Mikayla Johnson
Data Structures
Spring 2023

# Homework 1

Repository link: https://github.com/mikajohn4319/f23csci2114hw1MJohnson

**Question 1:**

1. Output results

```
deDetailsInExceptionMessages' '-cp' 'C:\Users\mikay\Dc
Yolo!
PS C:\Users\mikay\Documents\ClassFall2023\Homework1>
```

**Question 2:**

1. Array results

```
Welcome to Fibonacci generator!
Input a number:
42
          0          1          1          2          3          5          8
         13         21         34         55         89        144        233
        377        610        987       1597       2584       4181       6765
      10946      17711      28657      46368      75025     121393     196418
     317811     514229     832040    1346269    2178309    3524578    5702887
    9227465   14930352   24157817   39088169   63245986  102334155  165580141
PS C:\Users\mikay\Documents\ClassFall2023\Homework1>
```

**Question 3:**

1. Result for all prime numbers under 100

```
Welcome to Eratosthenes generator!
Input a number:
100
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,
```

2. Result for the five largest prime numbers under 100

```
Welcome to Eratosthenes generator!
Input a number:
100
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,

Five largest numbers:
97, 89, 83, 79, 73,
```

3. Result for the five largest prime numbers under 1048576, and the total duration

```
Five largest numbers:
1048573, 1048571, 1048559, 1048549, 1048517,
Duration 0.19455063333333333
```

4. It can not. I think this is because it takes a significant amount of time and memory to find all of the prime numbers in such a large array. The time complexity of the Sieve of Eratosthenes is O(n log log n), which grows exponentially larger as the range does.

**Question 4:**

1. Results for the first 15 numbers and the last 5 numbers

```
First 15 Numbers:
5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59,
Last five numbers:
4294967189, 4294967197, 4294967231, 4294967279, 4294967291,
```

2. Results for the total duration

```
First 15 Numbers:
5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59,
Last five numbers:
4294967189, 4294967197, 4294967231, 4294967279, 4294967291,
Duration 0.044599758333333336
```

3. The printed numbers are all prime numbers. If we added a 2 to them, they would all be odd numbers. Adding a 3 would make them all even numbers.

**Question 5:**

1. Recovered Plain Text

```
### The Appointment in Samarra
SHEPPEY.  Look 'ere, you ain't come 'ere on my account?

DEATH.  Yes.

SHEPPEY.  You're joking. I thought you'd just come to 'ave a little
chat. I'm sorry, my dear, there's nothing doing to-day. You must call
again some other time.

DEATH.  I'm too busy for that.

SHEPPEY. I don't think that's treating me right. Coming in all
friendly and pleasant. If I'd known what you was after I'd 'ave nipped
off with Cooper when 'e asked me.

DEATH.  That wouldn't have helped you much.

SHEPPEY.  I wish now I'd gone down to the Isle of Sheppey when the
doctor advised it. You wouldn't 'ave thought of looking for me there.

DEATH.  There was a merchant in Bagdad who sent his servant to market
to buy provisions and in a little while the servant came back, white
and trembling, and said, Master, just now when I was in the
market-place I was jostled by a woman in the crowd and when I turned I
saw it was death that jostled me. She looked at me and made a
threatening gesture; now, lend me your horse, and I will ride away
from this city and avoid my fate. I will go to Samarra and there death
will not find me. The merchant lent him his horse, and the servant
mounted it, and he dug his spurs in its flanks and as fast as the
horse could gallop he went. Then the merchant went down to the
market-place and he saw me standing in the crowd and he came to me and
said, Why did you make a threatening gesture to my servant when you
saw him this morning? That was not a threatening gesture, I said, it
was only a start of surprise. I was astonished to see him in Bagdad
for I had an appointment with him tonight in Samarra.

SHEPPEY.  (with a shudder) D'you mean there's no escaping you?

DEATH.  No.

The Death's story is an old Arab fable retold in the 1933 play _Sheppey_.
```

2. The text encryption was 128 bits