# Three formulas that generate easily certain types of triplets of primes

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**Abstract.** In this paper I present three formulas, each of them with the following property: starting from a given prime p, are obtained in many cases two other primes, q and r. I met the triplets of primes [p, q, r] obtained with these formulas in the study of Carmichael numbers; the three primes mentioned are often the three prime factors of a 3-Carmichael number.

**Note:**

To refer to the three formulas easily I will name them the formula alpha, beta or gama and the triplets obtained the triplet alpha, beta or gama.

**Formula alpha:**

The formula alpha is 30*a*n – (a*p + a – 1). The first prime of a triplet alpha is p and the other two ones are obtained giving to n values of integers, under the condition that a*p + a – 1 is prime.

Examples:

: For p = 11 and a = 2 the condition that a*p + a – 1 is prime is met because 2*11 + 2 – 1 = 23 which is prime; the formula alpha becomes 60*n – 23; it can be seen that for n = 1 is obtained 47 (prime) and for n = 2 is obtained 97 (prime) so we have the triplet alpha [11, 47, 97]; also for n = 3 is obtained 157 (prime) so other two triplets alpha are [11, 47, 157] and [11, 97, 157];

: For p = 7 and a = 3 the condition that a*p + a – 1 is prime is met because 3*7 + 3 – 1 = 23 which is prime; the formula alpha becomes 90*n – 23; it can be seen that for n = 1 is obtained 67 (prime) and for n = 2 is obtained 157 (prime) so we have the triplet alpha [7, 67, 157]; also for n = 4 is obtained 337 (prime) so other two triplets alpha are [7, 67, 337] and [7, 157, 337].

Note: see the sequence A182416 in OEIS for the connection between Carmichael numbers and formula alpha.

**Formula beta:**

The formula beta is 30*a*n + (a*p + a – 1). The first prime of a triplet beta is p and the other two ones are obtained giving to n values of integers, under the condition that a*p + a – 1 is prime.

Examples:

: For p = 11 and a = 2 the condition that a*p + a – 1 is prime is met because 2*11 + 2 – 1 = 23 which is prime; the formula beta becomes 60*n + 23; it can be seen that for n = 1 is obtained 83 (prime) and for n = 4 is obtained 263 (prime) so we have the triplet beta [11, 83, 263]; also for n = 6 is obtained 383 (prime) so other two triplets beta are [11, 83, 383] and [11, 263, 383];

: For p = 19 and a = 3 the condition that a*p + a – 1 is prime is met because 3*19 + 3 – 1 = 59 which is prime; the formula beta becomes 90*n + 59; it can be seen that for n = 1 is obtained 149 (prime) and for n = 2 is obtained 239 (prime) so we have the triplet beta [59, 149, 239]; also for n = 4 is obtained 419 (prime) so other two triplets beta are [59, 149, 419] and [59, 239, 419].

Note: see the sequence A182416 in OEIS for the connection between Carmichael numbers and formula beta.

**Formula gama:**

The formula gama is 2*p*n – 2*n + p. The first prime of a triplet gama is p and the other two ones are obtained giving to n values of integers, under the condition that 2*p – 1 is prime.

Example:

: For p = 7 the condition that 2*p – 1 is prime is met; the formula gama becomes 12*n + 7; for n = 1 is obtained 19 (prime) and for n = 2 is obtained 31 so we have the triplet gama [7, 19, 31]; also for n = 3 is obtained 43 so other two triplets gama are [7, 19, 43] and [7, 31, 43].

Note: see the sequence A182207 in OEIS for the connection between Carmichael numbers and formula gama.