# CS 115 - Introduction to Programming in Python

## Lab 05

**Lab Objectives:** Tuples, Lists, Dictionaries

**Notes:**

1. Upload your solutions as **a single .zip file** to the Lab05 assignment for your section on Moodle **by 17:30 on Friday, November 6**. You must use the following naming convention: Lab05_Surname_FirstName.zip where Surname is your family name and FirstName is your first name.
2. Solutions sent through email after the due date will not be accepted.
3. You should only use functionality covered in CS115 in your solution.
4. Include a docstring for your functions.

**1.** Write a function called **estimateE** that takes an integer value n as input and calculates each element of the following series and returns a tuple holding the values:

$$1 + \frac{1}{1!} + \frac{1}{2!} + \frac{1}{3!} \quad \ldots\ldots \quad + \frac{1}{n!}$$

Write a script **(`Lab5Q1.py`)** to input a number (n) from the user. Call the **estimateE** function on the number and print out the tuple and also the difference between the estimated value of e and the real value.

**Sample Runs:**

```
Enter the value of n: 6
E =  + 1 + 1.0 + 0.5 + 0.16666666666666666 + 0.041666666666666664 +
0.008333333333333333 + 0.001388888888888889
Estimated Value:  2.7180555555555554
Error =  0.0002262729034896438

Enter the value of n: 3
E =  + 1 + 1.0 + 0.5 + 0.16666666666666666
Estimated Value:  2.6666666666666665
Error =  0.05161516179237857
```

**2.** a) Write a function **separate** which gets a list of mixed types and returns a dictionary of each different type as **keys** and the list of elements of that type as a **value**.

b) Write a script **(`Lab5Q2.py`)** to initialize a list of mixed types (int, float,string boolean) and display the list of elements of each type in the dictionary created by the **separate** function.

**Sample Run:**

Original List = [2, 3.75, False, 'Today', 'CS115', 6, 1.5, 4.0, 'python', True, 25, 1.9]

<class 'int'> -> [2, 6, 25]
<class 'float'> -> [3.75, 1.5, 4.0, 1.9]
<class 'bool'> -> [False, True]
<class 'str'> -> ['Today', 'CS115', 'python']

**3.** In `words.txt` file, each line contains a word and an integer position of that word in the sentence separated by a single space.

a) Write a function `form` which reads the words and their positions from the file into two parallel lists `words` and `numbers` and then forms a sentence by concatenating the words in the words list according their positions in `numbers` list in ascending order.

b) Write a script **(`Lab5Q3.py`)** to call the above form function for the list of words in words.txt and display the formed sentence.

**Sample Run:**

A book is the best friend in life