Laboratory Assignment 2

Problem 1 - Fahrenheit - Celsius conversion [7 pts]

Ask for a Fahrenheit degree from the user, then convert to Celsius and return the result as a float.

- `inputs : input = { x: x ∈ R and 200.0 ≥ x ≥ -100.0}`
- `output : float (with epsilon = 1E-9)`

```
>>>
Enter Fahrenheit degree: 68
20.0
```

Problem 2 - Celsius - Fahrenheit conversion [7 pts]

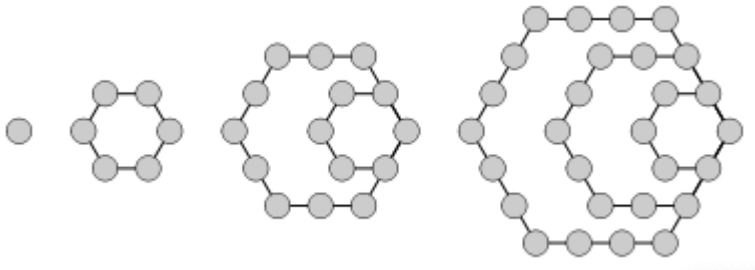
Ask for a Celsius degree from the user, then convert to Fahrenheit and return the result as a float.

- `inputs : input = { x: x ∈ R and 100.0 ≥ x ≥ -100.0}`
- `output : float (with epsilon = 1E-9)`

```
>>>
Enter Celsius degree: 20
68.0
```

Problem 3 - Hexagonal number [8 pts]

The nth hexagonal number h_n is the number of distinct dots in a pattern of dots consisting of the outlines of regular hexagons with sides up to n dots, when the hexagons are overlaid so that they share one vertex. [1]



The formula for the *n*th hexagonal number is given as:

$$h_n = 2n^2 - n$$

Ask for a number from the user. Calculate and return the hexagonal number that corresponds to that number. As an example, first 7 hexagonal numbers are: 1, 6, 15, 28, 45, 66, 91

- `inputs : input = {x: x ∈ ℕ and 1E6 ≥ x ≥ 1}`
- `output : integer`

```
>>>
Enter a number: 1
1

>>>
Enter a number: 6
66
```

Problem 4 - Lucas number [15 pts]

Each Lucas number is defined to be the sum of its two immediate previous terms and the first two Lucas numbers are L(0) = 2, and L(1) = 1 as shown below. [2]

$$L_n := \begin{cases} 2 & \text{if } n = 0; \\ 1 & \text{if } n = 1; \\ L_{n-1} + L_{n-2} & \text{if } n > 1. \end{cases}$$

Ask for a number from the user. Calculate and return the lucas number that corresponds to that number starting with index 0. As an example, first 7 Lucas numbers are: 2, 1, 3, 4, 7, 11, 18

- inputs : input = {x: x ∈ ℕ and 1E6 ≥ x ≥ 0}
- output : integer

```
>>>
Enter a number: 0
2

>>>
Enter a number: 6
18
```

Problem 5 - Reversing a string [5 pts]

Ask for an input string from the user and return the reverse of it.

- inputs : input ∈ {x: printable characters except whitespaces and len(x) ∈ [1, 100]}.
- output : string

```
>>>
Enter a string: Inf211
112fnI
```

Problem 6 - Removing unwanted printable characters [13 pts]

Ask for an input string from the user and return the string with **only letters and numbers** in the **entered order.**

- Unwanted printable characters that should be removed are:
  `!"#$%&\'()*+,-./:;<=>?@[\\]^_`{|}~`

- Note that the string can include " or ' characters, so take necessary precautions.
- `inputs : input = {x: x ∈ printable characters except whitespaces and len(x) ∈ [1, 100]}.`
- `output : string`

```
>>>
Enter a string: :I!n#f21@1;,
Inf211

>>>
Enter a string: :I!n'"#f"2%$/1@1;,.
Inf211
```

Problem 7 - Base 4 representation [15 pts]

Base 4 is a number system that represents a given number using the {0, 1, 2, 3} set.

Ask for an integer from the user, then return the base 4 representation of that number as a string.

- There should be no leading zeros for any credit: i.e: it should return "123" instead of "00123".
- If the number is negative, prepend a minus sign (-) to the string.
- `inputs: input = {x: x ∈ ℤ and 1E6 ≥ x ≥ -1E6}`
- `output: string`

```
>>>
Enter input: 14
32

Explanation: 3 * 4**1 + 2 * 4**0 = 14

>>>
Enter input: -14
-32

>>>
Enter input: 27
123

Explanation: 1 * 4**2 + 2 * 4**1 + 3 * 4**0 = 27

>>>
Enter input: -27
-123
```

Problem 8 - Valid brackets [17 pts]

Ask for an input from the user containing only parentheses. Then return if the parentheses are actually in correct order (or it is valid).

- The parentheses are valid if open brackets closed by the same type of brackets and open brackets closed in the correct order.
- inputs: input = {x: x ∈ "{,},(,),[,]" and len(x) ∈ [1, 100]}
- output: boolean

```
>>>
Enter input: {}
True

>>>
Enter input: {}{}[]
True

>>>
Enter input: [{}]
True

>>>
Enter input: {([])}[]
True

>>>
Enter input: {(})
False

Explanation: After {( expression, first ( should be closed with ), then }.

>>>
Enter input: [)
False

Explanation: After [, it should be closed with ].

>>>
Enter input: [()
False

Explanation: First [ is never closed.
```

Problem 9 - Last word length [13 pts]

Ask for a string input from the user, then find the length of the last word in the string. Return the length.

- inputs: input = {x: x ∈ All English letters and space, and len(x) ∈ [1, 200]}.
- output: integer

```
>>>
Enter a string: There are no secrets to success It is the result of preparation hard work and learning from failure
7

Explanation: Last word is "failure" and its length is 7.

>>>
Enter a string: The way to get started is to quit talking and begin doing
5

Explanation: Last word is "doing" and its length is 5.

>>>
Enter a string: Geronimo
8

Explanation: Last word is "Geronimo" and its length is 8.
```

[1] https://en.wikipedia.org/wiki/Hexagonal_number
[2] https://en.wikipedia.org/wiki/Lucas_number