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The Distribution of Prime Numbers and Finding the Factor of Composite Numbers without Searching

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Abstract

In this paper, there are 5 sections of tables represented by 5 linear sequence functions. There are two one-variable sequence functions that they are able to represent all prime numbers. The first one helps the last one to produce another three two-variable linear sequence functions. With the help of these three two-variable sequence functions, the last one, one-variable sequence function, is able to set apart all prime numbers from composite numbers. The formula shows that there are infinitely many prime numbers by applying limit to infinity. The three two-variable sequence functions help us to find the factor of all composite numbers.

Keywords

The n^{th} Sequence of an Arithmetic Sequence, Number of Elements of the Set, Sequence Functions

1. Introduction

A prime number (or a prime) is a natural number greater than 1 that has no positive divisors other than 1 and itself. A natural number greater than 1 that is not a prime number is called a composite number. For example, 5 is prime because 1 and 5 are its only positive integer factors, whereas 6 is composite because it has the divisors 2 and 3 in addition to 1 and 6. The fundamental theorem of arithmetic establishes the central role of primes in number theory: any integer greater than 1 can be expressed as a product of primes that is unique up to ordering. The uniqueness in this theorem requires excluding 1 as a prime because one can include arbitrarily many instances of 1 in any factorization, e.g., 3, 1 × 3, 1 × 1 × 3, etc. are all valid factorizations of 3. The property of being prime (or not) is called primality. A simple but slow method of verifying the primality of a given number

n is known as trial division. It consists of testing whether n is a multiple of any integer between 2 and $\sqrt{n}$. Algorithms much more efficient than trial division have been devised to test the primality of large numbers. Particularly fast methods are available for numbers of special forms, such as Mersenne numbers. As of April 2014, the largest known prime number has 17,425,170 decimal digits. There are infinitely many primes, as demonstrated by Euclid around 300 BC. There is no known useful formula that sets apart all of the prime numbers from composites. However, the distribution of primes, that is to say, the statistical behaviour of primes in the large, can be modelled. The first result in that direction is the prime number theorem, proven at the end of the 19th century, which says that the probability that a given, randomly chosen number n is prime is inversely proportional to its number of digits, or to the logarithm of n. Many questions regarding prime numbers remain open, such as Goldbach's conjecture (that every even integer greater than 2 can be expressed as the sum of two primes), and the twin prime conjecture (that there are infinitely many pairs of primes whose difference is 2). Such questions spurred the development of various branches of number theory, focusing on analytic or algebraic aspects of numbers. Primes are used in several routines in information technology, such as public-key cryptography, which makes use of properties such as the difficulty of factoring large numbers into their prime factors. Prime numbers give rise to various generalizations in other mathematical domains, mainly algebra, such as prime elements and prime ideals [1].

In this paper I am going to prove that:

1) 1 is prime number, so the definition of prime number becomes "A prime number (or a prime) is a natural number greater than or equal to 1 that has no positive divisors other than 1 and itself."

2) There is useful formula that sets apart all of the prime numbers from composites or the distribution of primes.

3) Goldbach's conjecture and the twin prime conjecture.

4) Finding the factor of any odd composite numbers without searching.

For example to find the factor of composite number

n = 114381625757888867669235779976146612010218296721242362562561842935706935245733897830597123563958705058989075147599290026879543541 [2] the only thing we need to have is microsoft Excel software with big cell and a little bit big screen computer and track the number $\frac{n-105}{2}$ from the two tables using two functions that we will discuss. My paper is important to find the factor composite numbers and prime numbers as we want as fast as possible and faster than trial division and algorithmic methods and perfect.

2. Preliminary

Definition (When Is a Number Divisible by 3) [3].

If the sum of the digits of a number is divisible by 3 , then the original number is divisible by 3.

Definition (When Is a Number Divisible by 5) [3].

If the last digit of the number being inspected for divisibility is either a 0 or 5, then the number itself will be divisible by 5.

Definition (When Is a Number Divisible by 7) [3].

Delete the last digit from the given number and then subtract twice this deleted digit from the remaining number. If the result is divisible by 7, the original number is divisible by 7. This process may be repeated if the result is too large for simple inspection of divisibility of 7.

Definition (The n^{th} term of Arithmetic sequence).

The n^{th} term of an Arithmetic sequence is given by $a_n = a_1 + (n-1)d$, where a_1 is the first term of the sequence and d is the common difference of the sequence.

Definition (Multivariable sequence function).

A function $f(n_1, n_2, \cdots, n_k): D \subseteq \aleph^k \to \Re$ is a real valued multi-variable sequence function defined on the set of k^{th} natural numbers, $\aleph^k$, where $n_1, n_2, \cdots, n_k \in \aleph$ and number of elements in the range $= n(f) \le \prod_{i=1}^{k} n(n_i) =$ the product of number of elements of $n_i, i = 1, 2, \cdots, k$.

Example: If $f(n_1, n_2) = 5460 - 105(n_1 + n_2) + 2n_1 n_2$ for $n_1 = n_2 = 1, 2, 4, 8, 11, 13, 16, 17, 19, 22, 23, 26, 29, 31, 32, 34, 37, 38, 41, 43, 44, 46, 47$, that is, $n(n_1) = n(n_2) = 23$, then number of elements of $f(n_1, n_2) = C_2^{23} + 23 = \frac{23!}{2!(23-2)!} + 23 = 276 \le \prod_{i=1}^{2} n(n_i) = 529$, here I take combination because addition is commutative from $f(n_1, n_2) = 5460 - 105(n_1 + n_2) + 2n_1 n_2$ the term $n_1 + n_2 = n_2 + n_1$ therefore order is not considered.

But if $f(n_1,n_2)=5460+105(n_2-n_1)-2n_1n_2$, then the number of elements of $f(n_1,n_2)=P_2^{23}+23=\frac{23!}{(23-2)!}+23=(23)(22)+23=529=\prod_{i=1}^{2}n(n_i)$, here I take permutation because subtraction is not commutative from $f(n_1,n_2)=5460+105(n_2-n_1)-2n_1n_2$ the term $n_2-n_1\neq n_1-n_2$ therefore order is considered.

3. Tables

Theorem 1. *The linear sequence function* $f(p)=105-2p$ *represents all odd numbers from* 1 *to* 103 *for* $1\leq p\leq 52$, *where* $p\in\aleph$.

Proof. The sequence function $f(p)=105-2p$ is an arithmetic sequence function of decreasing odd numbers from 103 to 1 with common difference 2 and initial term 103, that is, $f(p)=103+(1-p)2=105-2p, 1\leq p\leq 52$. □

Theorem 2. *The linear sequence function* $f(p)=105+2p$ *represents all odd numbers greater than* 105 *for natural number* $p\geq 1$.

Proof. The function $f(p)=105+2p$ is an arithmetic sequence function that represents all odd numbers greater than 105 with common difference 2 and initial term 107, that is $f(p)=107+(p-1)2=105+2p,\ p\geq 1$. □

Theorem 3. *The linear sequence function* $f(p)=105+2p$ *represents all odd numbers greater than* 105 *except a number which are multiples of* 3, 5 *and* 7 *for natural numbers p and n suchthat* $p\neq 3n, 5n$ *and* $7n$.

Proof. Since $f(p)=105+2p=(3)(5)(7)+2p$, then $f(p)\neq 3n,5n$ and $7n$ for all p and n suchthat $p\neq 3n,5n$ and $7n$. □

Theorem 4. *The linear sequence function* $f(p)=105-2p$ *represents all prime numbers from* 1 *to* 103 *except* 2, 5 *and* 7 *for natural numbers p and n suchthat* $p\neq 3n,5n$ *and* $7n$, *and* $1\leq p\leq 52$, *that is,* 1 *is prime number*.

Proof. See **Table 1**. □

Table 1. My magical table.

p	$105-2p$
1	103
2	101
4	97
8	89
11	83
13	79
16	73
17	71
19	67
22	61
23	59
26	53
29	47
31	43
32	41
34	37
37	31
38	29
41	23
43	19
44	17
46	13
47	11
52	1

Theorem 5. *The sequence function* $f(p_1, p_2) = 5460 - 105(p_1 + p_2) + 2p_1p_2$ *represents* 1128 *different natural numbers for natural numbers* $1 \le p_1 \le 47$ *and* $1 \le p_2 \le 47$.

Proof. From combination of objects p_1 and p_2 we have $C_2^{47} + 47 = 1128$ since $n(p_1) = n(p_2) = 47$.

Thus $f(p_1, p_2)$ represents 1128 different natural numbers. □

Theorem 6. *If* $g(p) = 105 + 2p$, *then* $g(f(p_1, p_2))$ *is composite numbers with factors* $105 - 2p_1$ *and* $105 - 2p_2$, *where* p_1, p_2 *and* $f(p_1, p_2)$ *are stated from above Theorem*-5.

Proof. Since

$g(f(p_1, p_2)) = 105 + 2(5460 - 105(p_1 + p_2) + 2p_1p_2) = 11025 - 210(p_1 + p_2) + 4p_1p_2 = (105 - 2p_1)(105 - 2p_2)$, then $g(f(p_1, p_2))$ is composite numbers with factors $105 - 2p_1$ and $105 - 2p_2$. □

Theorem 7. *The sequence function* $f(p_1, p_2) = 5460 - 105(p_1 + p_2) + 2p_1p_2$ *represents* 276 *different natural numbers which are not multiples of* 3, 5 *and* 7 *for natural numbers* p_1, p_2 *and n suchthat* $p_1, p_2 \ne 3n, 5n,$ *and* $7n$ *and* $1 \le p_1 \le 47, 1 \le p_2 \le 47$.

Proof. Since $n(p_1) = n(p_2) = 23$, that is,

$p_1 = p_2 = 1, 2, 4, 8, 11, 13, 16, 17, 19, 22, 23, 26, 29, 31, 32, 34, 37, 38, 41, 43, 44, 46, 47$, then $C_2^{23} + 23 = 276$.

See the following table, where p_1 represents the 1^{st} column and p_2 represents the 1^{st} row. □

Example: For Theorem 7 see the following **Table 2**, **Table 3** which represents $f(p_1, p_2) = 5460 - 105(p_1 + p_2) + 2p_1p_2$ for $1 \le p_1, p_2 \le 47$ where p_1 represents the first column and p_2 represents the first row.

Table 2. Tabular proof for theorem 7.

$p_{1,2}$	47	46	44	43	41	38	37	34	32	31	29	26
47	8	19	41	52	74	107	118	151	173	184	206	239
46	19	32	58	71	97	136	149	188	214	227	253	292
44	41	58	92	109	143	194	211	262	296	313	347	398
43	52	71	109	128	166	223	242	299	337	356	394	451
41	74	97	143	166	212	281	304	373	419	442	488	557
38	107	136	194	223	281	368	397	484	542	571	629	716
37	118	149	211	242	304	397	428	521	583	614	676	769
34	151	188	262	299	373	484	521	632	706	743	817	928
32	173	214	296	337	419	542	583	706	788	829	911	1034
31	184	227	313	356	442	571	614	743	829	872	958	1087
29	206	253	347	394	488	629	676	817	911	958	1052	1193
26	239	292	398	451	557	716	769	928	1034	1087	1193	1352
23	272	331	449	508	626	803	862	1039	1157	1216	1334	1511
22	283	344	466	527	649	832	893	1076	1198	1259	1381	1564
19	316	383	517	584	718	919	986	1187	1321	1388	1522	1723
17	338	409	551	622	764	977	1048	1261	1403	1474	1616	1829
16	349	422	568	641	787	1006	1079	1298	1444	1517	1663	1882
13	382	461	619	698	856	1093	1172	1409	1567	1646	1804	2041
11	404	487	653	736	902	1151	1234	1483	1649	1732	1898	2147
8	437	526	704	793	971	1238	1327	1594	1772	1861	2039	2306
4	481	578	772	869	1063	1354	1451	1742	1936	2033	2227	2518
2	503	604	806	907	1109	1412	1513	1816	2018	2119	2321	2624
1	514	617	823	926	1132	1441	1544	1853	2059	2162	2368	2677

Table 3. Tabular proof for theorem 7 continued.

$p_{1,2}$	23	22	19	17	16	13	11	8	4	2	1
47	272	283	316	338	349	382	404	437	481	503	514
46	331	344	383	409	422	461	487	526	578	604	617
44	449	466	517	551	568	619	653	704	772	806	823
43	508	527	584	622	641	698	736	793	869	907	926
41	626	649	718	764	787	856	902	971	1063	1109	1132
38	803	832	919	977	1006	1093	1151	1238	1354	1412	1441
37	862	893	986	1048	1079	1172	1234	1327	1451	1513	1544
34	1039	1076	1187	1261	1298	1409	1483	1594	1742	1816	1853
32	1157	1198	1321	1403	1444	1567	1649	1772	1936	2018	2059
31	1216	1259	1388	1474	1517	1646	1732	1861	2033	2119	2162
29	1334	1381	1522	1616	1663	1804	1898	2039	2227	2321	2368
26	1511	1564	1723	1829	1882	2041	2147	2306	2518	2624	2677
23	1688	1747	1924	2042	2101	2278	2396	2573	2809	2927	2986
22	1747	1808	1991	2113	2174	2357	2479	2662	2906	3028	3089
19	1924	1991	2192	2326	2393	2594	2728	2929	3197	3331	3398
17	2042	2113	2326	2468	2539	2752	2894	3107	3391	3533	3604
16	2101	2174	2393	2539	2612	2831	2977	3196	3488	3634	3707
13	2278	2357	2594	2752	2831	3068	3226	3463	3779	3937	4016
11	2396	2479	2728	2894	2977	3226	3392	3641	3973	4139	4222
8	2573	2662	2929	3107	3196	3463	3641	3908	4264	4442	4531
4	2809	2906	3197	3391	3488	3779	3973	4264	4652	4846	4943
2	2927	3028	3331	3533	3634	3937	4139	4442	4846	5048	5149
1	2986	3089	3398	3604	3707	4016	4222	4531	4943	5149	5252

Theorem 8. *If the sequence function,* $g(p)=105+2p$*, then the sequence function* $g(f(p_1,p_2))$ *represents composite numbers with factors* $105-2p_1$ *and* $105+2p_2$*, where* $f(p_1,p_2)=5460+105(p_2-p_1)-2p_1p_2$*,* $1\le p_1\le 47$*,* $p_2\ge 1$.

Proof. Since $g(f(p_1,p_2))=105+2(5460+105(p_2-p_1)-2p_1p_2)=(105-2p_1)(105+2p_2)$, then $g(f(p_1,p_2))$ is composite numbers with factors $105-2p_1$ and $105+2p_2$ for $1\le p_1\le 47$ and $p_2\ge 1$. □

Theorem 9. *If the sequence function,* $g(p)=105+2p, p\ne 3n,5n,$ *and* $7n$*, where* $n\in\aleph$*, then the sequence function* $g(f(p_1,p_2))$ *represents composite numbers which are not multiples of* 3, 5 *and* 7 *with factors* $105-2p_1$ *and* $105+2p_2$*, where* $f(p_1,p_2)=5460+105(p_2-p_1)-2p_1p_2$*,* $1\le p_1\le 47$*,* $p_2\ge 1$ *and* $P_{1,2}\ne 3n,5n,7n$ *where* $n\in\aleph$.

Proof. If $p_1,p_2\ne 3n,5n,$ and $7n$ then $105-2p_1, 105+2p_2\ne 3n,5n,$ and $7n$ this implies that $(105-2p_1)(105+2p_2)\ne 3n,5n,$ and $7n$.

Thus $\frac{(105-2p_1)(105+2p_2)-105}{2}=f(p_1,p_2)\ne 3n,5n,$ and $7n$ this implies that $g(f(p_1,p_2))=105+2(f(p_1,p_2))\ne 3n,5n,$ and $7n$ for $f(p_1,p_2)\ne 3n,5n,$ and $7n$ and composite numbers with factors $105-2p_1$ and $105+2p_2$.

Example: For Theorem 9 see the following **Table 4**, **Table 5** which represents $f(p_1,p_2)=5460+105(p_2-p_1)-2p_1p_2$ for $1\le p_1,p_2\le 47$ where p_1 represents the first column and p_2 represents the first row.

Table 4. Examples for theorem 9.

$p_{1,2}$	1	2	4	8	11	13	16	17	19	22	23	26
47	536	547	569	613	646	668	701	712	734	767	778	811
46	643	656	682	734	773	799	838	851	877	916	929	968
44	857	874	908	976	1027	1061	1112	1129	1163	1214	1231	1282
43	964	983	1021	1097	1154	1192	1249	1268	1306	1363	1382	1439
41	1178	1201	1247	1339	1408	1454	1523	1546	1592	1661	1684	1753
38	1499	1528	1586	1702	1789	1847	1934	1963	2021	2108	2137	2224
37	1606	1637	1699	1823	1916	1978	2071	2102	2164	2257	2288	2381
34	1927	1964	2038	2186	2297	2371	2482	2519	2593	2704	2741	2852
32	2141	2182	2264	2428	2551	2633	2756	2797	2879	3002	3043	3166
31	2248	2291	2377	2549	2678	2764	2893	2936	3022	3151	3194	3323
29	2462	2509	2603	2791	2932	3026	3167	3214	3308	3449	3496	3637
26	2783	2836	2942	3154	3313	3419	3578	3631	3737	3896	3949	4108
23	3104	3163	3281	3517	3694	3812	3989	4048	4166	4343	4402	4579
22	3211	3272	3394	3638	3821	3943	4126	4187	4309	4492	4553	4736
19	3532	3599	3733	4001	4202	4336	4537	4604	4738	4939	5006	5207
17	3746	3817	3959	4243	4456	4598	4811	4882	5024	5237	5308	5521
16	3853	3926	4072	4364	4583	4729	4948	5021	5167	5386	5459	5678
13	4174	4253	4411	4727	4964	5122	5359	5438	5596	5833	5912	6149
11	4388	4471	4637	4969	5218	5384	5633	5716	5882	6131	6214	6463
8	4709	4798	4976	5332	5599	5777	6044	6133	6311	6578	6667	6934
4	5137	5234	5428	5816	6107	6301	6592	6689	6883	7174	7271	7562
2	5351	5452	5654	6058	6361	6563	6866	6967	7169	7472	7573	7876
1	5458	5561	5767	6179	6488	6694	7003	7106	7312	7621	7724	8033

Table 5. Examples for theorem 9 continued.

$p_{1,2}$	29	31	32	34	37	38	41	43	44	46	47
47	844	866	877	899	932	943	976	998	1009	1031	1042
46	1007	1033	1046	1072	1111	1124	1163	1189	1202	1228	1241
44	1333	1367	1384	1418	1469	1486	1537	1571	1588	1622	1639
43	1496	1534	1553	1591	1648	1667	1724	1762	1781	1819	1838
41	1822	1868	1891	1937	2006	2029	2098	2144	2167	2213	2236
38	2311	2369	2398	2456	2543	2572	2659	2717	2746	2804	2833
37	2474	2536	2567	2629	2722	2753	2846	2908	2939	3001	3032
34	2963	3037	3074	3148	3259	3296	3407	3481	3518	3592	3629
32	3289	3371	3412	3494	3617	3658	3781	3863	3904	3986	4027
31	3452	3538	3581	3667	3796	3839	3968	4054	4097	4183	4226
29	3778	3872	3919	4013	4154	4201	4342	4436	4483	4577	4624
26	4267	4373	4426	4532	4691	4744	4903	5009	5062	5168	5221
23	4756	4874	4933	5051	5228	5287	5464	5582	5641	5759	5818
22	4919	5041	5102	5224	5407	5468	5651	5773	5834	5956	6017
19	5408	5542	5609	5743	5944	6011	6212	6346	6413	6547	6614
17	5734	5876	5947	6089	6302	6373	6586	6728	6799	6941	7012
16	5897	6043	6116	6262	6481	6554	6773	6919	6992	7138	7211
13	6386	6544	6623	6781	7018	7097	7334	7492	7571	7729	7808
11	6712	6878	6961	7127	7376	7459	7708	7874	7957	8123	8206
8	7201	7379	7468	7646	7913	8002	8269	8447	8536	8714	8803
4	7853	8047	8144	8338	8629	8726	9017	9211	9308	9502	9599
2	8179	8381	8482	8684	8987	9088	9391	9593	9694	9896	9997
1	8342	8548	8651	8857	9166	9269	9578	9784	9887	10093	10,196

Theorem 10. *If the sequence function,* $g(p)=105+2p$, *then the sequence function* $g(f(p_1,p_2))$ *represents composite numbers with factors* $105+2p_1$ *and* $105+2p_2$, *where* $f(p_1,p_2)=5460+105(p_1+p_2)+2p_1p_2$, $p_{1,2}\geq 1$.

Proof. Since $g(f(p_1,p_2))=105+2(f(p_1,p_2))=105+2(5460+105(p_1+p_2)+2p_1p_2)=(105+2p_1)(105+2p_2)$ this implies that $g(f(p_1,p_2))$ is composite numbers with factors $105+2p_1$ and $105+2p_2$ for $p_1,p_2\geq 1$. □

Theorem 11. *If the sequence function,* $g(p)=105+2p, p\neq 3n,5n,$ *and* $7n$, *where* $n\in\aleph$, *then the sequence function* $g(f(p_1,p_2))$ *represents composite numbers which are not multiples of* 3, 5 *and* 7 *with factors* $105+2p_1$ *and* $105+2p_2$, *where* $f(p_1,p_2)=5460+105(p_1+p_1)+2p_1p_2$, $p_{1,2}\geq 1$ *and* $P_{1,2}\neq 3n,5n,7n$ *where* $n\in\aleph$.

Proof. If $p_1,p_2\neq 3n,5n,$ and $7n$ then $105+2p_1,105+2p_2\neq 3n,5n,$ and $7n$ this implies $(105+2p_1)(105+2p_2)\neq 3n,5n,$ and $7n$.

Thus $\frac{(105+2p_1)(105+2p_2)-105}{2}=f(p_1,p_2)\neq 3n,5n,$ and $7n$ this implies that $g(f(p_1,p_2))=105+2(f(p_1,p_2))\neq 3n,5n,$ and $7n$ for $f(p_1,p_2)\neq 3n,5n,$ and $7n$ and is composite numbers with factors $105+2p_1$ and $105+2p_2$. □

Example: For Theorem 11 see the following **Tables 6-8** which represents $f(p_1,p_2)=5460+105(p_1+p_2)+2p_1p_2$ for $1\leq p_1,p_2\leq 47$ where p_1 represents the first column and p_2 represents the first row.

Table 6. Examples for theorem 11.

$p_{1,2}$	1	2	4	8	11	13	16	17
1	5672	5779	5993	6421	6742	6956	7277	7384
2	5779	5888	6106	6542	6869	7087	7414	7523
4	5993	6106	6332	6784	7123	7349	7688	7801
8	6421	6542	6784	7268	7631	7873	8236	8357
11	6742	6869	7123	7631	8012	8266	8647	8774
13	6956	7087	7349	7873	8266	8528	8921	9052
16	7277	7414	7688	8236	8647	8921	9332	9469
17	7384	7523	7801	8357	8774	9052	9469	9608
19	7598	7741	8027	8599	9028	9314	9743	9886
22	7919	8068	8366	8962	9409	9707	10,154	10,303
23	8026	8177	8479	9083	9536	9838	10,291	10,442
26	8347	8504	8818	9446	9917	10,231	10,702	10,859
29	8668	8831	9157	9809	10,298	10,624	11,113	11,276
31	8882	9049	9383	10,051	10,552	10,886	11,387	11,554
32	8989	9158	9496	10,172	10,679	11,017	11,524	11,693
34	9203	9376	9722	10,414	10,933	11,279	11,798	11,971
37	9524	9703	10,061	10,777	11,314	11,672	12,209	12,388
38	9631	9812	10,174	10,898	11,441	11,803	12,346	12,527
41	9952	10,139	10,513	11,261	11,822	12,196	12,757	12,944
43	10,166	10,357	10,739	11,503	12076	12,458	13,031	13,222
44	10,273	10,466	10,852	11,624	12,203	12,589	13,168	13,361
46	10,487	10,684	11,078	11,866	12,457	12,851	13,442	13,639
47	10,594	10,793	11,191	11,987	12,584	12,982	13,579	13,778

Table 7. Examples for Theorem 11 continued.

$p_{1,2}$	19	22	23	26	29	31	32	34
1	7598	7919	8026	8347	8668	8882	8989	9203
2	7741	8068	8177	8504	8831	9049	9158	9376
4	8027	8366	8479	8818	9157	9383	9496	9722
8	8599	8962	9083	9446	9809	10,051	10,172	10,414
11	9028	9409	9536	9917	10,298	10,552	10,679	10,933
13	9314	9707	9838	10,231	10,624	10,886	11,017	11,279
16	9743	10,154	10,291	10,702	11,113	11,387	11,524	11,798
17	9886	10,303	10,442	10,859	11,276	11,554	11,693	11,971
19	10,172	10,601	10,744	11,173	11,602	11,888	12,031	12,317
22	10,601	11,048	11,197	11,644	12,091	12,389	12,538	12,836
23	10,744	11,197	11,348	11,801	12,254	12,556	12,707	13,009
26	11,173	11,644	11,801	12,272	12,743	13,057	13,214	13,528
29	11,602	12,091	12,254	12,743	13,232	13,558	13,721	14,047
31	11,888	12,389	12,556	13,057	13,558	13,892	14,059	14,393
32	12,031	12,538	12,707	13,214	13,721	14,059	14,228	14,566
34	12,317	12,836	13,009	13,528	14,047	14,393	14,566	14,912
37	12,746	13,283	13,462	13,999	14,536	14,894	15,073	15,431
38	12,889	13,432	13,613	14,156	14,699	15,061	15,242	15,604
41	13,318	13,879	14,066	14,627	15,188	15,562	15,749	16,123
43	13,604	14,177	14,368	14,941	15,514	15,896	16,087	16,469
44	13,747	14,326	14,519	15,098	15,677	16,063	16,256	16,642
46	14,033	14,624	14,821	15,412	16,003	16,397	16,594	16,988
47	14,176	14,773	14,972	15,569	16,166	16,564	16,763	17,161

Table 8. Examples for Theorem 11 continued.

$p_{1,2}$	37	38	41	43	44	46	47
1	9524	9631	9952	10,166	10,273	10,487	10,594
2	9703	9812	10,139	10,357	10,466	10,684	10,793
4	10,061	10,174	10,513	10,739	10,852	11,078	11,191
8	10,777	10,898	11,261	11,503	11,624	11,866	11,987
11	11,314	11,441	11,822	12,076	12,203	12,457	12,584
13	11,672	11,803	12,196	12,458	12,589	12,851	12,982
16	12,209	12,346	12,757	13,031	13,168	13,442	13,579
17	12,388	12,527	12,944	13,222	13,361	13,639	13,778
19	12,746	12,889	13,318	13,604	13,747	14,033	14,176
22	13,283	13,432	13,879	14,177	14,326	14,624	14,773
23	13,462	13,613	14,066	14,368	14,519	14,821	14,972
26	13,999	14,156	14,627	14,941	15,098	15,412	15,569
29	14,536	14,699	15,188	15,514	15,677	16,003	16,166
31	14,894	15,061	15,562	15,896	16,063	16,397	16,564
32	15,073	15,242	15,749	16,087	16,256	16,594	16,763
34	15,431	15,604	16,123	16,469	16,642	16,988	17,161
37	15,968	16,147	16,684	17,042	17,221	17,579	17,758
38	16,147	16,328	16,871	17,233	17,414	17,776	17957
41	16,684	16,871	17,432	17,806	17,993	18,367	18554
43	17,042	17,233	17,806	18,188	18,379	18,761	18952
44	17,221	17,414	17,993	18,379	18,572	18,958	19151
46	17,579	17,776	18,367	18,761	18,958	19,352	19549
47	17,758	17,957	18,554	18,952	19,151	19,549	19748

Theorem 12. *The union of three sequence functions,* $f_1(p_1,p_2)=5460-105(p_1+p_2)+2p_1p_2$, $1\le p_1,p_2\le 52$, $f_2(p_1,p_2)=5460+105(p_2-p_1)-2p_1p_2$, $1\le p_1\le 52, p_2\ge 1$, *and* $f_3(p_1,p_2)=5460+105(p_1+p_2)+2p_1p_2$, $p_1,p_2\ge 1$ *represents the set of natural numbers.*

Proof. Let S_1,S_2 and S_3 be disjoint subsets of the set of natural numbers whose union is equal to the set of natural numbers, then there exists p_1 and p_2 such that

$105+2s_1=(105-2p_1)(105-2p_2)$ this implies that $s_1=\frac{(105-2p_1)(105-2p_2)-105}{2}=f_1\in F_1\subseteq\aleph$ for $s_1\in S_1$.

$105+2s_2=(105-2p_1)(105+2p_2)$ this implies that $s_2=\frac{(105-2p_1)(105+2p_2)-105}{2}=f_2\in F_2\subseteq\aleph$ for $s_2\in S_2$.

$105+2s_3=(105+2p_1)(105+2p_2)$. this implies that $s_3=\frac{(105+2p_1)(105+2p_2)-105}{2}=f_3\in F_3\subseteq\aleph$ for $s_3\in S_3$

Therefore $F_1\cup F_2\cup F_3=\aleph$.

Theorem 13. *If* $g(p)=105+2p$ *then the sequence functions* $g(f_1(p_1,p_2))$, $g(f_2(p_1,p_2))$ *and* $g(f_3(p_1,p_2))$ *represents all odd composite numbers greater than* 107, *where* $f_1(p_1,p_2)$, $1\le p_1,p_2\le 47$, $f_2(p_1,p_2)$, $1\le p_1\le 47, p_2\ge 1$ *and* $f_3(p_1,p_2)$, $p_1,p_2\ge 1$ *are defined from above Theorem*-12.

Proof. Since $g(f_1(p_1,p_2))=(105-2p_1)(105-2p_2)$ for $f_1\in F_1\subseteq\aleph$

or $g(f_2(p_1,p_2))=(105-2p_1)(105+2p_2)$ for $f_2\in F_2\subseteq\aleph$

or $g(f_3(p_1,p_2))=(105+2p_1)(105+2p_2)$ for $f_3\in F_3\subseteq\aleph$ and from the above Theorem-12 we have $F_1\cup F_2\cup F_3=\aleph$, then $g(F_1)\cup g(F_2)\cup g(F_3)=g(\aleph)$ represents the set of all odd composite numbers. □

Theorem 14. *The sequence function,* $g(p)=105+2p$, *represents all prime numbers greater than or equal to* 107 *for* $p\ne 3n,5n,7n, f_1(p_1,p_2), f_2(p_1,p_2)$ *and* $f_3(p_1,p_2)$ *where* $n\in\aleph$,
$f_1(p_1,p_2)=5460-105(p_1+p_2)+2p_1p_2$ *for* $1\le p_1,p_2\le 47$, $f_2(p_1,p_2)=5460+105(p_2-p_1)-2p_1p_2$ *for* $1\le p_1\le 47, p_2\ge 1$, *and* $f_3(p_1,p_2)=5460+105(p_1+p_2)+2p_1p_2$ *for* $p_1,p_2\ge 1$.

Proof. Suppose $g(p)=105+2p$ represents all prime numbers for $p=f_1,f_2,f_3,3n,5n,$ and $7n$.

But $g(f_1)$ or $g(f_2)$ or $g(f_3)$ or $g(3n)$ or $g(5n)$ or $g(7n)$ represents all odd composite numbers then this contradicts our supposition.

Therefore, there exists a number $p\ne f_1,f_2,f_3,3n,5n,$ and $7n$ suchthat $g(p)=105+2p$ represents all prime numbers. □

Theorem 15. *There are infinitely many prime numbers.*

Proof. Since $g(p)=105+2p\to\infty\ (p\to\infty)$, then there are infinitely many prime numbers. □

Theorem 16. (*Goldbach's theorem*)

Every even integer greater than or equal to 2 can be expressed as the sum of two primes.

Proof. Suppose $h_1(p_1,p_2)=5460-105(p_1+p_2)+2p_1p_2$ for $1\le p_1,p_2\le 47$,
$h_2(p_1,p_2)=5460+105(p_2-p_1)-2p_1p_2$ for $1\le p_1\le 47, p_2\ge 1$, and
$h_3(p_1,p_2)=5460+105(p_1+p_2)+2p_1p_2$ for $p_1,p_2\ge 1$.

$f_1(p_1,p_2)=5460-105(p_1+p_2)+2p_1p_2$ for $1\le p_1,p_2\le 52$, $f_2(p_1,p_2)=5460+105(p_2-p_1)-2p_1p_2$ for $1\le p_1\le 52, p_2\ge 1$, and $f_3(p_1,p_2)=5460+105(p_1+p_2)+2p_1p_2$ for $p_1,p_2\ge 1$.

Thus for all $s_1,s_2\ne 3n,5n,$ and $7n$ for $1\le s_1,s_2\le 52$ there always exists f_1 or f_2 or f_3 such that $105-(s_1+s_2)=f_1$ or f_2 or f_3 this implies that

$$2(105-(s_1+s_2))=105-2s_1+105-2s_2=2(f_1)\text{ or }2(f_2)\text{ or }2(f_3) \quad (1)$$

Or for all $s_1\ne 3n,5n,$ and $7n$ for $1\le s_1\le 52$ and $s_2\ne 3n,5n,7n,h_1,h_2$ and h_3 for $s_2\ge 1$ there always exists f_1 or f_2 or f_3 such that

$105+(s_2-s_1)=f_1$ or f_2 or f_3 this implies that

$$2(105+(s_2-s_1))=105-2s_1+105+2s_2=2(f_1)\text{ or }2(f_2)\text{ or }2(f_3) \quad (2)$$

Or for all $s_1,s_2\ne 3n,5n,7n,h_1,h_2,$ and h_3 for $s_1,s_2\ge 1$ there always exists f_1 or f_2 or f_3 such that

$105+(s_1+s_2)=f_1$ or f_2 or f_3 this implies that

$$2(105+(s_1+s_2))=105+2s_1+105+2s_2=2(f_1) \text{ or } 2(f_2) \text{ or } 2(f_3) \quad (3)$$

Therefore from Equations (1), (2), and (3) we have

$2n=105-2s_1+105-2s_2=2(105-(s_1+s_2))$ or $105-2s_1+105+2s_2=2(105+(s_2-s_1))$ or $105+2s_1+105+2s_2=2(105+(s_1+s_2))$ for $n\in\aleph=F_1\cup F_2\cup F_3$, where $f_1\in F_1\subseteq\aleph$, $f_2\in F_2\subseteq\aleph$ and $f_3\in F_3\subseteq\aleph$.

Thus every even integer greater than or equal to 2 can be expressed as the sum of two primes. □

Theorem 17. (*Twin prime theorem*)

There are infinitely many pairs of primes whose difference is 2.

Proof. Suppose there are infinitely many numbers $p_n, p_{n+1}\neq 3n,5n,7n, f_1(k_1,k_2), f_2(k_1,k_2)$, and $f_3(k_1,k_2)$ such that $p_{n+1}=p_n+1$, where $f_1(k_1,k_2)=5460-105(k_1+k_2)+2k_1k_2$ for $1\le k_1,k_2\le 47$, $f_2(k_1,k_2)=5460+105(k_2-k_1)-2k_1k_2$ for $1\le k_1\le 47$, $k_2\ge 1$, and $f_3(k_1,k_2)=5460+105(k_1+k_2)+2k_1k_2$ for $k_1,k_2\ge 1$, $n\in\aleph$.

Thus $g(p_n)=105+2p_n$ and $g(p_{n+1})=105+2(p_{n+1})$ represents prime numbers and $g(p_{n+1})-g(p_n)=(105+2(p_{n+1}))-(105+2(p_n))=(105+2(p_n+1))-(105+2p_n)=2$ and $g(p_{n+1}),g(p_n)\to\infty\ (n\to\infty)$. □

Theorem 18. *Suppose* $n_1=\frac{k_3}{3}$, $n_2=\frac{k_5}{5}$, $n_3=\frac{k_7}{7}$, $n_4=\frac{k_{15}}{15}$, $n_5=\frac{k_{21}}{21}$, $n_6=\frac{k_{35}}{35}$, $n_7=\frac{k_{105}}{105}$, *where* $k_3,k_5,k_7,k_{15},k_{21},k_{35},k_{105}$ *are multiples of* $3,5,7,15,21,35,$ *and* 105 *respectively and*

$f_1(p_1,p_2)=5460-105(p_1+p_2)+2p_1p_2$ for $1\le p_1,p_2\le 47$,

$f_2(p_1,p_2)=5460+105(p_2-p_1)-2p_1p_2$ for $1\le p_1\le 47$, $p_2\ge 1$

and $f_3(p_1,p_2)=5460+105(p_1+p_2)+2p_1p_2$ for $p_1,p_2\ge 1$.

If $g(p)=105+2p$, $p\ge 1$ is the given n^{th} term prime number, then *n* can be calculated as:
$n=p+24-(n_1+n_2+n_3+n(f_1)+n(f_2)+n(f_3)-(n_4+n_5+n_6+n_7))$, where $k_3,k_5,k_7,k_{15},k_{21},k_{35},k_{105}$ are the first term of which is less than *p* and $n(f_1(p_1,p_2))=$ number of elements of f_1 less than *p*, $n(f_2(p_1,p_2))=$ number of elements of f_2 less than *p* and $n(f_3(p_1,p_2))=$ number of elements of f_3 less than *p*.

Proof. Since $g(p)=105+2p$ is prime number for $p\ge 1$ and $p\neq 3n,5n,7n, f_1, f_2,$ and f_3.

Now let $n_1,n_2,n_3,n_4,n_5,$ and n_6 be in the set of natural numbers such that

$k_3=3+(n_1-1)3$ where $k_3=3n$, $n\in\aleph$ is the first term less than *p*, this implies that $n_1=\frac{k_3}{3}$. Thus we have $\frac{k_3}{3}$ number of terms which are multiples of 3.

$k_5=5+(n_2-1)5$ where $k_5=5n$, $n\in\aleph$ is the first term less than *p*, this implies that $n_2=\frac{k_5}{5}$. Thus we have $\frac{k_5}{5}$ number of terms which are multiples of 5.

$k_7=7+(n_3-1)7$ where $k_7=7n$, $n\in\aleph$ is the first term less than *p*, this implies that $n_3=\frac{k_7}{7}$. Thus we have $\frac{k_7}{7}$ number terms which are multiples of 7.

$k_{15}=15+(n_4-1)15$ where $k_{15}=15n$, $n\in\aleph$ is the first term less than *p*, this implies that $n_4=\frac{k_{15}}{15}$. Thus we have $\frac{k_{15}}{15}$ number of terms which are multiples of 15.

$k_{21}=21+(n_5-1)21$ where $k_{21}=21n$, $n\in\aleph$ is the first term less than *p*, this implies that $n_5=\frac{k_{21}}{21}$. Thus we have $\frac{k_{21}}{21}$ number of terms which are multiples of 21.

$k_{35} = 35 + (n_6 - 1)35$ where $k_{35} = 35n$, $n \in \aleph$ is the first term less than *p*, this implies that $n_6 = \frac{k_{35}}{35}$. Thus we have $\frac{k_{35}}{35}$ number of terms which are multiples of 35.

$k_{105} = 105 + (n_7 - 1)105$ where $k_{105} = 105n$, $n \in \aleph$ is the first term less than *p*, this implies that $n_7 = \frac{k_{105}}{105}$. Thus we have $\frac{k_{105}}{105}$ number of terms which are multiples of 105.

Thus we have to eliminate $n_1 + n_2 + n_3 + n(f_1) + n(f_2) + n(f_3) - (n_4 + n_5 + n_6 + n_7)$ number of terms between 1 and *p* to find the n^{th} term of prime numbers.

Therefore we have $p - (n_1 + n_2 + n_3 + n(f_1) + n(f_2) + n(f_3) - (n_4 + n_5 + n_6 + n_7))$ number of prime numbers between 1 and *p* including 107 and $g(p) = 105 + 2p$.

Since we have 24 number of prime numbers less than 107, hence
$n = p + 24 - (n_1 + n_2 + n_3 + n(f_1) + n(f_2) + n(f_3) - (n_4 + n_5 + n_6 + n_7))$, that is, the n^{th} prime number is $g(p) = 105 + 2p$. □

Example: For Theorem 12 - 18 see the following **Tables 9-16**. Where the bold face numbers are elements of $f_1(p_1, p_2)$ for $1 \le p_1, p_2 \le 47$, $f_2(p_1, p_2)$ for $1 \le p_1 \le 47$ and $p_2 \ge 1$, and $f_3(p_1, p_2)$ for $p_1, p_2 \ge 1$. and $g(p) = 105 + 2p$ for $p \ge 1$.

Table 9. Examples for theorem 12 - 18.

p	$g(p)$	p	$g(p)$	p	$g(p)$	p	$g(p)$	p	$g(p)$
1	107	103	311	202	509	302	709	403	911
2	109	104	313	**206**	517	**304**	713	**404**	913
4	113	106	317	208	521	307	719	407	919
8	121	**107**	319	209	523	311	727	**409**	923
11	127	**109**	323	**211**	527	**313**	731	412	929
13	131	113	331	**212**	529	314	733	416	937
16	137	116	337	**214**	533	**316**	737	418	941
17	139	**118**	341	218	541	317	739	**419**	943
19	143	121	347	221	547	319	743	421	947
22	149	122	349	**223**	551	323	751	**422**	949
23	151	124	353	226	557	326	757	424	953
26	157	127	359	**227**	559	328	761	**428**	961
29	163	**128**	361	229	563	**331**	767	431	967
31	167	131	367	232	569	332	769	433	971
32	169	134	373	233	571	334	773	436	977
34	173	**136**	377	236	577	**337**	779	**437**	979
37	179	137	379	**239**	583	**338**	781	439	983
38	181	139	383	241	587	341	787	**442**	989
41	187	142	389	**242**	589	**344**	793	443	991
43	191	**143**	391	244	593	346	797	446	997
44	193	146	397	247	599	**347**	799	**449**	1003
46	197	148	401	248	601	**349**	803	**451**	1007
47	199	**149**	403	251	607	352	809	452	1009

Table 10. Examples for theorem 12 - 18 continued.

p	$g(p)$	p	$g(p)$	p	$g(p)$	p	$g(p)$	p	$g(p)$
52	209	**151**	407	**253**	611	353	811	454	1013
53	211	152	409	254	613	**356**	817	457	1019
58	221	157	419	256	617	358	821	458	1021
59	223	158	421	257	619	359	823	**461**	1027
61	227	163	431	**262**	629	361	827	463	1031
62	229	164	433	263	631	362	829	464	1033
64	233	**166**	437	268	641	367	839	**466**	1037
67	239	167	439	269	643	**368**	841	467	1039
68	241	169	443	271	647	**373**	851	472	1049
71	247	172	449	**272**	649	374	853	473	1051
73	251	**173**	451	274	653	376	857	478	1061
74	253	176	457	277	659	377	859	479	1063
76	257	178	461	278	661	379	863	**481**	1067
79	263	179	463	**281**	667	**382**	869	482	1069
82	269	181	467	**283**	671	**383**	871	**484**	1073
83	271	**184**	473	284	673	386	877	**487**	1079
86	277	187	479	286	677	388	881	**488**	1081
88	281	**188**	481	289	683	389	883	491	1087
89	283	191	487	**292**	689	391	887	493	1091
92	289	193	491	293	691	**394**	893	494	1093
94	293	**194**	493	**296**	697	**397**	899	496	1097
97	299	197	499	298	701	**398**	901	499	1103
101	307	199	503	**299**	703	401	907		

Table 11. Examples for theorem 12 - 18 continued.

p	$g(p)$	p	$g(p)$	p	$g(p)$	p	$g(p)$	p	$g(p)$
502	1109	601	1307	**703**	1511	**803**	1711	904	1913
503	1111	**604**	1313	**704**	1513	**806**	1717	**907**	1919
506	1117	607	1319	**706**	1517	808	1721	**908**	1921
508	1121	608	1321	709	1523	809	1723	**911**	1927
509	1123	611	1327	**712**	1529	**811**	1727	913	1931
512	1129	**613**	1331	713	1531	814	1733	914	1933
514	1133	**614**	1333	**716**	1537	**817**	1739	**916**	1937
517	1139	**617**	1339	**718**	1541	818	1741	**919**	1943
521	1147	**619**	1343	719	1543	821	1747	922	1949
523	1151	**622**	1349	722	1549	**823**	1751	923	1951
524	1153	**626**	1357	724	1553	824	1753	**926**	1957
526	1157	628	1361	727	1559	827	1759	**928**	1961
527	1159	**629**	1363	731	1567	**829**	1763	**929**	1963
529	1163	631	1367	733	1571	**832**	1769	**932**	1969
533	1171	**632**	1369	**734**	1573	836	1777	934	1973
536	1177	634	1373	**736**	1577	**838**	1781	937	1979
538	1181	638	1381	737	1579	839	1783	941	1987
541	1187	**641**	1387	739	1583	841	1787	**943**	1991
542	1189	**643**	1391	**743**	1591	842	1789	944	1993
544	1193	**646**	1397	746	1597	**844**	1793	946	1997
547	1199	647	1399	748	1601	848	1801	947	1999
548	1201	**649**	1403	751	1607	**851**	1807	949	2003
551	1207	652	1409	752	1609	853	1811	953	2011

Table 12. Examples for theorem 12 - 18 continued.

p	$g(p)$	p	$g(p)$	p	$g(p)$	p	$g(p)$	p	$g(p)$
554	1213	**653**	1411	754	1613	**856**	1817	956	2017
556	1217	**656**	1417	757	1619	**857**	1819	**958**	2021
557	1219	659	1423	758	1621	859	1823	961	2027
559	1223	661	1427	761	1627	**862**	1829	962	2029
562	1229	662	1429	**764**	1633	863	1831	**964**	2033
563	1231	664	1433	766	1637	**866**	1837	967	2039
566	1237	667	1439	**767**	1639	**869**	1843	**968**	2041
568	1241	**668**	1441	**769**	1643	871	1847	**971**	2047
569	1243	671	1447	**772**	1649	**872**	1849	974	2053
571	1247	673	1451	**773**	1651	**874**	1853	**976**	2057
572	1249	674	1453	776	1657	**877**	1859	**977**	2059
577	1259	**676**	1457	**778**	1661	878	1861	979	2063
578	1261	677	1459	779	1663	881	1867	982	2069
583	1271	**682**	1469	781	1667	883	1871	**983**	2071
584	1273	683	1471	782	1669	884	1873	**986**	2077
586	1277	688	1481	**787**	1679	886	1877	988	2081
587	1279	689	1483	**788**	1681	887	1879	989	2083
589	1283	691	1487	**793**	1691	892	1889	991	2087
592	1289	692	1489	794	1693	**893**	1891	992	2089
593	1291	694	1493	796	1697	898	1901	997	2099
596	1297	697	1499	797	1699	**899**	1903	**998**	2101
598	1301	**698**	1501	**799**	1703	901	1907		
599	1303	**701**	1507	802	1709	**902**	1909		

Table 13. Examples for theorem 12 - 18 continued.

p	$g(p)$	p	$g(p)$	p	$g(p)$	p	$g(p)$	p	$g(p)$
1003	2111	1102	2309	**1201**	2507	1303	2711	**1403**	2911
1004	2113	1103	2311	**1202**	2509	1304	2713	1406	2917
1006	2117	**1108**	2321	**1207**	2519	**1306**	2717	**1408**	2921
1007	2119	**1109**	2323	1208	2521	1307	2719	**1409**	2923
1009	2123	**1111**	2327	1213	2531	1312	2729	1411	2927
1012	2129	**1112**	2329	**1214**	2533	1313	2731	**1412**	2929
1013	2131	1114	2333	**1216**	2537	1318	2741	1417	2939
1016	2137	1117	2339	1217	2539	**1319**	2743	**1418**	2941
1018	2141	1118	2341	1219	2543	**1321**	2747	**1423**	2951
1019	2143	1121	2347	1222	2549	1322	2749	1424	2953
1021	2147	1123	2351	1223	2551	1324	2753	1426	2957
1024	2153	**1124**	2353	1226	2557	**1327**	2759	**1427**	2959
1027	2159	1126	2357	**1228**	2561	**1328**	2761	1429	2963
1028	2161	**1129**	2363	**1229**	2563	1331	2767	1432	2969
1031	2167	**1132**	2369	**1231**	2567	**1333**	2771	1433	2971
1033	2171	1133	2371	**1234**	2573	**1334**	2773	**1436**	2977
1034	2173	1136	2377	1237	2579	1336	2777	**1438**	2981
1037	2179	1138	2381	**1238**	2581	**1339**	2783	**1439**	2983
1039	2183	1139	2383	**1241**	2587	1342	2789	**1441**	2987
1042	2189	1142	2389	1243	2591	1343	2791	**1444**	2993
1046	2197	1144	2393	1244	2593	1346	2797	1447	2999
1048	2201	1147	2399	**1247**	2599	1348	2801	1448	3001
1049	2203	**1151**	2407	**1249**	2603	1349	2803	**1451**	3007

Table 14. Examples for theorem 12 - 18 continued.

p	$g(p)$	p	$g(p)$	p	$g(p)$	p	$g(p)$	p	$g(p)$
1051	2207	1153	2411	1252	2609	**1352**	2809	1453	3011
1052	2209	**1154**	2413	1256	2617	**1354**	2813	**1454**	3013
1054	2213	1156	2417	1258	2621	1357	2819	1457	3019
1058	2221	**1157**	2419	**1259**	2623	1361	2827	1459	3023
1061	2227	1159	2423	**1261**	2627	**1363**	2831	**1462**	3029
1063	2231	**1163**	2431	**1262**	2629	1364	2833	1466	3037
1066	2237	1166	2437	1264	2633	1366	2837	1468	3041
1067	2239	1168	2441	**1268**	2641	**1367**	2839	**1469**	3043
1069	2243	1171	2447	1271	2647	1369	2843	**1471**	3047
1072	2249	**1172**	2449	**1273**	2651	1373	2851	1472	3049
1073	2251	**1174**	2453	1276	2657	1376	2857	**1474**	3053
1076	2257	1177	2459	1277	2659	1378	2861	1478	3061
1079	2263	**1178**	2461	1279	2663	**1381**	2867	1481	3067
1081	2267	1181	2467	**1282**	2669	**1382**	2869	**1483**	3071
1082	2269	1184	2473	1283	2671	**1384**	2873	**1486**	3077
1084	2273	1186	2477	1286	2677	1387	2879	1487	3079
1087	2279	**1187**	2479	1289	2683	**1388**	2881	1489	3083
1088	2281	**1189**	2483	1291	2687	1391	2887	1492	3089
1091	2287	**1192**	2489	1292	2689	**1394**	2893	**1493**	3091
1093	2291	**1193**	2491	1294	2693	1396	2897	**1496**	3097
1094	2293	**1196**	2497	1297	2699	**1397**	2899	**1499**	3103
1096	2297	**1198**	2501	**1298**	2701	1399	2903		
1097	2299	1199	2503	1301	2707	1402	2909		

Table 15. Examples for theorem 12 - 18 continued.

p	$g(p)$	p	$g(p)$	p	$g(p)$	p	$g(p)$	p	$g(p)$
1501	3107	1601	3307	**1702**	3509	**1804**	3713	1906	3917
1502	3109	1604	3313	1703	3511	1807	3719	1907	3919
1504	3113	**1606**	3317	1706	3517	**1808**	3721	1909	3923
1507	3119	1607	3319	**1709**	3523	1811	3727	1912	3929
1508	3121	1609	3323	1711	3527	1814	3733	1913	3931
1511	3127	1612	3329	1714	3533	**1816**	3737	**1916**	3937
1513	3131	1613	3331	1717	3539	1817	3739	1919	3943
1514	3133	**1616**	3337	1718	3541	**1819**	3743	1921	3947
1516	3137	**1618**	3341	1721	3547	**1822**	3749	**1922**	3949
1517	3139	1619	3343	**1723**	3551	**1823**	3751	**1924**	3953
1522	3149	1621	3347	**1724**	3553	**1826**	3757	**1927**	3959
1523	3151	**1622**	3349	1726	3557	1828	3761	**1928**	3961
1528	3161	1627	3359	1727	3559	**1829**	3763	1931	3967
1529	3163	1628	3361	**1732**	3569	1831	3767	**1933**	3971
1531	3167	1633	3371	1733	3571	1832	3769	**1934**	3973
1532	3169	1634	3373	1738	3581	1837	3779	**1936**	3977
1534	3173	**1636**	3377	1739	3583	**1838**	3781	**1937**	3979
1537	3179	**1637**	3379	**1741**	3587	**1843**	3791	1942	3989
1538	3181	**1639**	3383	**1742**	3589	1844	3793	**1943**	3991
1541	3187	1642	3389	1744	3593	1846	3797	1948	4001
1543	3191	1643	3391	**1747**	3599	**1847**	3799	1949	4003
1544	3193	**1646**	3397	**1748**	3601	1849	3803	1951	4007
1546	3197	**1648**	3401	1751	3607	**1852**	3809	**1952**	4009

Table 16. Examples for theorem 12 - 18 continued.

p	$g(p)$	p	$g(p)$	p	$g(p)$	p	$g(p)$	p	$g(p)$
1549	3203	**1649**	3403	**1753**	3611	**1853**	3811	1954	4013
1552	3209	1651	3407	1754	3613	**1856**	3817	1957	4019
1553	3211	1654	3413	1756	3617	1858	3821	1958	4021
1556	3217	**1657**	3419	1759	3623	1859	3823	1961	4027
1558	3221	**1658**	3421	**1762**	3629	**1861**	3827	**1963**	4031
1559	3223	**1661**	3427	1763	3631	1864	3833	**1964**	4033
1562	3229	**1663**	3431	1766	3637	**1867**	3839	**1966**	4037
1564	3233	1664	3433	**1768**	3641	**1868**	3841	**1969**	4043
1567	3239	**1667**	3439	1769	3643	1871	3847	1972	4049
1571	3247	**1669**	3443	**1772**	3649	1873	3851	1973	4051
1573	3251	1672	3449	**1774**	3653	1874	3853	1976	4057
1574	3253	1676	3457	1777	3659	**1877**	3859	**1978**	4061
1576	3257	1678	3461	**1781**	3667	1879	3863	**1979**	4063
1577	3259	1679	3463	**1783**	3671	**1882**	3869	**1982**	4069
1579	3263	1681	3467	1784	3673	1886	3877	1984	4073
1583	3271	1682	3469	1786	3677	1888	3881	1987	4079
1586	3277	**1684**	3473	**1787**	3679	**1889**	3883	**1991**	4087
1588	3281	**1688**	3481	**1789**	3683	**1891**	3887	1993	4091
1591	3287	**1691**	3487	1793	3691	1892	3889	1994	4093
1592	3289	1693	3491	1796	3697	**1894**	3893	**1996**	4097
1594	3293	**1696**	3497	1798	3701	**1898**	3901	1997	4099
1597	3299	1697	3499	**1801**	3707	1901	3907	**1999**	4103
1598	3301	**1699**	3503	1802	3709	1903	3911		

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