Lab Assignment 4
Nested Loops

COL 100

26 March 2021

1 Triangles

Write a C program that takes a positive integer n and prints a triangle like this: (given example for $n = 5$)

```
1
1 2
1 2 3
1 2 3 4
1 2 3 4 5
```

2 Inverted Triangles

Write a C program that takes a positive integer n and prints a triangle like this: (given example for $n = 5$)

```
5 4 3 2 1
4 3 2 1
3 2 1
2 1
1
```

3 Pattern

Write a C program that takes a positive integer n and prints a pattern like this: (given example for $n = 4$)

```
#              #
 ##          ##
  ###      ###
   ########
   ########
  ###      ###
 ##          ##
#              #
```

4 Prime Square

Write a C program that takes a positive integer n and prints the first n^2 prime numbers in a square. (given example for $n = 5$)

```
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
```

Note that its perfectly fine if the output is not exactly a square. It just needs to have n primes in each row.

5 Divisible pairs

Given two positive integers a and b ($a \leq b \leq 1000$), find the number of pairs (i, j) ($a \leq i \leq j \leq b$) such that i divides j. For example:

- Input:

  ```
  1 10
  ```

  Output:

  ```
  27
  ```

- Input:

  ```
  1 1000
  ```

  Output:

  ```
  7069
  ```

6 Non-coprimes

Given two positive integers a and b ($a \leq b \leq 1000$), find the number of pairs (i, j) ($a \leq i \leq j \leq b$) such that $gcd(i, j) > 1$. For example:

- Input:

  ```
  1 10
  ```

  Output:

  ```
  23
  ```

- Input:

  ```
  1 1000
  ```

Output:

```
196308
```

7 Playing with digits

For any positive integer x, define:

- $sumD(x)$ = sum of digits of x.

- $numD(x)$ = number of positive integers $\leq x$ that are divisible by $sumD(x)$.

Given a positive integer $n(n \leq 1000)$, let $F(n) = \sum_{x=1}^{n}(numD(x))$. Write a C program that takes a positive integer n and prints $F(n)$. For example:

- Input:

```
10
```

  Output:

```
19
```

- Input:

```
1000
```

  Output:

```
37570
```

8 Sum of squares

Given a positive integer n ($n \leq 100$), find the number of positive integers less than or equal to n, that are expressible as sum of squares of two (not necessarily distinct) non-negative integers a and b. For example:

- Input:

```
5
```

  Output:

```
4
```

  as $1 = 0^2 + 1^2, 2 = 1^2 + 1^2, 4 = 0^2 + 2^2, 5 = 1^2 + 2^2$.

- Input:

```
50
```

  Output:

```
24
```

Submission and other logistics

Submit at least 4 code solutions(.c files of 4 questions) as a zip file on Gradescope (to your respective group's course). Additionally, add screenshots in the same submission showing the execution of your code on your terminal with outputs for some given inputs. Submit only one .c file for each question. Use separate .c files for each new question. Please name your .c files as per the question number (q1.c, q2.c, ... etc). Following this naming convention will help TAs to figure out where to look the answers easily. You can also submit more than 4 or all questions to increase your chances of full marks.

Example: To zip folder 'a4' as 'a4.zip':

```
zip -r a4.zip a4
```

It is highly **recommended** that you name the code files and variables in those code files with proper names as per the question to easily identify them. Comments in your codes are also highly **encouraged** and makes life easier for everyone.
You can check **2nd Chapter** in NASA's C style guide for styling recommendations

You can work either individually or with another student of your group for the assignment.
only one submission on gradescope is enough for a team but you need to **add your teammate** on gradescope after submission.
Follow these steps for adding your team member
Note: you can change your team for future assignments