Name Student ID

ITS100 Lab Midterm Quiz 1/2019

Q1

Write a program to take time as input in H:M:S format where H is an integer denoting the hour, M is an integer denoting the minute, and S is an integer denoting the second. The value of H is between 00 and 23 inclusive. The value of M is between 00 and 59 inclusive. The value of S is between 00 and 59 inclusive. The program then converts the time into the number of seconds since the beginning of the day. The program must output "Invalid time" when the values of H, M and S are not in the valid ranges.

Note that one hour has 60 minutes, and one minutes has 60 seconds.

Example 1 (user inputs are in *italics*)

```
Input: 00:00:00
The number of seconds = 0
```

Example 2 (user inputs are in *italics*)

```
Input: 59:01:00
Invalid time
```

Example 3 (user inputs are in *italics*)

```
Input: 12:12:-60
Invalid time
```

Example 4 (user inputs are in *italics*)

```
Input: 1:00:01
The number of seconds = 3601
```

Example 5 (user inputs are in *italics*)

```
Input: 23:59:59
The number of seconds = 86399
```

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Q2

Write a program to take a position integer (N) as an input. The value of N is between 1 and 15 inclusive. The program then prints an upper triangular matrix with N rows and N columns in the tab-separated format. The top left entry is 1, and the entries increases by 1 when we go from left to right, and they continue on the next rows. All entries of below the main diagonal of the matrix are 0.

The program outputs "Invalid input" when N is not valid.

Use `print(x, end="\t")` to print the value of variable `x` followed by a tab.

Example 1 (user inputs are in *italics*)

```
Input: 1
1
```

Example 2 (user inputs are in *italics*)

```
Input: 2
1    2
0    3
```

Example 3 (user inputs are in *italics*)

```
Input: 5
1    2    3    4    5
0    6    7    8    9
0    0    10   11   12
0    0    0    13   14
0    0    0    0    15
```

Example 4 (user inputs are in *italics*)

```
Input: -1
Invalid input
```

Example 5 (user inputs are in *italics*)

```
Input: 21
Invalid input
```

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Q3

Write a program for a buffet restaurant that takes two inputs. The inputs are the number of customers and a discount code (On-top discount). The program then calculates a subtotal price and a total price as the outputs. The total for each step is calculated from each table below. Note here that all the prices are formatting with “%.2f”.

A restaurant is setting up a promotion as the following table (the output after applying this promotion is a subtotal price):

Number of customers	Price per person
1-3	399 Baht
4-6	499 Baht
More than 6	599 Baht

A restaurant is setting up a discount code (On-top discount) as the following table (the output after applying this discount code is a total price):
*Only the match discount code with a case sensitive is used.

Discount code	On-top discount
CASH	5%
BIRTHDAY	10%
COVID	30%

Example 1 (user inputs are in *italics*)

```
Input (Number of customers): 1
Input (Discount code):
1 person x 399.00 baht
A subtotal price is 399.00 baht
On-top discount 0%
A total price is 399.00 baht
```

Example 2 (user inputs are in *italics*)

```
Input (Number of customers): 5
Input (Discount code): COVID
5 person x 499.00 baht
A subtotal price is 2495.00 baht
On-top discount 30%
A total price is 1746.50 baht
```

Example 3 (user inputs are in *italics*)

```
Input (Number of customers): 7
Input (Discount code): CASH
7 person x 599.00 baht
A subtotal price is 4193.00 baht
On-top discount 5%
A total price is 3983.35 baht
```

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Q4

Write a program that takes three inputs. The inputs are a width, a height, and a border thickness. The program then generated a rectangle filling with space, while the border is a random pattern concerning the border thickness. The width and the height inputs are the size of the rectangle, including the border. The border of the rectangle must be randomly generated. The border pattern is composed of characters randomly from "#" or "*" or "$".

Example 1 (user inputs are in *italics*)

```
Rectangle width: 3
Rectangle height: 3
Border thickness: 1
#$#
* #
#*#
```

Example 2 (user inputs are in *italics*)

```
Rectangle width: 20
Rectangle height: 6
Border thickness: 2
#**#**$*#**#$*#*$$*#
$*$*##*$$####*#*$$#$
$*                 *#
*#                 ##
$#*$#***$#$$$#***$**
$*$#$###$##*$**$$#$*
```

Example 3 (user inputs are in *italics*)

```
Rectangle width: 10
Rectangle height: 4
Border thickness: 3
*#*#$$*#*#
$##$$#$$*#
**#$$###$$
#$#***$$$*
```

Example 4 (user inputs are in *italics*)

```
Rectangle width: 15
Rectangle height: 7
Border thickness: 3
$$$$$*#$*####*
*#$##$###$###**
****$**$##**$*#
$##         *$$
#**#*##$####$$$
*$#*$##*##*$*##
#**#*##*#$***##
```

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Q9

Write a program that accepts speed (v) in mph, distance (d) in miles, and output format (either 'D' or 'M') as inputs. Then, the program calculates the travel time (t) for the given speed and distance where t = d/v.

When the user specifies the output format as 'D', the program displays the travel time in decimal hour format using `%.2f`. When the user specifies the output format as 'M', the program displays the travel time in hour and minute format.

The program displays "Invalid input" when the speed or the distance is not positive integers, or the output format is neither 'D' nor 'M'.

Example 1 (user inputs are in *italics*)

```
Enter speed in mph: 75
Enter distance in miles: 597
Enter output format (D or M): D
At 75 mph, it will take
7.96 hours to travel 597 miles.
```

Example 2 (user inputs are in *italics*)

```
Enter speed in mph: 50
Enter distance in miles: 475
Enter output format (D or M): M
At 50 mph, it will take
9 hours and 30 minutes to travel 475 miles.
```

Example 3 (user inputs are in *italics*)

```
Enter speed in mph: 56
Enter distance in miles: 174
Enter output format (D or M): t
Invalid input
```

Example 4 (user inputs are in *italics*)

```
Enter speed in mph: -1
Invalid input
```

Example 5 (user inputs are in *italics*)

```
Enter speed in mph: 55
Enter distance in miles: sixteen
Invalid input
```

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Q10

Write a program to test the DNA by giving some string DNA containing the letters A, C, G, or T, representing the bases that make up DNA. The question is how many times does a certain base occur in the DNA string? For example, if DNA is ATGGCATTA and we ask how many times the base A occur in this string, the answer is 3 (in a format shown in examples below). If input of DNA or base is number, the system must show "This is not DNA String" and terminate the program.

Example 1 (user inputs are in *italics*)

```
DNA: ATGGCATTA
base: A
c: A
True if test
c: T
c: G
c: G
c: C
c: A
True if test
c: T
c: T
c: A
True if test
There are 3 times that the base A occur in this DNA.
```

Example 2 (user inputs are in *italics*)

```
DNA: TAGCCTAGC
base: C
c: T
c: A
c: G
c: C
True if test
c: C
True if test
c: T
c: A
c: G
c: C
True if test
There are 3 times that the base C occur in this DNA.
```

Example 3 (user inputs are in *italics*)

```
DNA: TAGCCTAGC
base: 3
This is not DNA String
```

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Q11

Write a program to check whether three floating point numbers a, b, c given by the user could be edge lengths of a triangle, by checking two conditions:

- a, b, c must all be positive.
- The biggest must be smaller than the sum of the other twos. For example, if a is the biggest, then a < b + c.

If the user fails to give three numbers, then the program prints out "`Some input is not a number`".

Example 1 (user inputs are in *italics*)

```
Input: a=? 1
Input: b=? 1
Input: c=? 1
Output: Form a triangle
```

Example 2 (user inputs are in *italics*)

```
Input: a=? 1
Input: b=? 1
Input: c=? 3
Output: Can't form a triangle
```

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Q12

Write a program to print out all characters between two characters given by the user. Consider only English alphabet in lower case: abcdefghijklmnopqrstuvwxyz

If the user fails to give two characters, then the program prints out "`You need to input two characters`".

We can use comparison operators (e.g. >, <) to compare two characters. For example, when `x='a'` and `y='t'`, an expression `x > y` is `False` but and expression `x < y` is `True`.

Example 1 (user inputs are in *italics*)

```
Give me a character: a
Give me another character: c
Output:
abc
```

Example 2 (user inputs are in *italics*)

```
Give me a character: d
Give me another character: a
Output:
abcd
```

Example 3 (user inputs are in *italics*)

```
Give me a character: 0
Give me another character: a
Output:
You need to input two characters.
```