# Primes obtained concatenating the prime factors of composite numbers

**Abstract.** In this paper I make the following conjecture: Let's consider the primes p obtained from composite numbers in the following way: concatenating the prime factors of a composite number n (example: for 31941 = 3*3*3*7*13*13, the concatenation of its prime factors is 33371313) is obtained either a prime (in which case this prime is p), either a composite; if is obtained a composite, is reiterated the operation until is obtained a prime (in which case this prime is p). I conjecture that there exist such prime p for every composite number.

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The sequence of primes obtained by this method:

: for n = 4 = 2*2, 22 = 2*11 and p = 211, prime;
: for n = 6 = 2*3, p = 23, prime;
: for n = 8 = 2*2*2, 222 = 2*3*37, 2337 = 3*19*41, 31941 = 3*3*3*7*13*13, 33371313 = 3*11123771 = 7*149*317*941, 7149317941 = 229*31219729 = 11*2084656339, 112084656339 = 3*347*911*118189, 3347911118189 = 11*613*496501723, 11613496501723 = 97*130517*917327, 97130517917327 = 53*1832651281459, 531832651281459 = 3*3*3*11*139*653*3863*5107 and p = 3331113965338635107, prime;
: for n = 9 = 3*3, 33 = 3*11 and p = 311, prime;
: for n = 10 = 2*5, 25 = 5*5, 55 = 5*11, 511 = 7*73 and p = 773, prime;
: for n = 12 = 3*4, 34 = 2*17, 217 = 7*31, 731 = 17*43, 1743 = 3*7*83, 3783 = 3*13*97 and p = 31397, prime;
: for n = 14 = 2*7, 27 = 3*3*3, 333 = 3*3*37, 3337 = 47*71, 4771 = 13*367 and p = 13367, prime;
: for n = 15 = 3*5, 35 = 5*7, 57 = 3*19, 319 = 11*29 and 1129 = p, prime;
: for n = 18 = 2*3*3, p = 233, prime;

:  for n = 20 = 2*2*5, 225 = 3*3*5*5, 3355 = 5*11*61, 51161 = 11*4651, 114651 = 3*3*12739, 3312739 = 17*194867, 17194867 = 19*41*22073, 194122073 = 709*273797, 709273797 = 3*97*137*17791, 39713717791 = 11*3610337981, 113610337981 = 7*3391*4786213, 733914786213 = 3*3*3*3*7*23*31*1815403, 3333723311815403 = 13*17*23*655857429041, 131723655857429041 = 7*7*2688237874641409, 7726882378746414O9 = 3*31*8308475676071413 and p = 3318308475676071413, prime;
:  for n = 21 = 3*7, p = 37, prime;
:  for p = 22, p = 211, prime (see above n = 4);
:  for n = 24, p = 2*2*2*3, 2223 = 3*3*13*19 and p = 331319, prime;
:  for n = 25, p = 773, prime (see above n = 10);
:  for n = 26 = 2*13, 213 = 3*71, 371 = 7*53, 753 = 3*251 and p = 3251, prime;
:  for n = 27, p = 13367, prime (see above n = 14);
:  for n = 28 = 2*2*7, p = 227, prime;
:  for n = 30 = 2*3*5, 235 = 5*47 and p = 547, prime;
:  for n = 32 = 2*2*2*2*2, 22222 = 2*41*271 and p = 241271, prime;
:  for n = 33 = 3*11, p = 311, prime;
:  for n = 34, p = 31397 (see above n = 12)
:  for n = 35, p = 1129, prime (see above n = 15);
:  for n = 36 = 2*2*3*3, 2233 = 7*11*29 and p = 71129, prime;
:  for n = 38 = 2*19, 219 = 3*73 and p = 373, prime;
:  for n = 39 = 3*13, p = 313, prime;
   (...)

So the sequence of these primes is:
:  211, 23, 3331113965338635107, 311, 773, 31397, 13367, 1129, 233, 3318308475676071413, 37, 211, 331319, 773, 3251, 13367, 227, 547, 241271, 311, 31397, 1129, 71129, 373, 313 (...)
corresponding to the numbers 4, 6, 8, 9, 10, 12, 14, 15, 18, 20, 21, 22, 24, 25, 26, 27, 28, 30, 32, 33, 34, 35, 36, 38, 39 (...)

Note that p is the same, 211, for n = 4 and n = 22; 773, for n = 10 and n = 25 ; 13367, for n = 14 and n = 27; 31397, for n = 12 and n = 34.