Operation based on squares of primes for obtaining twin primes and twin c-primes and the definition of a c-prime

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Abstract. In this paper I show how, concatenating to the right the squares of primes with the digit 1, are obtained primes or composites n = p(1)*p(2)*...*p(m), where p(1), p(2), ..., p(m) are the prime factors of n, which seems to have often (I conjecture that always) the following property: there exist p(k) and p(h), where p(k) is the product of some distinct prime factors of n and p(h) the product of the other distinct prime factors such that the numbers p(k) + p(h) ± 1 are twin primes or twin c-primes and I also define the notion of a c-prime.

Conjecture:

Concatenating to the right the squares of primes, greater than or equal to 5, with the digit 1, are obtained always either primes either composites n = p(1)*p(2)*...*p(m), where p(1), p(2), ..., p(m) are the prime factors of n, which have the following property: there exist p(k) and p(h), where p(k) is the product of some distinct prime factors of n and p(h) the product of the other distinct prime factors such that the numbers p(k) + p(h) ± 1 are twin primes or twin c-primes.

Definition:

We name a c-prime a positive odd integer which is either prime either semiprime of the form p(1)*q(1), p(1) < q(1), with the property that the number q(1) – p(1) + 1 is either prime either semiprime p(2)*q(2) with the property that the number q(2) – p(2) + 1 is either prime either semiprime with the property showed above... (until, eventualy, is obtained a prime).

Example: 4979 is a c-prime because 4979 = 13*383, where 383 – 13 + 1 = 371 = 7*53, where 53 – 7 + 1 = 47, a prime.

Verifying the conjecture:
(for the first n primes greater than or equal to 5)

For p = 5, p^2 = 25;
: the number 251 is prime;
For p = 7, p^2 = 49;
: the number 491 is prime;

For p = 11, p^2 = 121;
: 1211 = 7*173; indeed, the numbers 7 + 173 ± 1 are twin primes (179 and 181);
For p = 13, p^2 = 169;
: 1691 = 19*89; indeed, the numbers 19 + 89 ± 1 are twin primes (107 and 109);
For p = 17, p^2 = 289;
: 2891 = 49*59; indeed, the numbers 49 + 59 ± 1 are twin primes (107 and 109);
For p = 19, p^2 = 361;
: 3611 = 23*157; indeed, the numbers 23 + 157 ± 1 are twin primes (179 and 181);
For p = 23, p^2 = 529;
: 5291 = 11*13*37; indeed, the numbers 11*13 + 37 ± 1 are twin primes (179 and 181);
For p = 29, p^2 = 841;
: 8411 = 13*647; indeed, the numbers 13 + 647 ± 1 are twin primes (659 and 661);
For p = 31, p^2 = 961;
: 9611 = 7*1373; indeed, the numbers 7 + 1373 ± 1 are twin c-primes (1381 is prime and 1379 is c-prime because is equal to 7*197, where 197 – 7 + 1 = 191, which is prime);
For p = 37, p^2 = 1369;
: the number 13691 is prime;
For p = 41, p^2 = 1681;
: the number 16811 is prime;
For p = 43, p^2 = 1849;
: 18491 = 11*41^2; indeed, the numbers 11 + 1681 ± 1 are twin c-primes (1693 is prime and 1691 is c-prime because is equal to 19*89, where 89 – 19 + 1 = 71, which is prime);
For p = 47, p^2 = 2209;
: the number 22091 is prime;
For p = 53, p^2 = 2809;
: 28091 = 7*4013; indeed, the numbers 7 + 4013 ± 1 are twin primes (4019 and 4021);
For p = 59, p^2 = 3481;
: 34811 = 7*4973; indeed, the numbers 7 + 4973 ± 1 are twin c-primes (4981 is c-prime because is equal to 17*293, where 293 – 17 + 1 = 277, which is prime, and 4979 is c-prime because is equal to 13*383, where 383 – 13 + 1 = 371 = 7*53, where 53 – 7 + 1 = 47, which is prime);
For p = 61, p^2 = 3721;
: 37211 = 127*293; indeed, the numbers 127 + 293 ± 1 are twin primes (419 and 421);
For p = 67, p^2 = 4489;
: 44891 = 7*11^2*53; indeed, the numbers 7*53 + 11^2 ± 1 are twin c-primes (491 is prime and 493 is c-prime

because is equal to 17*29, where 29 – 17 + 1 = 13, which is prime);

For p = 71, p^2 = 5041;

: the number 50411 is prime;

For p = 73, p^2 = 5329;

: 53291 = 7*23*331; indeed, the numbers 7*23 + 331 ± 1 are twin c-primes (491 is prime and 493 is c-prime because is equal to 17*29, where 29 – 17 + 1 = 13, which is prime);

Note that, coming to confirm the potential of the operation of concatenation used on squares of primes, concatenating to the right with the digit one the squares of the primes 67 and 73 are obtained the numbers 44891 = 7*11^2*53 and 53291 = 7*23*331 with the property that 7*53 + 11^2 = 7*23 + 331 = 492, which is a fact interesting enough by itself.

For p = 79, p^2 = 6241;

: 62411 = 139*449; indeed, the numbers 139 + 449 ± 1 are twin c-primes (587 is prime and 589 is c-prime because is equal to 19*31, where 31 – 19 + 1 = 13, which is prime);

For p = 83, p^2 = 6889;

: the number 68891 is prime;

For p = 89, p^2 = 7921;

: 79211 = 11*19*379; indeed, the numbers 11*19 + 379 ± 1 are twin c-primes (587 is prime and 589 is c-prime because is equal to 19*31, where 31 – 19 + 1 = 13, which is prime);

Note that (see the note above also) concatenating to the right with the digit one the squares of the primes 79 and 89 are obtained the numbers 62411 = 139*449 and 79211 = 11*19*379 with the property that 139 + 449 = 11*19 + 379 = 588.

For p = 97, p^2 = 9409;

: 94091 = 37*2543; indeed, the numbers 37 + 2543 ± 1 are twin c-primes (2579 is prime and 2581 is c-prime because is equal to 29*89, where 89 – 29 + 1 = 61, which is prime).

For p = 101, p^2 = 10201;

: 102011 = 7*13*19*59; indeed, the numbers 7*13 + 19*59 ± 1 are twin c-primes (1213 is prime and 1211 is c-prime because is equal to 7*173, where 173 – 7 + 1 = 167, which is prime).