

#### Question 1: Number Guessing Game using Binary search

1. The random numbers between 1 .. 1K: Total guesses: 89947, Avg: 8.9947
2. The random numbers between 1 .. 1M: Total guesses: 189653, Avg: 18.9653

#### Question 2: Timer Function

List of prime numbers of 10000

```
{
  'start': 1739054939.999966,
  'end': 1739054940.000966,
  'time efficiency': 0.001,
  'result': [2, 3, 5, 7, 11, 13, 17, 19, 23, 29, '...', 9887, 9901, 9907, 9923,
9929, 9931, 9941, 9949, 9967, 9973],
}
```

#### Question 3: Generate Random Numbers

```
Running trial 0/10000...
Running trial 1000/10000...
Running trial 2000/10000...
Running trial 3000/10000...
Running trial 4000/10000...
Running trial 5000/10000...
Running trial 6000/10000...
Running trial 7000/10000...
Running trial 8000/10000...
Running trial 9000/10000...
```

##### a)Deterministic brute-force guessing algorithm

Number of tries: 10000  
The highest number of guesses in a try: 720  
The lowest number of tries: 3  
The average number of tries: 458.3381

##### b)Random guessing algorithm

Number of tries: 10000  
The highest number of guesses in a try: 10000  
The lowest number of tries: 1  
The average number of tries: 989.2689  
Number of bailouts: 2

#### Question 4: Collatz 3n+1 Algorithm

Running Collatz Sequence Analysis for 1000000 numbers...

```
Processed: 100000/1000000
Processed: 200000/1000000
Processed: 300000/1000000
Processed: 400000/1000000
Processed: 500000/1000000
Processed: 600000/1000000
Processed: 700000/1000000
Processed: 800000/1000000
Processed: 900000/1000000
Processed: 1000000/1000000
```

##### Top 10 Longest Collatz Sequences

1. Collatz sequence for 837799: 524 steps, Largest value: 2974984576

2. Collatz sequence for 626331: 508 steps, Largest value: 7222283188
3. Collatz sequence for 939497: 506 steps, Largest value: 939497
4. Collatz sequence for 704623: 503 steps, Largest value: 704623
5. Collatz sequence for 910107: 475 steps, Largest value: 34987624
6. Collatz sequence for 927003: 475 steps, Largest value: 4280566984
7. Collatz sequence for 511935: 469 steps, Largest value: 13120360
8. Collatz sequence for 767903: 467 steps, Largest value: 767903
9. Collatz sequence for 796095: 467 steps, Largest value: 392181316
10. Collatz sequence for 970599: 457 steps, Largest value: 125931832

Execution Time: 1.7 seconds.

#### Question 5: Extra Credit Detector

List of prime numbers of 10000

```
{  
  'start': 1739055305.096745,  
  'end': 1739055305.097744,  
  'time efficiency': 0.000999  
  'result': [2, 3, 5, 7, 11, 13, 17, 19, 23, 29, '...', 9887, 9901, 9907, 9923, 9929,  
9931, 9941, 9949, 9967, 9973]  
}
```

Found 1229 prime numbers.