Primes obtained concatenating to the left a prime having an odd prime digit sum s with a multiple of s-1

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Abstract. In a previous paper, "Primes obtained concatenating to the left a prime having an odd prime digit sum s with a divisor of s - 1", I observed that for many primes p having an odd prime digit sum s there exist a prime obtained concatenating p to the left with a divisor of s – 1. In this paper I conjecture that for any prime p, p ≠ 5, having an odd prime digit sum s there exist an infinity of primes obtained concatenating to the left p with multiples of s – 1. Yet I conjecture that there exist at least a prime obtained concatenating n*(s – 1) with p such that n < sqr s.

Conjecture 1:

For any prime p, p ≠ 5, having an odd prime digit sum s there exist an infinity of primes obtained concatenating to the left p with multiples of s – 1.

Note: see the sequence A046704 in OEIS for the primes having a prime digit sum.

Examples:

Such primes obtained for p = 29 (s – 1 = 10):

: 2029, 6029, 9029, 14029, 17020, 20029, 23029, 24029 (...)

Such primes obtained for p = 89 (s – 1 = 16):

: 4889, 8089, 9689, 12889, 14489, 19289, 32089, 46489 (...)

Conjecture 2:

For any prime p, p ≠ 5, having an odd prime digit sum s there exist at least a prime obtained concatenating to the left p with the number n*(s – 1) such that n < sqr p.

The sequence of the least primes obtained concatenating each prime p, p ≠ 5, p having an odd prime digit sum s, to the left with numbers n*(s – 1):

: 23, 67, 823, 2029, 2441, 643, 6047, 661, 2467, 2083, 4889, 12113, 36131, 30137, 60139, 6151, 12157, 20173, 48179, 80191, 48179, 80191, 48193, 48197, 18199, 18223, 50227, 24229, 12241, 50263 (...)

obtained for the following values of [p, s, n]: [3, 3, 1], [7, 7, 1], [23, 5, 2], [29, 11, 2], [41, 5, 6], [43, 7, 1], [47, 11, 6], [61, 7, 1], [67, 13, 2], [83, 11, 2], [89, 17, 3], [113, 5, 3], [131, 5, 9], [137, 11, 3], [139, 13, 5], [151, 7, 1], [157, 13, 1], [173, 11, 2], [179, 17, 3], [191, 11, 8], [193, 13, 4], [197, 17, 3], [199, 19, 1], [223, 7, 3], [227, 11, 5], [229, 13, 2], [241, 7, 2], [263, 11, 5].

The conjecture was verified for the first 30 primes p with the defined property. The values of n closest by the values of sqr p were:

n = 1 for sqr 3 = 1.732;
n = 6 for sqr 41 = 6.403;
n = 9 for sqr 131 = 11.445.

The least such primes obtained for 5 consecutive primes p with 6 digits, i.e. 287491, 287501, 287671, 287789, 287813:

: 120287491 obtained for n = 4 (s = 30);
: 110287501 obtained for n = 5 (s = 22);
: 90287671 obtained for n = 3 (s = 30);
: 440287789 obtained for n = 11 (s = 40);
: 56287813 obtained for n = 2 (s = 28).

Note for what low values of n were obtained the primes above!