# Conjecture on the pairs of consecutive primes having the same number of digits involving concatenation

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**Abstract.** In this paper I make the following conjecture: For any pair of consecutive primes [p1, p2], p2 > p1 > 43, p1 and p2 having the same number of digits, there exist a prime q, 5 < q < p1, such that the number n obtained concatenating (from the left to the right) q with p2, then with p1, then again with q is prime. Example: for [p1, p2] = [961748941, 961748947] there exist q = 19 such that n = 1996174894796174894119 is prime. Note that the least values of q that satisfy this conjecture for twenty consecutive pairs of consecutive primes with 9 digits are 19, 17, 107, 23, 131, 47, 83, 79, 61, 277, 163, 7, 41, 13, 181, 19, 7, 37, 29 and 23 (all twenty primes lower than 300!), the corresponding primes n obtained having 20 to 24 digits! This method appears to be a good way to obtain big primes with a high degree of ease and certainty.

**Conjecture:**

For any pair of consecutive primes [p1, p2], p2 > p1 > 43, p1 and p2 having the same number of digits, there exist a prime q, 5 < q < p1, such that the number n obtained concatenating (from the left to the right) q with p2, then with p1, then again with q is prime.

Example: for [p1, p2] = [961748941, 961748947] there exist q = 19 such that n = 1996174894796174894119 is prime.

**The least such primes q for the first twenty pairs of consecutive primes (such that p2 > p1 > 43):**

: q = 23 for [p1, p2] = [47, 53], because n = 23534723 is prime;

: q = 41 for [p1, p2] = [53, 59], because n = 41595341 is prime;

: q = 7 for [p1, p2] = [59, 61], because n = 761597 is prime (note that 11615911, 37615937 and 53615953 are also primes);

: q = 7 for [p1, p2] = [61, 67], because n = 767617 is prime;

: q = 13 for [p1, p2] = [67, 71], because n = 13716713 is prime (note that 23716723, 37716737, 59716759 and 61716761 are also primes);

: q = 23 for [p1, p2] = [71, 73], because n = 23737123 is prime (note that 29737129, 31737131, 43737143, 47737147 and 67737167 are also primes);

: q = 61 for [p1, p2] = [73, 79], because n = 61797361 is prime;

: q = 11 for [p1, p2] = [79, 83], because n = 11837911 is prime (note that 13837913, 47837947 and 59837959 are also primes);

: q = 17 for [p1, p2] = [83, 89], because n = 17898317 is prime (note that 29898329, 53898353, 59898359 and 71898371 are also primes);

: q = 7 for [p1, p2] = [89, 97], because n = 797897 is prime (note that 19978919, 43978943 and 73978973 are also primes);

: q = 7 for [p1, p2] = [101, 103], because n = 71031017 is prime (note that 1710310117, 1910310119, 4710310147 and 5310310153 are also primes);

: q = 11 for [p1, p2] = [103, 107], because n = 1110710311 is prime (note that 1710710317, 2310710323 and 5910710359 are also primes);

: q = 43 for [p1, p2] = [107, 109], because n = 4310910743 is prime (note that 4710910747, 5310910753 and 7110910771 are also primes);

: q = 17 for [p1, p2] = [109, 113], because n = 1711310917 is prime (note that 4311310943 is also prime);

: q = 11 for [p1, p2] = [113, 127], because n = 1112711311 is prime (note that 1312711313, 3112711331, 4112711341, 4712711347 and 7912711379 are also primes);

: q = 11 for [p1, p2] = [127, 131], because n = 1113112711 is prime (note that 2313112723, 6713112767, 7113112771, 8313112783 and 101131127101 are also primes);

: q = 89 for [p1, p2] = [131, 137], because n = 8913713189 is prime (note that 107137131107 and 113137131113 are also primes);

: q = 7 for [p1, p2] = [137, 139], because n = 71391377 is prime (note that 1113913711, 4313913743 and 6113913761 are also primes);

: q = 11 for [p1, p2] = [139, 149], because n = 1114913911 is prime (note that 2914913929, 4314913943, 4714913947, 6714913967, 8314913983, 101149139101, 127149139127 and 137149139137 are also primes);

: q = 17 for [p1, p2] = [149, 151], because n = 1715114917 is prime (note that 2915114929, 5315114953, 103151149103, 113151149113 and 131151149131 are also primes).

**The least such primes q for twenty larger consecutive pairs of consecutive primes:**

: q = 19 for [p1, p2] = [961748941, 961748947], because n = 1996174894796174894119 is prime;

: q = 17 for [p1, p2] = [961748947, 961748951], because n = 1796174895196174894717 is prime;

: q = 107 for [p1, p2] = [961748951, 961748969], because n = 107961748969961748951107 is prime;

: q = 23 for [p1, p2] = [961748987, 961748969], because n = 2396174898796174896923 is prime;

: q = 131 for [p1, p2] = [961748987, 961748993], because n = 131961748993961748987131 is prime;

: q = 47 for [p1, p2] = [961748993, 961749023], because n = 4796174902396174899347 is prime;

: q = 83 for [p1, p2] = [961749023, 961749037], because n = 8396174903796174902383 is prime;

: q = 79 for [p1, p2] = [961749037, 961749043], because n = 7996174904396174903779 is prime;

: q = 61 for [p1, p2] = [961749043, 961749067], because n = 6196174906796174904361 is prime;

: q = 277 for [p1, p2] = [961749067, 961749079], because n = 277961749079961749067277 is prime;

: q = 163 for [p1, p2] = [961749079, 961749091], because n = 163961749091961749079163 is prime;

: q = 7 for [p1, p2] = [961749091, 961749097], because n = 79617490979617490917 is prime;

: q = 41 for [p1, p2] = [961749097, 961749101], because n = 4196174910196174909741 is prime;

: q = 13 for [p1, p2] = [961749101, 961749121], because n = 1396174912196174910113 is prime;

: q = 181 for [p1, p2] = [961749121, 961749157], because n = 181961749157961749121181 is prime;

: q = 19 for [p1, p2] = [961749157, 961749167], because n = 1996174916796174915719 is prime;

: q = 7 for [p1, p2] = [961749167, 961749193], because n = 79617491939617491677 is prime;

: q = 37 for [p1, p2] = [961749193, 961749199], because n = 3796174919996174919337 is prime;

: q = 29 for [p1, p2] = [961749199, 961749221], because n = 2996174922196174919929 is prime;

: q = 23 for [p1, p2] = [961749221, 961749227], because n = 2396174922796174922123 is prime.

Note that the least values of q that satisfy this conjecture for twenty consecutive pairs of consecutive primes with 9 digits are 19, 17, 107, 23, 131, 47, 83, 79, 61, 277, 163, 7, 41, 13, 181, 19, 7, 37, 29 and 23 (all twenty primes lower than 300!), the corresponding primes n obtained having 20 to 24 digits! This method appears to be a good way to obtain big primes with a high degree of ease and certainty.