Regularity on Mersenne number with n=odd number

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Abstract

The purpose of this paper is to introduce regularity on Mersenne number with n=odd number. There is regularity among n=odd numbers in Mersen number. If the k and l is odd number, $2^{kl}-1=\alpha(2^k-1)$.

1. Regularity on Mersenne number

The prime number's pattern could be applied to Mersen number. The pattern shows regularity among n = odd numbers for the Mersen number, as shown in Figure 1. [2]

For example, $2^{31}-1$ can be divided into 2^3-1 (where l=1,3,5, …).

M=2^n-1	odd	$M_3/7$	$M_5/31$	$M_7/127$	$M_9/511$	$M_{11}/2047$
1	1					
7	3	1.0000				
31	5	4.4286	1.0000			
127	7	18.1429	4.0968	1.0000		
511	9	73.0000	16.4839	4.0236	1.0000	
2047	11	292.4286	66.0323	16.1181	4.0059	1.0000
8191	13	1170.1429	264.2258	64.4961	16.0294	4.0015
32767	15	4681.0000	1057.0000	258.0079	64.1233	16.0073
131071	17	18724.4286	4228.0968	1032.0551	256.4990	64.0308
524287	19	74898.1429	16912.4839	4128.2441	1026.0020	256.1246
2097151	21	299593.0000	67650.0323	16513.0000	4104.0137	1024.4998
8388607	23	1198372.4286	270600.2258	66052.0236	16416.0607	4098.0005
33554431	25	4793490.1429	1082401.0000	264208.1181	65664.2485	16392.0034
134217727	27	19173961.0000	4329604.0968	1056832.4961	262657.0000	65568.0151
536870911	29	76695844.4286	17318416.4839	4227330.0079	1050628.0059	262272.0620
2147483647	31	306783378.1429	69273666.0323	16909320.0551	4202512.0294	1049088.2496
8589934591	33	1227133513.0000	277094664.2258	67637280.2441	16810048.1233	4196353.0000
34359738367	35	4908534052.4286	1108378657.0000	270549121.0000	67240192.4990	16785412.0015
137438953471	37	19634136210.1429	443514628.0968	1082196484.0236	268960770.0020	67141648.0073
549755813887	39	78536544841.0000	17734058512.4839	4328785936.1181	1075843080.0137	268566592.0308
2199023255551	41	314146179364.4290	70936234050.0323	17315143744.4961	4303372320.0607	1074266368.1246
8796093022207	43	1256584717458.1400	283744936200.2260	69260574978.0079	17213489280.2485	4297065472.4998
35184372088831	45	5026338869833.0000	1134979744801.0000	277042299912.0550	68853957121.0000	17188261890.0005
140737488355327	47	20105355479332.4000	4539918979204.1000	1108169199648.2400	275415828484.0060	68753047560.0034
562949953421311	49	80421421917330.1000	18159675916816.5000	4432676798593.0000	1101663313936.0300	275012190240.0150

Figure 1. Regularity on Mersenne number

Let k and l = 1, 3, 5, … .

This implies that

$$2^{kl} - 1 = \alpha(2^k - 1)$$

Where α is integer

3. References

[1] Chris K. Caldwell, Mersenne Primes: History, Theorems and Lists Archived 2019-03-13 at the Wayback Machine.

[2] Minho Baek, A Study on the Pattern in the Prime Numbers and Primality Test, viXra.org:2512.0039