555, 9952)$	3011	AR	1983
22	$F(5213, 9952)$	3012	AR	1983
23	$F(4682, 9952)$	3012	AR	1983
24	$F(4638, 9952)$	3012	AR	1983
25	$F(3950, 9952)$	3012	AR	1983
26	$F(2081, 9952)$	3012	AR	1983
27	$A(103858755, 9952)$	3004	AR	1980
28	$A(31336305, 9921)$	2995	AR	1980

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Table 1. (Cont'd.)

No.	Prime	Digits	Discoverer[a]	Year
29	$B(1, 9941)$	2993	G	1963
30	$E(694, 9920)$	2992	AR	1980
31	$A(2897, 9715)$	2928	K	1979
32	$B(1, 9689)$	2917	G	1963
33	$A(25, 9522)$	2868	K	1983
34	$A(19, 9450)$	2847	K	1983
35	$A(9, 9431)$	2840	K	1983
36	$A(31, 9096)$	2740	K	1983
37	$A(65057, 8899)$	2684	K	1983
38	$A(41, 8411)$	2534	K	1983
39	$A(14899, 8234)$	2483	K	1983
40	$B(9, 8007)$	2412	BB	1980
41	$A(19, 7998)$	2409	K	1983
42	$A(9, 7967)$	2400	AR	1979
43	$B(9, 7939)$	2391	BB	1980
44	$A(29, 7927)$	2388	CW	1979
45	$A(271, 7780)$	2345	K	1983
46	$A(27, 7639)$	2301	CW	1979
47	$A(41, 7607)$	2292	K	1983
48	$A(39, 7583)$	2285	K	1983
49	$B(3, 7559)$	2276	BB	1980
50	$A(19, 7498)$	2259	K	1983
51	$A(49, 7446)$	2244	K	1983
52	$A(15, 7392)$	2227	K	1983
53	$A(17, 7311)$	2203	CW	1979
54	$872! + 1$	2188	D	1983
55	$A(15, 7050)$	2124	K	1983
56	$A(21, 6981)$	2103	K	1983
57	$A(9, 6937)$	2090	K	1983
58	$A(45, 6923)$	2086	K	1983
59	$A(73253, 6889)$	2079	K	1983
60	$A(19, 6838)$	2060	K	1983
61	$A(15, 6804)$	2050	K	1983
62	$A(21, 6712)$	2022	K	1983

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Table 1. (Cont'd.)

No.	Prime	Digits	Discoverer[a]	Year
63	$A(7, 6614)$	1992	CW	1979
64	$A(35, 6541)$	1971	K	1983
65	$A(17, 6539)$	1970	CW	1979
66	$J(6048, 3217)$	1941	K	1983
67	$J(5380, 3217)$	1941	K	1983
68	$A(27, 6419)$	1934	CW	1979
69	$E(3501, 6400)$	1934	AR	1979
70	$A(60829, 6398)$	1931	K	1983
71	$A(383, 6393)$	1928	BCW	1983
72	$A(45, 6359)$	1916	K	1983
73	$A(33, 6346)$	1912	K	1983
74	$G(3, 1900)$	1901	D	1984
75	$A(45, 6284)$	1894	K	1983
76	$A(173, 6253)$	1885	K	1983
77	$A(49, 6242)$	1881	K	1983
78	$A(18203, 6141)$	1853	K	1983
79	$A(45, 6146)$	1852	K	1983
80	$A(47, 6115)$	1843	K	1983
81	$A(21167, 6095)$	1840	K	1983
82	$A(5, 5947)$	1791	AR	1979
83	$A(65477, 5887)$	1771	K	1983
84	$B(9, 5893)$	1775	BB	1980
85	$A(37, 5870)$	1769	K	1983
86	$B(9, 5815)$	1752	BB	1980
87	$A(8543, 5793)$	1748	BCW	1980
88	$A(9, 5802)$	1748	AR	1979
89	$A(67913, 5773)$	1743	K	1983
90	$H(914, 3626)$	1734	J	1983
91	$A(57503, 5697)$	1720	K	1983
92	$A(47911, 5652)$	1707	K	1983
93	$B(9, 5589)$	1684	BB	1980
94	$A(47911, 5568)$	1681	K	1983
95	$A(91, 5536)$	1669	K	1983
96	$A(29, 5443)$	1640	CW	1979

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Table 1. (Cont'd.)

No.	Prime	Digits	Discoverer[a]	Year
97	$A(17, 5355)$	1614	CW	1979
98	$A(43, 5322)$	1604	K	1983
99	$A(39, 5317)$	1603	K	1983
100	$A(7493, 5249)$	1584	BCW	1980
101	$A(23779, 5234)$	1580	K	1983
102	$A(33, 5236)$	1578	K	1983
103	$A(25, 5152)$	1553	K	1983
104	$A(71869, 5130)$	1550	K	1983
105	$B(3, 5134)$	1546	BB	1980
106	$A(77341, 5076)$	1533	K	1983
107	$A(7957, 5064)$	1529	BCW	1980
108	$A(91, 5028)$	1516	K	1983
109	$A(33, 4941)$	1489	K	1983
110	$A(39, 4865)$	1467	K	1983
111	$A(25861, 4848)$	1464	K	1983
112	$A(9, 4842)$	1459	K	1983
113	$A(36781, 4824)$	1457	K	1983
114	$A(39, 4802)$	1448	K	1983
115	$A(46159, 4790)$	1447	K	1983
116	$A(35, 4737)$	1428	K	1983
117	$A(29, 4727)$	1425	CW	1979
118	$A(5, 4687)$	1412	CW	1979
119	$A(21, 4644)$	1400	K	1983
120	$A(6319, 4606)$	1391	BCW	1980
121	$A(21, 4585)$	1382	K	1983
122	$J(9378, 2281)$	1378	K	1983
123	$J(7668, 2281)$	1378	K	1983
124	$J(4638, 2281)$	1377	K	1983
125	$J(3252, 2281)$	1377	K	1983
126	$J(3060, 2281)$	1377	K	1983
127	$J(2212, 2281)$	1377	K	1983
128	$A(11, 4543)$	1369	K	1983
129	$A(219649815, 4481)$	1358	AR	1983
130	$B(219649815, 4481)$	1358	AR	1983

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Table 1. (Cont'd.)

No.	Prime	Digits	Discoverer[a]	Year
131	$A(17, 5355)$	1342	K	1983
132	$A(25339, 4438)$	1341	K	1983
133	$C(2966964, 4423)$	1338	K	1983
134	$C(2879910, 4423)$	1338	K	1983
135	$C(280944, 4423)$	1338	K	1983
136	$C(2748090, 4423)$	1338	K	1983
137	$C(2502084, 4423)$	1338	K	1983
138	$C(2375424, 4423)$	1338	K	1983
139	$C(2363310, 4423)$	1338	K	1983
140	$C(2353944, 4423)$	1338	K	1983
141	$C(2295360, 4423)$	1338	K	1983
142	$C(2278836, 4423)$	1338	K	1983
143	$C(2070336, 4423)$	1338	K	1983
144	$C(2048886, 4423)$	1338	K	1983
145	$C(2040540, 4423)$	1338	K	1983
146	$C(2028660, 4423)$	1338	K	1983
147	$C(2008794, 4423)$	1338	K	1983
148	$C(1993254, 4423)$	1338	K	1983
149	$C(1983840, 4423)$	1338	K	1983
150	$C(1843440, 4423)$	1338	K	1983
151	$C(1812006, 4423)$	1338	K	1983
152	$C(1739670, 4423)$	1338	K	1983
153	$C(1639494, 4423)$	1338	K	1983
154	$D(1639494, 4423)$	1338	K	1983
155	$C(1547760, 4423)$	1338	K	1983
156	$C(1303950, 4423)$	1338	K	1983
157	$C(1298610, 4423)$	1338	K	1983
158	$C(1294254, 4423)$	1338	K	1983
159	$C(120366, 4423)$	1338	K	1983
160	$C(1209630, 4423)$	1338	K	1983
161	$C(1093566, 4423)$	1338	K	1983
162	$A(19, 4438)$	1338	K	1983
163	$C(587820, 4423)$	1338	K	1983
164	$C(587814, 4423)$	1338	K	1983

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Table 1. (Cont'd.)

No.	Prime	Digits	Discoverer[a]	Year
165	$C(393216, 4423)$	1338	K	1983
166	$C(388320, 4423)$	1338	K	1983
167	$C(320250, 4423)$	1337	K	1983
168	$C(314496, 4423)$	1337	K	1983
169	$C(312246, 4423)$	1337	K	1983
170	$C(184716, 4423)$	1337	K	1983
171	$C(151716, 4423)$	1337	K	1983
172	$C(84810, 4423)$	1337	K	1983
173	$C(83004, 4423)$	1337	K	1983
174	$C(9436, 4423)$	1336	K	1983
175	$G(6, 1334)$	1335	D	1984
176	$B(1, 4423)$	1332	K	1983
177	$J(6904, 2203)$	1331	K	1983
178	$J(6568, 2203)$	1331	K	1983
179	$A(15, 4410)$	1329	K	1983
180	$A(19, 4386)$	1322	K	1983
181	$A(32393, 4365)$	1319	K	1983
182	$A(43, 4344)$	1310	K	1983
183	$G(33, 1305)$	1307	K	1983
184	$A(127, 4322)$	1304	K	1983
185	$A(43429, 4290)$	1297	K	1983
186	$A(73189, 4278)$	1293	K	1983
187	$A(74959, 4274)$	1292	K	1983
188	$C(2859240, 4253)$	1287	K	1983
189	$C(2707782, 4253)$	1287	K	1983
190	$C(2567208, 4253)$	1287	K	1983
191	$C(2471052, 4253)$	1287	K	1983
192	$C(2464302, 4253)$	1287	K	1983
193	$C(2453262, 4253)$	1287	K	1983
194	$C(2445810, 4253)$	1287	K	1983
195	$D(2445810, 4253)$	1287	K	1983
196	$C(2433990, 4253)$	1287	K	1983
197	$C(2370192, 4253)$	1287	K	1983
198	$C(2357562, 4253)$	1287	K	1983

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Table 1. (Cont'd.)

No.	Prime	Digits	Discoverer[a]	Year
199	$C(2311170, 4253)$	1287	K	1983
200	$C(2305632, 4253)$	1287	K	1983
201	$C(2217660, 4253)$	1287	K	1983
202	$C(2119470, 4253)$	1287	K	1983
203	$C(2060730, 4253)$	1287	K	1983
204	$C(2054790, 4253)$	1287	K	1983
205	$C(1919298, 4253)$	1287	K	1983
206	$C(1874208, 4253)$	1287	K	1983
207	$C(1858818, 4253)$	1287	K	1983
208	$C(1765812, 4253)$	1287	K	1983
209	$C(1669812, 4253)$	1287	K	1983
210	$C(1647150, 4253)$	1287	K	1983
211	$C(1614180, 4253)$	1287	K	1983
212	$C(1586022, 4253)$	1287	K	1983
213	$C(1475160, 4253)$	1287	K	1983
214	$C(1447902, 4253)$	1287	K	1983
215	$C(1418598, 4253)$	1287	K	1983
216	$C(1229552, 4253)$	1287	K	1983
217	$C(1187658, 4253)$	1287	K	1983
218	$C(1126140, 4253)$	1287	K	1983
219	$C(1102788, 4253)$	1287	K	1983
220	$C(1084818, 4253)$	1287	K	1983
221	$C(1038492, 4253)$	1287	K	1983
222	$C(991728, 4253)$	1287	K	1983
223	$C(971370, 4253)$	1287	K	1983
224	$C(950118, 4253)$	1287	K	1983
225	$C(928950, 4253)$	1287	K	1983
226	$C(879102, 4253)$	1287	K	1983
227	$C(707190, 4253)$	1287	K	1983
228	$C(511080, 4253)$	1286	K	1983
229	$C(301350, 4253)$	1286	K	1983
230	$C(258570, 4253)$	1286	K	1983
231	$C(120078, 4253)$	1286	K	1983
232	$C(104898, 4253)$	1286	K	1983

[a]Key to Discoverers: AR = A.Oliver L.Atkin, Neil W.Rickert; BB = Walter Borho, Jurgen Buhl; BCP = Joe P.Buhler, Richard E.Crandall, MIchael R.Penk; BCW = Robert Baillie, G.V.Cormack, Hugh C.Williams; BR = Walter Borho, R.Reckow; CW = G.V. Cormack, Hugh C.Williams; D = Harvey Dubner; G = Donald B.Gillies; H = Alexander Horwitz; J = Gerhard Jaeschke; K = Wilfred Keller; N = Curt L.Noll;NN = Curt L.Noll, Laura A.Nickel; S = David Slowinski; SN = David Slowinski, Harry L.Nelson; SU = Hiromi Suymama; T = Bryant Tuckerman.

Table 1. (Cont'd.)

No.	Prime	Digits	Discoverer[a]	Year
233	$C(8196, 4253)$	1285	K	1983
234	$C(6742, 4253)$	1285	K	1983
235	$C(3708, 4253)$	1284	K	1983
236	$C(2010, 4253)$	1284	K	1983
237	$B(1, 4253)$	1281	H	1981
238	$B(4, 4204)$	1267	BB	1980
239	$A(74221, 4188)$	1266	J	1983
240	$A(77267, 4159)$	1257	J	1983
241	$A(83, 4129)$	1245	SU	1983
242	$G(7, 1235)$	1236	D	1984
243	$A(99, 4082)$	1231	SU	1983
244	$A(99, 4029)$	1215	SU	1983
245	$A(69, 4025)$	1214	SU	1983
246	$A(71, 4017)$	1212	SU	1983
247	$A(81, 3995)$	1205	K	1983
248	$A(177, 3980)$	1201	K	1983
249	$A(185, 3963)$	1196	K	1983
250	$A(81, 3945)$	1190	K	1983
251	$A(25, 3938)$	1187	CW	1979
252	$A(23, 3929)$	1185	CW	1979
253	$A(3, 3912)$	1179	CW	1979
254	$A(25, 3905)$	1177	CW	1979
255	$G(6, 1173)$	1174	D	1984
256	$A(15, 3888)$	1172	CW	1979
257	$A(97, 3880)$	1170	K	1983
258	$A(159, 3862)$	1165	K	1983
259	$A(175, 3848)$	1161	K	1983
260	$A(171, 3837)$	1158	K	1983
261	$A(85, 3834)$	1157	K	1983
262	$A(101, 3831)$	1156	K	1983
263	$A(171, 3825)$	1154	K	1983
264	$A(17597, 3799)$	1148	K	1983
265	$A(101, 3767)$	1136	K	1983
266	$A(189, 3730)$	1126	K	1983

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Table 1. (Cont'd.)

No.	Prime	Digits	Discoverer[a]	Year
267	$A(193, 3712)$	1120	K	1983
268	$A(76969, 3702)$	1120	J	1982
269	$A(161, 3703)$	1117	K	1983
270	$2 \cdot 3 \cdot 5 \cdot 7... \cdot 2657 + 1$	1115	BCP	1981
271	$A(9, 3690)$	1112	CW	1979
272	$A(103, 3670)$	1107	K	1983
273	$A(51, 3659)$	1104	K	1983
274	$A(179, 3655)$	1103	K	1983
275	$A(9323, 3649)$	1103	SU	1983
276	$A(85, 3638)$	1098	K	1983
277	$A(35, 3627)$	1094	K	1983
278	$A(29, 3627)$	1094	CW	1979
279	$A(195, 3623)$	1093	K	1983
280	$A(179, 3623)$	1093	K	1983
281	$A(105, 3619)$	1092	K	1983
282	$A(52909, 3606)$	1091	K	1983
283	$A(67, 3602)$	1087	K	1983
284	$A(73, 3596)$	1085	K	1983
285	$A(181, 3560)$	1074	K	1983
286	$A(147, 3554)$	1073	K	1983
287	$A(131, 3553)$	1072	K	1983
288	$A(189, 3538)$	1068	K	1983
289	$A(52909, 3518)$	1064	K	1983
290	$A(43, 3528)$	1064	K	1983
291	$A(81, 3497)$	1055	K	1983
292	$469! - 1$	1051	BCP	1981
293	$A(65, 3477)$	1049	K	1983
294	$A(125, 3475)$	1049	K	1983
295	$A(113, 3461)$	1044	K	1983
296	$A(105, 3461)$	1044	K	1983
297	$A(179, 3459)$	1044	K	1983
298	$A(256200945, 3426)$	1040	AR	1980
299	$B(256200945, 3426)$	1040	AR	1980
300	$A(51, 3337)$	1040	K	1983

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Table 1. (Cont'd.)

No.	Prime	Digits	Discoverer[a]	Year
301	$G(9, 1038)$	1039	D	1984
302	$A(16519, 3434)$	1038	J	1982
303	$A(95, 3437)$	1037	K	1983
304	$A(9, 3417)$	1030	CW	1979
305	$G(3, 1020)$	1021	D	1984
306	$G(6, 1019)$	1020	D	1984
307	$A(69, 3379)$	1020	K	1983
308	$A(141, 3375)$	1019	K	1983
309	$A(77521, 3360)$	1017	K	1983
310	$A(34565, 3361)$	1017	J	1982
311	$A(9, 3354)$	1011	CW	1979
312	$G(6, 1009)$	1010	D	1984
313	$A(77521, 3336)$	1010	J	1982
314	$B(9, 3349)$	1010	BB	1980
315	$A(217, 3344)$	1009	SU	1983
316	$A(105, 3331)$	1005	K	1983
317	$A(61, 3328)$	1004	K	1983
318	$A(27, 3322)$	1002	CW	1979
319	$A(25, 3314)$	1000	CW	1979

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