An Original Method to Find Probable Prime Numbers by David Hill

Abstract

This paper presents an original method devised by David Hill for identifying probable prime numbers through a series of systematic steps involving division and rounding. The method begins with selecting any natural number, repeatedly dividing it by 2 until the result ends in a decimal of .5. Based on the parity of the original number, the resulting decimal is then rounded to the nearest even or odd number. This rounded number is either added to or subtracted from the original input number, often resulting in a prime number. While the method does not guarantee a prime in every case, it demonstrates a high success rate, particularly within the range of 2 to 100. An exception is made for generating the prime number 2 from the input number 1.

To validate this method, two Python programs were utilized. One program tested integer numbers within a given range one by one, and the other produced a list of probable prime numbers found. Analysis of the results revealed that the method consistently found a higher number of primes than initially estimated. For example, starting in the range of 2 to 100 integers, the method found 34 primes compared to the estimated 25. This pattern held true across larger ranges, with the method finding up to 46.06% more primes out of the estimated in the range of 2 to 10,000,000.

Additionally, the method identified the greatest prime numbers that extended significantly beyond the initial range limits. The trend line for the percentage increase in found primes suggested that the method becomes increasingly effective at identifying additional primes as the range expands.

These findings suggest that the method has the potential to uncover a greater number of prime numbers than traditional estimation methods predict, providing a new approach to prime number discovery. This could indicate a deeper connection between composite numbers and primes through systematic division and balancing of odds and evens. Further research is needed to determine the method's effectiveness across larger and more varied ranges, but the initial results are promising.

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System Rules

A. Choose any natural number as input. Let's choose four examples: 25, 26, 28, and 32.

B. Keep dividing your input number by 2 until you get your first number that ends in a decimal of .5. Any odd number will only need to be divided by 2 once before it becomes a decimal.

- Example: 25 ÷ 2 = 12.5 For even numbers, the input number must be divided by 2 multiple times until it ends in a decimal of .5.
- Example 1: 26 ÷ 2 = 13; 13 ÷ 2 = 6.5
- Example 2: 28 ÷ 2 = 14; 14 ÷ 2 = 7; 7 ÷ 2 = 3.5
- Example 3: 32 ÷ 2 = 16; 16 ÷ 2 = 8; 8 ÷ 2 = 4; 4 ÷ 2 = 2; 2 ÷ 2 = 1; 1 ÷ 2 = 0.5

C. Round the decimal to the nearest whole number based on the parity of the original input number.

- If the original number was odd, round the decimal to the nearest even number.
    - Example: 25 ÷ 2 = 12.5 (25 is odd, so round 12.5 down to 12)
- If the original number was even, round the decimal to the nearest odd number.
    - Example 1: 26 ÷ 2 = 13; 13 ÷ 2 = 6.5 (26 is even, so round 6.5 up to 7)
    - Example 2: 28 ÷ 2 = 14; 14 ÷ 2 = 7; 7 ÷ 2 = 3.5 (28 is even, so round 3.5 down to 3)
    - Example 3: 32 ÷ 2 = 16; 16 ÷ 2 = 8; 8 ÷ 2 = 4; 4 ÷ 2 = 2; 2 ÷ 2 = 1; 1 ÷ 2 = 0.5 (32 is even, so round 0.5 up to 1)

D. Use the rounded number to add to or subtract from the original input number. You will find that in most cases, this will lead to a prime number either by addition or subtraction, and sometimes both.

- Example: 25 ÷ 2 = 12.5 (round to 12)
    - 25 + 12 = 37 (prime)
    - 25 - 12 = 13 (prime)
- Example 1: 26 ÷ 2 = 13; 13 ÷ 2 = 6.5 (round to 7)
    - 26 - 7 = 19 (prime)
- Example 2: 28 ÷ 2 = 14; 14 ÷ 2 = 7; 7 ÷ 2 = 3.5 (round to 3)
    - 28 + 3 = 31 (prime)
- Example 3: 32 ÷ 2 = 16; 16 ÷ 2 = 8; 8 ÷ 2 = 4; 4 ÷ 2 = 2; 2 ÷ 2 = 1; 1 ÷ 2 = 0.5 (round to 1)
    - 32 - 1 = 31 (prime)

In about 10% of cases, using input numbers from 2 to 100, the method did not generate a prime number. However, the majority of input numbers did generate primes, and as far as I recall, all primes from 3 to 100 were found using this method. This indicates that for this range, the method effectively generates all possible primes, except for the prime number 2, which I will explain below.

Will this method work for any given range of numbers? I do not know, but it will be interesting to find out. If this system consistently generates more primes than not, it likely can't be a coincidence. If all primes in a range are found regardless, that would be even more impressive. However, since primes are infinite, it is challenging to determine if a system is always true or usually true. Similar to observing trends in the stock market, you might think you've found a trend only to realize it was just a small part of a larger picture.

A limitation of this system is that it doesn't indicate whether the rounded number should be added or subtracted, and the resulting number still needs to be tested for primality. Despite this, it could potentially show a pattern connecting composite numbers to primes, rather than the usual view that primes form composites. This could suggest that composites can lead to primes through a series of divisions and adjustments between odds and evens.

Number 1: The Exception

To get the prime number 2, you have to create an exception to the rule for the input number 1.

- Using the system above: 1 ÷ 2 = 0.5
- Input 1 is an odd number, so according to the original rules, we should round to the nearest even number, but we can only round to either 0 or 1. In this case, there is no even number to round to.
- If we choose 0, we get stuck in a loop because 1 + 0 = 1 and 1 - 0 = 1. To get the prime number 2, we have to create an exception to our rule: if rounding down creates a 0, then

round to the nearest number. This way, we round 0.5 up to 1, making both the input number and the rounded number odd. By doing so, we can then do 1 + 1 to get 2.

My friend @SilvioGabbianelli (Gasbion is his python pseudonym) sent me a preview of a program that could perform calculations according to my method. In the end, two programs were written: one to test integer numbers within a given range one by one, and the other to produce a list of probable prime numbers to compare with the estimated number of primes up to a given n. By calculation, I am happy to confirm my expectations. This method allows us to find, starting from a range of consecutive integers, not only all the prime numbers within the range but also a higher number of prime numbers that reach a probable maximum prime number, approximately 30-45% more than the estimated primes present in the search interval. The results show that the estimated number of primes up to that maximum prime number found is exactly that of the primes in the extended interval up to the maximum prime found.

Below are the interesting data observed through the two Python programs wrote for this purpose. The first program starts with integers in the range from 2 to 100 and produces probable prime numbers using my methodology. The second program lists probable prime numbers found between 2 and 69200. The estimates of the number of primes in these ranges, calculated using the Riemann zeta function, are also reported.

Program to calculate the probable prime number in a given interval of positive integers by @Day Hill method Edited by Gasbion 06/2024

integers to test from? 2

integers to test to? 100

 ('Testing number:', 2)

1.0 2

0.5

3 (sum)

1 (difference)

('Testing number:', 3)

1.5 3

5 (sum)

1 (difference)

('Testing number:', 4)

2.0 4

1.0 4

0.5

5 (sum)

3 (difference)

('Testing number:', 5)

2.5 5

7 (sum) is probable prime

3 (difference) is probable prime

('Testing number:', 6)

3.0 6

1.5

7 (sum) is probable prime

5 (difference) is probable prime

('Testing number:', 7)

3.5 7

11 (sum) is probable prime

3 (difference)

('Testing number:', 8)

4.0 8

2.0 8

1.0 8

0.5

9 (sum)

7 (difference) is probable prime

('Testing number:', 9)

4.5 9

13 (sum) is probable prime

5 (difference) is probable prime

('Testing number:', 10)

5.0 10

2.5

13 (sum) is probable prime

7 (difference) is probable prime

('Testing number:', 11)

5.5 11

17 (sum) is probable prime

5 (difference) is probable prime

('Testing number:', 12)

6.0 12

3.0 12

1.5

13 (sum) is probable prime

11 (difference) is probable prime

('Testing number:', 13)

6.5 13

19 (sum) is probable prime

7 (difference) is probable prime

('Testing number:', 14)

7.0 14

3.5

17 (sum) is probable prime

11 (difference) is probable prime

('Testing number:', 15)

7.5 15

23 (sum) is probable prime

7 (difference) is probable prime

('Testing number:', 16)

8.0 16

4.0 16

2.0 16

1.0 16

0.5

17 (sum) is probable prime

15 (difference)

('Testing number:', 17)

8.5 17

25 (sum) is probable prime

9 (difference)

('Testing number:', 18)

9.0 18

4.5

23 (sum) is probable prime

13 (difference) is probable prime

('Testing number:', 19)

9.5 19

29 (sum) is probable prime

9 (difference)

('Testing number:', 20)

10.0 20

5.0 20

2.5

23 (sum) is probable prime

17 (difference) is probable prime

('Testing number:', 21)

10.5 21

31 (sum) is probable prime

11 (difference) is probable prime

('Testing number:', 22)

11.0 22

5.5

27 (sum)

17 (difference) is probable prime

('Testing number:', 23)

11.5 23

35 (sum)

11 (difference) is probable prime

('Testing number:', 24)

12.0 24

6.0 24

3.0 24

1.5

25 (sum)

23 (difference) is probable prime

('Testing number:', 25)

12.5 25

37 (sum) is probable prime

13 (difference) is probable prime

('Testing number:', 26)

13.0 26

6.5

33 (sum)

19 (difference) is probable prime

('Testing number:', 27)

13.5 27

41 (sum) is probable prime

13 (difference) is probable prime

('Testing number:', 28)

14.0 28

7.0 28

3.5

31 (sum) is probable prime

25 (difference)

('Testing number:', 29)

14.5 29

43 (sum) is probable prime

15 (difference)

('Testing number:', 30)

15.0 30

7.5

37 (sum) is probable prime

23 (difference) is probable prime

('Testing number:', 31)

15.5 31

47 (sum) is probable prime

15 (difference)

('Testing number:', 32)

16.0 32

8.0 32

4.0 32

2.0 32

1.0 32

0.5

33 (sum)

31 (difference) is probable prime

('Testing number:', 33)

16.5 33

49 (sum)

17 (difference) is probable prime

('Testing number:', 34)

17.0 34

8.5

43 (sum) is probable prime

25 (difference)

('Testing number:', 35)

17.5 35

53 (sum) is probable prime

17 (difference) is probable prime

('Testing number:', 36)

18.0 36

9.0 36

4.5

41 (sum) is probable prime

31 (difference) is probable prime

('Testing number:', 37)

18.5 37

55 (sum)

19 (difference) is probable prime

('Testing number:', 38)

19.0 38

9.5

47 (sum) is probable prime

29 (difference) is probable prime

('Testing number:', 39)

19.5 39

59 (sum) is probable prime

19 (difference) is probable prime

('Testing number:', 40)

20.0 40

10.0 40

5.0 40

2.5

43 (sum) is probable prime

37 (difference) is probable prime

('Testing number:', 41)

20.5 41

61 (sum) is probable prime

21 (difference)

('Testing number:', 42)

21.0 42

10.5

53 (sum) is probable prime

31 (difference) is probable prime

('Testing number:', 43)

21.5 43

65 (sum)

21 (difference)

('Testing number:', 44)

22.0 44

11.0 44

5.5

49 (sum)

39 (difference)

('Testing number:', 45)

22.5 45

67 (sum) is probable prime

23 (difference) is probable prime

('Testing number:', 46)

23.0 46

11.5

57 (sum)

35 (difference)

('Testing number:', 47)

23.5 47

71 (sum) is probable prime

23 (difference) is probable prime

('Testing number:', 48)

24.0 48

12.0 48

6.0 48

3.0 48

1.5

49 (sum)

47 (difference)

('Testing number:', 49)

24.5 49

73 (sum) is probable prime

25 (difference)

('Testing number:', 50)

25.0 50

12.5

63 (sum)

37 (difference) is probable prime

('Testing number:', 51)

25.5 51

77 (sum)

25 (difference)

('Testing number:', 52)

26.0 52

13.0 52

6.5

59 (sum) is probable prime

45 (difference)

('Testing number:', 53)

26.5 53

79 (sum) is probable prime

27 (difference)

('Testing number:', 54)

27.0 54

13.5

67 (sum) is probable prime

41 (difference) is probable prime

('Testing number:', 55)

27.5 55

83 (sum) is probable prime

27 (difference)

('Testing number:', 56)

28.0 56

14.0 56

7.0 56

3.5

59 (sum) is probable prime

53 (difference) is probable prime

('Testing number:', 57)

28.5 57

85 (sum)

29 (difference) is probable prime

('Testing number:', 58)

29.0 58

14.5

73 (sum) is probable prime

43 (difference) is probable prime

('Testing number:', 59)

29.5 59

89 (sum) is probable prime

29 (difference) is probable prime

('Testing number:', 60)

30.0 60

15.0 60

7.5

67 (sum) is probable prime

53 (difference) is probable prime

('Testing number:', 61)

30.5 61

91 (sum)

31 (difference) is probable prime

('Testing number:', 62)

31.0 62

15.5

77 (sum)

47 (difference) is probable prime

('Testing number:', 63)

31.5 63

95 (sum)

31 (difference) is probable prime

('Testing number:', 64)

32.0 64

16.0 64

8.0 64

4.0 64

2.0 64

1.0 64

0.5

65 (sum)

63 (difference)

('Testing number:', 65)

32.5 65

97 (sum) is probable prime

33 (difference)

('Testing number:', 66)

33.0 66

16.5

83 (sum) is probable prime

49 (difference)

('Testing number:', 67)

33.5 67

101 (sum) is probable prime

33 (difference)

('Testing number:', 68)

34.0 68

17.0 68

8.5

77 (sum)

59 (difference) is probable prime

('Testing number:', 69)

34.5 69

103 (sum) is probable prime

35 (difference)

('Testing number:', 70)

35.0 70

17.5

87 (sum)

53 (difference) is probable prime

('Testing number:', 71)

35.5 71

107 (sum) is probable prime

35 (difference)

('Testing number:', 72)

36.0 72

18.0 72

9.0 72

4.5

77 (sum)

67 (difference) is probable prime

('Testing number:', 73)

36.5 73

109 (sum) is probable prime

37 (difference) is probable prime

('Testing number:', 74)

37.0 74

18.5

93 (sum)

55 (difference)

('Testing number:', 75)

37.5 75

113 (sum) is probable prime

37 (difference) is probable prime

('Testing number:', 76)

38.0 76

19.0 76

9.5

85 (sum)

67 (difference) is probable prime

('Testing number:', 77)

38.5 77

115 (sum)

39 (difference)

('Testing number:', 78)

39.0 78

19.5

97 (sum) is probable prime

59 (difference) is probable prime

('Testing number:', 79)

39.5 79

119 (sum)

39 (difference)

('Testing number:', 80)

40.0 80

20.0 80

10.0 80

5.0 80

2.5

83 (sum) is probable prime

77 (difference)

('Testing number:', 81)

40.5 81

121 (sum)

41 (difference) is probable prime

('Testing number:', 82)

41.0 82

20.5

103 (sum) is probable prime

61 (difference) is probable prime

('Testing number:', 83)

41.5 83

125 (sum)

41 (difference) is probable prime

('Testing number:', 84)

42.0 84

21.0 84

10.5

95 (sum)

73 (difference) is probable prime

('Testing number:', 85)

42.5 85

127 (sum) is probable prime

43 (difference) is probable prime

('Testing number:', 86)

43.0 86

21.5

107 (sum) is probable prime

65 (difference)

('Testing number:', 87)

43.5 87

131 (sum) is probable prime

43 (difference) is probable prime

('Testing number:', 88)

44.0 88

22.0 88

11.0 88

5.5

93 (sum)

83 (difference) is probable prime

('Testing number:', 89)

44.5 89

133 (sum) is probable prime

45 (difference)

('Testing number:', 90)

45.0 90

22.5

113 (sum) is probable prime

67 (difference) is probable prime

('Testing number:', 91)

45.5 91

137 (sum) is probable prime

45 (difference)

('Testing number:', 92)

46.0 92

23.0 92

11.5

103 (sum) is probable prime

81 (difference)

('Testing number:', 93)

46.5 93

139 (sum) is probable prime

47 (difference) is probable prime

('Testing number:', 94)

47.0 94

23.5

117 (sum)

71 (difference) is probable prime

('Testing number:', 95)

47.5 95

143 (sum)

47 (difference) is probable prime

('Testing number:', 96)

48.0 96

24.0 96

12.0 96

6.0 96

3.0 96

1.5

97 (sum) is probable prime

95 (difference)

('Testing number:', 97)

48.5 97

145 (sum)

49 (difference)

('Testing number:', 98)

49.0 98

24.5

123 (sum)

73 (difference) is probable prime

('Testing number:', 99)

49.5 99

149 (sum) is probable prime

49 (difference)

('Testing number:', 100)

50.0 100

25.0 100

12.5

113 (sum) is probable prime

87 (difference)

Program to calculate the probable prime number list in a given interval of positive integers by @Day Hill method Edited by Gasbion 06/2024

integers to test from? 2

integers to test to? 69200

Probable primes found:

[3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67, 71, 73, 79, 83, 89, 97, 101, 103, 107, 109, 113, 127, 131, 137, 139, 149, 151, 157, 163, 167, 173, 179, 181, 191, 193, 197, 199, 211, 223, 227, 229, 233, 239, 241, 251, 257, 263, 269, 271, 277, 281, 283, 293, 307, 311, 313, 317, 331, 337, 347, 349, 353, 359, 367, 373, 379, 383, 389, 397, 401, 409, 419, 421, 431, 433, 439, 443, 449, 457, 461, 463, 467, 479, 487, 491, 499, 503, 509, 521, 523, 541, 547, 557, 563, 569, 571, 577, 587, 593, 599, 601, 607, 613, 617, 619, 631, 641, 643, 647, 653, 659, 661, 673, 677, 683, 691, 701, 709, 719, 727, 733, 739, 743, 751, 757, 761, 769, 773, 787, 797, 809, 811, 821, 823, 827, 829, 839, 853, 857, 859, 863, 877, 881, 883, 887, 907, 911, 919, 929, 937, 941, 947, 953, 967, 971, 977, 983, 991, 997, 1009, 1013, 1019, 1021, 1031, 1033, 1039, 1049, 1051, 1061, 1063, 1069, 1087, 1091, 1093, 1097, 1103, 1109, 1117, 1123, 1129, 1151, 1153, 1163, 1171, 1181, 1187, 1193, 1201, 1213, 1217, 1223, 1229, 1231, 1237, 1249, 1259, 1277, 1279, 1283, 1289, 1291, 1297, 1301, 1303, 1307, 1319, 1321, 1327, 1361, 1367, 1373, 1381, 1399, 1409, 1423, 1427, 1429, 1433, 1439, 1447, 1451, 1453, 1459, 1471, 1481, 1483, 1487, 1489, 1493, 1499, 1511, 1523, 1531, 1543, 1549, 1553, 1559, 1567, 1571, 1579, 1583, 1597, 1601, 1607, 1609, 1613, 1619, 1621, 1627, 1637, 1657, 1663, 1667, 1669, 1693, 1697, 1699, 1709, 1721, 1723, 1733, 1741, 1747, 1753, 1759, 1777, 1783, 1787, 1789, 1801, 1811, 1823, 1831, 1847, 1861, 1867, 1871, 1873, 1877, 1879, 1889, 1901, 1907, 1913, 1931, 1933, 1949, 1951, 1973, 1979, 1987, 1993, 1997, 1999, 2003, 2011, 2017, 2027, 2029, 2039, 2053, 2063, 2069, 2081, 2083, 2087, 2089, 2099, 2111, 2113, 2129, 2131, 2137, 2141, 2143, 2153, 2161, 2179, 2203, 2207, 2213, 2221, 2237, 2239, 2243, 2251, 2267, 2269, 2273, 2281, 2287, 2293, 2297, 2309, 2311, 2333, 2339, 2341, 2347, 2351, 2357, 2371, 2377, 2381, 2383, 2389, 2393, 2399, 2411, 2417, 2423, 2437, 2441, 2447, 2459, 2467, 2473, 2477, 2503, 2521, 2531, 2539, 2543, 2549, 2551, 2557, 2579, 2591, 2593, 2609, 2617, 2621, 2633, 2647, 2657, 2659, 2663, 2671, 2677, 2683, 2687, 2689, 2693, 2699, 2707, 2711, 2713, 2719, 2729, 2731, 2741, 2749, 2753, 2767, 2777, 2789, 2791, 2797, 2801, 2803, 2819, 2833, 2837, 2843, 2851, 2857, 2861, 2879, 2887, 2897, 2903, 2909, 2917, 2927, 2939, 2953, 2957, 2963, 2969, 2971, 2999, 3001, 3011, 3019, 3023, 3037, 3041, 3049, 3061, 3067, 3079, 3083, 3089, 3109, 3119, 3121, 3137, 3163, 3167, 3169, 3181, 3187, 3191, 3203, 3209, 3217, 3221, 3229, 3251, 3253, 3257, 3259, 3271, 3299, 3301, 3307, 3313, 3319, 3323, 3329, 3331, 3343, 3347, 3359, 3361, 3371, 3373, 3389, 3391, 3407, 3413, 3433, 3449, 3457, 3461, 3463, 3467, 3469, 3491, 3499, 3511, 3517, 3527, 3529, 3533, 3539, 3541, 3547, 3557, 3559, 3571, 3581, 3583, 3593, 3607, 3613, 3617, 3623, 3631, 3637, 3643, 3659, 3671, 3673, 3677, 3691, 3697, 3701, 3709, 3719, 3727, 3733, 3739, 3761, 3767, 3769, 3779, 3793, 3797, 3803, 3821, 3823, 3833, 3847, 3851, 3853, 3863, 3877, 3881, 3889, 3907, 3911, 3917, 3919, 3923, 3929, 3931, 3943, 3947, 3967, 3989, 4001, 4003, 4007, 4013, 4019, 4021, 4027, 4049, 4051, 4057, 4073, 4079, 4091, 4093, 4099, 4111, 4127, 4129, 4133, 4139, 4153, 4157, 4159, 4177, 4201, 4211, 4217, 4219, 4229, 4231, 4241, 4243, 4253, 4259, 4261, 4271, 4273, 4283, 4289, 4297, 4327, 4337, 4339, 4349, 4357, 4363, 4373, 4391, 4397, 4409, 4421, 4423, 4441, 4447, 4451, 4457, 4463, 4481, 4483, 4493, 4507, 4513, 4517, 4519, 4523, 4547, 4549, 4561, 4567, 4583, 4591, 4597, 4603, 4621, 4637, 4639, 4643, 4649, 4651, 4657, 4663, 4673, 4679, 4691, 4703, 4721, 4723, 4729, 4733, 4751, 4759, 4783, 4787, 4789, 4793, 4799, 4801, 4813, 4817, 4831, 4861, 4871, 4877, 4889, 4903, 4909, 4919, 4931, 4933, 4937, 4943, 4951, 4957, 4967, 4969, 4973, 4987, 4993, 4999, 5003, 5009, 5011, 5021,

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9912 probable primes

Program to implement Riemann R function between two positive integers)

Returns approssimative number of prime Edited by Gasbion 01/2021

From? Enter a positive integer:2

To? Enter a positive integer:69200

6874   Approssimative number of prime numbers

Program to implement Riemann R function between two positive integers)

Returns approssimative number of prime Edited by Gasbion 01/2021

From? Enter a positive integer:2

To? Enter a positive integer:103787

9913   Approssimative number of prime numbers

We than extended the calculation up to 10000000 these are the resulting data up to respectively:

100, 25 found 34 36,00% more greatest prime number 149, estimated number of primes 33

1000, 168 found 238 41,67% more greatest prime number 1499, estimated number of primes 235
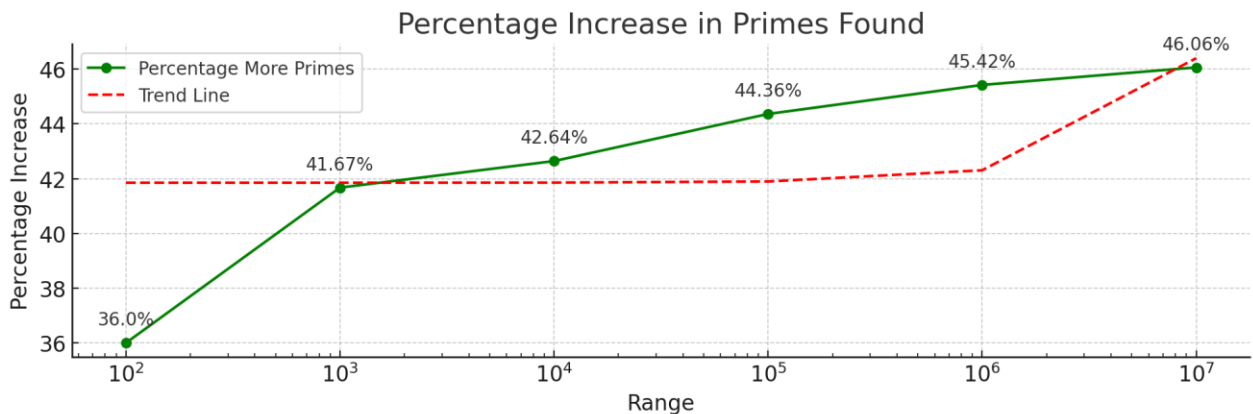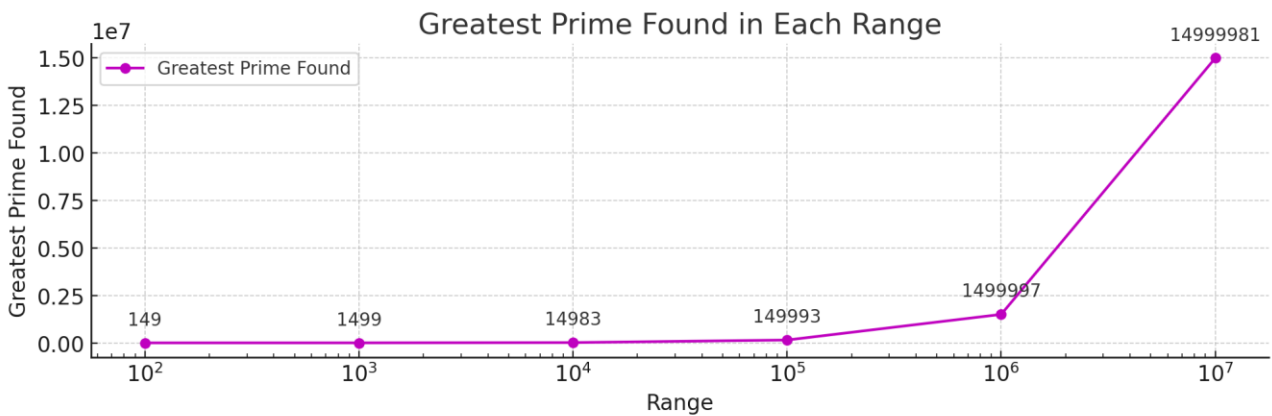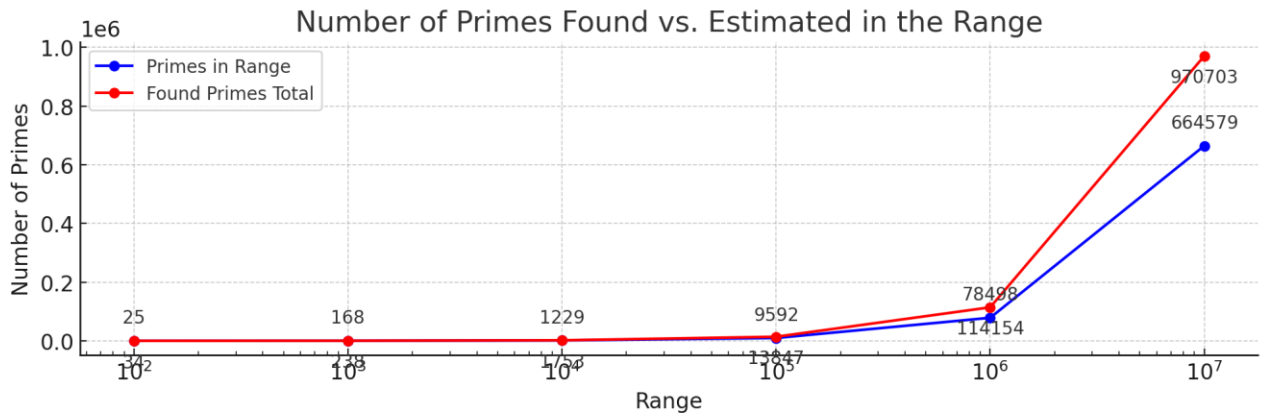
10000, 1229 found 1753 42,64% more greatest prime number 14983, , estimated number of primes 1751

100000, 9592 found 13847 44,36% more greatest prime number 149993, , estimated number of primes 13841

1000000, 78498, found 114154 45,42% more greatest prime number 1499997, , estimated number of primes 114144

10000000, 664579, found 970703 46,06% more greatest prime number 14999981, , estimated number of primes 970735

This is the resulting graphic with the tendencies:

Analysis of the Graphs

1. Number of Primes Found vs. Estimated in the Range

The first graph shows the comparison between the number of primes estimated within a given range (blue points) and the total number of primes found using the method (red points). The ranges considered are from 2 to 100, 2 to 1000, 2 to 10000, 2 to 100000, 2 to 1000000, and 2 to 10000000.

- For the range 2 to 100, the estimated number of primes is 25, while the method found a total of 34 primes.
- For the range 2 to 1000, the estimated number of primes is 168, whereas the method found 238 primes.
- For the range 2 to 10000, the estimated number of primes is 1229, but the method found 1753 primes.
- For the range 2 to 100000, the estimated number of primes is 9592, while the method found 13847 primes.
- For the range 2 to 1000000, the estimated number of primes is 78498, whereas the method found 114154 primes.
- For the range 2 to 10000000, the estimated number of primes is 664579, but the method found 970703 primes.

The annotations highlight that the method consistently finds more primes than initially estimated, indicating its effectiveness.

2. Greatest Prime Found in Each Range

The second graph depicts the greatest prime found in each range (magenta points). The values indicate:

- For the range 2 to 100, the greatest prime found is 149.
- For the range 2 to 1000, the greatest prime found is 1499.
- For the range 2 to 10000, the greatest prime found is 14983.
- For the range 2 to 100000, the greatest prime found is 149993.
- For the range 2 to 1000000, the greatest prime found is 1499997.
- For the range 2 to 10000000, the greatest prime found is 14999981.

These values show that the greatest prime found extends significantly beyond the initial range, demonstrating the method's capacity to discover larger primes.

3. Percentage Increase in Primes Found

The third graph illustrates the percentage increase in the number of primes found compared to the estimated primes (green points), along with a trend line (red dashed line).

- For the range 2 to 100, the percentage increase is 36.00%.
- For the range 2 to 1000, the percentage increase is 41.67%.
- For the range 2 to 10000, the percentage increase is 42.64%.
- For the range 2 to 100000, the percentage increase is 44.36%.
- For the range 2 to 1000000, the percentage increase is 45.42%.
- For the range 2 to 10000000, the percentage increase is 46.06%.

The trend line suggests that the percentage increase tends to grow slightly as the range increases, indicating that the method becomes more effective at finding additional primes in larger ranges.

Conclusion

The graphs provide a comprehensive analysis showing that my method consistently finds a higher number of primes than estimated across various ranges. The method also identifies the greatest prime numbers that extend beyond the initial range limits, and the percentage increase in found

primes demonstrates a growing trend. These results underscore the potential effectiveness of the method in discovering prime numbers.