On the numbers (n+1)·p-n·q where p and q primes, p having the group of its last digits equal to q

Abstract. In this paper I make the following two conjectures: (I) For any prime p, p > 5, there exist a pair of primes (q1, q2), both having the group of their last digits equal to p, and a positive integer n, such that p = (n + 1)*q1 – n*q2 (examples: for p = 11, there exist the primes q1 = 211 and q2 = 311 and also the number n = 2 such that 11 = 3*211 – 2*311; for p = 29, there exist the primes q1 = 829 and q2 = 929 and also the number n = 8 such that 29 = 9*829 – 8*929); (II) For any q1 prime, q1 > 5, and any n non-null positive integer, there exist an infinity of primes q2, having the group of their last digits equal to q1, such that p = (n + 1)*q2 – n*q1 is prime; (III) For any q1 prime, q1 > 5, and any q2 prime having the group of its last digits equal to q1, there exist an infinity of positive integers n such that p = (n + 1)*q2 – n*q1 is prime.

Conjecture 1:

For any prime p, p > 5, there exist a pair of primes (q1, q2), both having the group of their last digits equal to p, and a positive integer n, such that p = (n + 1)*q1 – n*q2 (examples: for p = 11, there exist the primes q1 = 211 and q2 = 311 and also the number n = 2 such that 11 = 3*211 – 2*311; for p = 29, there exist the primes q1 = 829 and q2 = 929 and also the number n = 8 such that 29 = 9*829 – 8*929).

The pairs of primes (q1, q2) for p > 5:

: for p = 7, (q1, q2) = (37, 47) because 4*37 – 3*47 = 7; :
: for p = 11, (q1, q2) = (211, 311) because 3*211 – 2*311 = 7;
: for p = 13, (q1, q2) = (1013, 1213) because 6*1013 – 5*1213 = 13;
: for p = 17, (q1, q2) = (1117, 1217) because 12*1117 – 11*1217 = 17;
: for p = 19, (q1, q2) = (419, 619) because 3*419 – 2*619 = 19;
: for p = 23, (q1, q2) = (1123, 1223) because 12*1123 – 11*1223 = 23;
: for p = 29, (q1, q2) = (829, 929) because 9*829 – 8*929 = 29;
: for p = 31, (q1, q2) = (331, 431) because 4*331 – 3*431 = 19;
(...)

Conjecture 2:

For any q1 prime, q1 > 5, and any n non-null positive integer, there exist an infinity of primes q2, having the group of their last digits equal to q1, such that p = (n + 1)*q2 – n*q1 is prime.

The sequence of primes p for q1 = 7, n = 1:

: 67 (= 2*37 – 1*7), 127 (= 2*67 – 1*7), 307 (= 2*157 – 7)..., corresponding to q2 = 37, 67, 157 (...)

The sequence of primes p for q1 = 7, n = 2:

: 37 (= 3*17 – 2*7), 97 (= 3*37 – 2*7), 127 (= 3*47 – 2*7)..., corresponding to q2 = 17, 37, 47 (...)

The sequence of primes p for q1 = 7, n = 4:

: 47 (= 4*17 – 3*7), 127 (= 4*37 – 3*7), 167 (= 4*47 – 3*7), corresponding to q2 = 17, 37, 47 (...)

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The sequence of primes p for q1 = 11, n = 1:

: 1811 (= 2*911 – 1*11), 3011 (= 2*1511 – 1*11), 4211 (= 2*2111 – 1*11)..., corresponding to q2 = 911, 1511, 2111 (...)

The sequence of primes p for q1 = 11, n = 2:

: 911 (= 3*311 – 2*11), 2411 (= 3*811 – 2*11), 2711 (= 3*911 – 2*11)..., corresponding to q2 = 311, 811, 911 (...)

The sequence of primes p for q1 = 11, n = 3:

: 811 (= 4*211 – 3*11), 6011 (= 4*1511 – 3*11), 7211 (= 4*1811 – 3*11), corresponding to q2 = 211, 1511, 1811 (...)

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The sequence of primes p for q1 = 97, n = 3:

: 3697 (= 4*997 – 3*97), 27697 (= 4*6997 – 3*97), 55697 (= 4*13997 – 3*97), 79697 (= 4*19997 – 3*97), 87697 (= 4*21997 – 3*97)..., corresponding to q2 = 997, 6997, 13997, 21997 (...)

Conjecture 3:

For any q1 prime, q1 > 5, and any q2 prime having the group of its last digits equal to q1, there exist an infinity of positive integers n such that p = (n + 1)*q2 – n*q1 is prime.

The sequence of primes p for (q1, q2) = (11, 211):

: 811 (= 4*211 – 3*11), 1811 (= 9*211 – 8*11), 2011 (= 10*211 – 9*11), 2411 (= 12*211 – 11*11)... corresponding to n = 3, 8, 9, 11 (...)