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J. RECREATIONAL MATHEMATICS, Vol. 18(4), 1985-86

A7610

PRIME SUMS OF CONSECUTIVE PRIMES

CHARLES W. TRIGG
San Diego, California

There are twenty-five primes $< 10^2$, namely:

2	3	5	7	11	13	17	19	23	29	31	37	41
	43	47	53	59	61	67	71	73	79	83	89	97

Imbedded in this sequence are sixty-six sub-sequences of consecutive primes with prime sums that vary from 5 to 1019. The five that contain 2 are:

$2 + 3 = 5$;
$2 + 3 + 5 + 7 = 17$;
$2 + 3 + 5 + 7 + 11 + 13 = 41$ a;
$2 + 3 + \ldots + 37 = 197$ c; and
$2 + 3 + \ldots + 43 = 281$ g.

These contain 2, 4, 6, 12, and 14 primes, respectively.

The sixty-one prime sums of an odd number of consecutive primes are listed in Table 1 where the frequencies of sub-sequences of particular lengths are shown in parentheses. Sums followed by the same lower case letter have dual representation, except that the three different sub-sequences, h, sum to 311.

Every prime < 89 is the leading term of at least one sub-sequence with a prime sum. It will be observed that in the group of three consecutive primes, the leading terms of 3, 5, 3, and 2 of the sub-sequences are consecutive primes. Similar relationships occur among the leading terms in the groups composed of five, seven, nine, eleven, and fifteen consecutive primes.

All of the sub-sequences of consecutive primes, except the four indicated by an asterisk (*), are imbedded in one or more longer sequences.

Six of the prime sums are palindromes: 101, 131, 181, 353, 373, and 797. The largest prime in the sequence totaling 353 is 53.

Table 1. Consecutive Primes with Prime Sums

Three Primes (15)

5 + 7 + 11 =	23
7 + 11 + 13 =	31
11 + 13 + 17 =	41 a
17 + 19 + 23 =	59
19 + 23 + 29 =	71
23 + 29 + 31 =	83 b
29 + 31 + 37 =	97
31 + 37 + 41 =	109
41 + 43 + 47 =	131
53 + 59 + 61 =	173
61 + 67 + 71 =	199 d
67 + 71 + 73 =	211
71 + 73 + 79 =	223 e
79 + 83 + 89 =	251 f
83 + 89 + 97 =	269

Five Primes (12)

5 + 7 + 11 + 13 + 17 =	53
7 + 11 + 13 + 17 + 19 =	67
11 + 13 + 17 + 19 + 23 =	83 b
13 + 17 + 19 + 23 + 29 =	101
19 + 23 + 29 + 31 + 37 =	139
29 + 31 + 37 + 41 + 43 =	181
31 + 37 + 41 + 43 + 47 =	199 d
43 + 47 + 53 + 59 + 61 =	263
53 + 59 + 61 + 67 + 71 =	311 h
59 + 61 + 67 + 71 + 73 =	331
67 + 71 + 73 + 79 + 83 =	373
73 + 79 + 83 + 89 + 97 =	421

Seven Primes (10)

17 + 19 + 23 + . . . + 41 =	197 c
19 + 23 + 29 + . . . + 43 =	223 e
23 + 29 + 31 + . . . + 47 =	251 f
29 + 31 + 37 + . . . + 53 =	281 g
31 + 37 + 41 + . . . + 59 =	311 h
43 + 47 + 53 + . . . + 71 =	401 i
47 + 53 + 59 + . . . + 73 =	431

Seven Primes (cont'd.)

53 + 59 + 61 + . . . + 79 =	463
61 + 67 + 71 + . . . + 89 =	523
67 + 71 + 73 + . . . + 97 =	559

Nine Primes (5)

3 + 5 + 7 + . . . + 29 =	127
29 + 31 + 37 + . . . + 61 =	401 i
31 + 37 + 41 + . . . + 67 =	439
37 + 41 + 43 + . . . + 71 =	479
47 + 53 + 59 + . . . + 83 =	593

Eleven Primes (8)

5 + 7 + 11 + . . . + 41 =	233
7 + 11 * 13 + . . . + 43 =	271
11 + 13 + 17 + . . . + 47 =	311 h
13 + 17 + 19 + . . . + 53 =	353
19 + 23 + 29 + . . . + 61 =	443
23 + 29 + 31 + . . . + 67 =	491 k
37 + 41 + 43 + . . . + 79 =	631
41 + 43 + 47 + . . . + 83 =	677

Thirteen Primes (2)

29 + 31 + 37 + . . . + 79 =	691
41 + 43 + 47 + . . . + 97 =	863m

Fifteen Primes (5)

3 + 5 + 7 + . . . + 53 =	379
7 + 11 + 13 + . . . + 61 =	491 k
19 + 23 + 29 + . . . + 79 =	733
23 + 29 + 31 + . . . + 83 =	797
29 + 31 + 37 + . . . + 89 =	863m

Seventeen Primes (2)

3 + 5 + 7 + . . . + 61 =	499 *
5 + 7 + 11 + . . . + 67 =	563 *

Nineteen Primes (2)

11 + 13 + 17 + . . . + 83 =	857
17 + 19 + 23 + . . . + 97 =	1019 *

Twenty-One Primes (1)

7 + 11 + 13 + . . . + 89 =	953 *