Two formulae for obtaining primes based on the prime decomposition of the number 561

Marius Coman
Bucuresti, Romania
email: mariuscoman13@gmail.com

Abstract. In this paper I present two formulae which seems to conduct to primes or products of very few prime factors, both of them inspired by the prime decomposition of the first absolute Fermat pseudoprime, the number 561.

Formula I

Observation:

Noting that the number N = 561 = 3*11*17 has the property that conducts to a prime for two values of d from three, where d prime factor, through the formula N – N/d – 1 (i.e. 373 = 561 – 561/3 – 1 and 509 = 561 – 561/11 – 1), I wondered if it is a general property of the numbers of the form N = 3*p*q, where (p, q) is a pair of sexy primes, to conduct often to primes and products of very few prime factors and it seems that, indeed, it is.

Verifying the observation:
(For the first 34 pairs of sexy primes)

: for (p, q) = (5, 11) are obtained the primes 109, 131 and 149;
: for (p, q) = (7, 13) are obtained the primes 181, 233 and 251;
: for (p, q) = (11, 17) are obtained the primes 373 and 509;
: for (p, q) = (13, 19) are obtained the primes 683 and 701;
: for (p, q) = (17, 23) is obtained the prime 1103;
: for (p, q) = (23, 29) are obtained the primes 1913 and 1931;
: for (p, q) = (31, 37) are obtained the primes 2293 and 3329;
: for (p, q) = (37, 43) are obtained the primes 3181 and 4643;
: for (p, q) = (47, 53) is obtained the prime 7331;
: for (p, q) = (53, 59) are obtained the primes 9203 and 9221;

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: for (p, q) = (67, 73) is obtained the prime 9781;
: for (p, q) = (83, 89) are obtained the primes 21893 and 21911;
: for (p, q) = (97, 103) is obtained the prime 29663;
: for (p, q) = (101, 107) are obtained the primes 21613, 32099 and 32117;
: for (p, q) = (103, 109) are obtained the primes 22453 and 33353;
: for (p, q) = (107, 113) are obtained the primes 24181, 35933 and 35951;
: for (p, q) = (151, 157) is obtained the prime 70667;
: for (p, q) = (157, 163) is obtained the prime 76283;
: for (p, q) = (167, 173) are obtained the primes 57781 and 86171;
: for (p, q) = (173, 179) are obtained the primes 61933, 92363 and 92381;
: for (p, q) = (191, 197) are obtained the primes 75253 and 111697;
: for (p, q) = (193, 199) is obtained the prime 114641;
: for (p, q) = (223, 229) is obtained the prime 152531;
: for (p, q) = (227, 233) is obtained the prime 157991;
: for (p, q) = (233, 239) is obtained the prime 111373;
: for (p, q) = (251, 257) are obtained the primes 192749 and 192767;
: for (p, q) = (257, 263) are obtained the primes 135181 and 202001;
: for (p, q) = (263, 269) is obtained the prime 211433;
: for (p, q) = (277, 281) are obtained the primes 156781, 234323 and 234341;
: for (p, q) = (307, 313) is obtained the prime 287333;
: for (p, q) = (311, 317) is obtained the prime 294809;
: for (p, q) = (331, 337) is obtained the prime 333647;

Note:
For 30 from the first 34 pairs of sexy primes the formula above conducted to at least one prime from three possible ones.

Formula II

Observation:

Noting that the number N = 32421 = 3*101*107 has the property that conducts to a prime for all three values of d, where d prime factor, through the formula N – N/d – 1 (i.e. 21613 = 32421 – 32421/3 – 1, 32099 = 32421 – 32421/11 – 1 and 32117 = 32421 – 32421/11), I wondered if it is a property of the numbers of the form N = 3*p*q, where p is the form 10^n + 1 and q is the form 10^n + 7, to conduct to big primes and products of very few prime factors and it seems that, indeed, it is.

Verifying the observation:

: for n = 1 are obtained the primes 373 and 509;
: for n = 2 are obtained the primes 21613, 32099 and 32117;
: for n = 3 is obtained the prime 3020999;
: for n = 5 is obtained the prime 30002099999;
: for n = 7 is obtained the prime 300000209999999;
: for n = 10 is obtained the prime 300000000209999999999;
: for n = 22 is obtained the prime
3000000000000002099999999999999999999999;
: for n = 23 is obtained the prime
20000000000000000000001600000000000000000000013;
: for n = 33 is obtained the prime
200000000000000000000000000000001600000000000000000000000
0000000013.

Note:

Many values of the number N – N/d – 1 are semiprimes or products of very few prime factors. For instance, the numbers
30000000000000000000002099999999999999999999999999999999999;
30000000000000000000000209999999999999999999999999999999999999
9;
30000000000000000000000000000000000021000000000000000000000000
0000000000017;
30000000000000000000000000000000000000000210000000000000000000
0000000000000000000017;
20000000000000000000000000000000000000000160000000000000000000
0000000000000000000013;
20000000000000000000000000000000000000000000160000000000000000
0000000000000000000000000013;
20000000000000000000000000000000000000000000000000000160000000
0000000000000000000000000000000000000000000013;
20000000000000000000000000000000000000000000000000000000160000
0000000000000000000000000000000000000000000000000013
and many others have only two prime factors.