Problem Set #1 (BDAT 1004)

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June 10, 2021

Please note, there is an issue with running C# in this Jupyter Notebook. Please run the C# codes in Visual Studio. Python works fine - thank you!

Question 1 C#

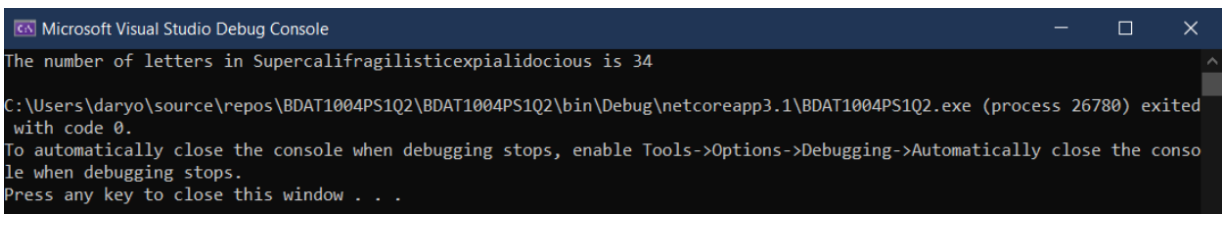
What data type is each of the following?

Question	Data type
5	int
5.0	float
5 > 1	boolean
'5'	string
5 * 2	int
'5' * 2	int (ASCII code of 5 is 53 and multiplied by 2 = 106)
'5' + '2'	string (5 concatenated with 2 = '52' as a string)
5 / 2	float
5 % 2	int
{5, 2, 1}	array
5 == 3	boolean
Pi (the number)	double

Question 2a C#

How many letters are there in 'Supercalifragilisticexpialidocious' ?

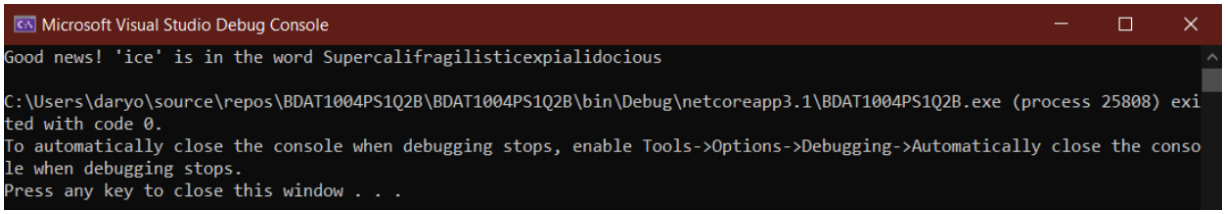
In [ ]:
```
using System;

namespace BDAT1004PS1Q2
{
    class Program
    {
        static void Main(string[] args)
        {
            string myString = "Supercalifragilisticexpialidocious";
            # count the number of letters in the string
            int l = myString.Length;
            Console.WriteLine("The number of letters in " + myString + " is " + l);
        }
    }
```



Question 2b C#

Does 'Supercalifragilisticexpialidocious' contain 'ice' as a substring?

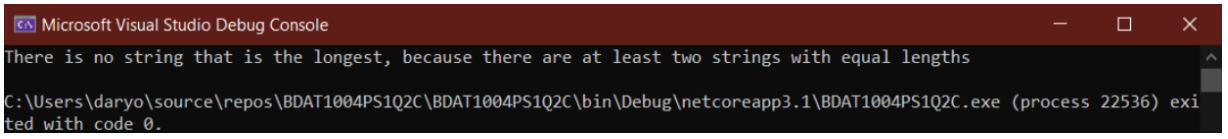
In [ ]:
```
using System;

namespace BDAT1004PS1Q2B
{
    class Program
    {
        static void Main(string[] args)
        {
            string myString = "Supercalifragilisticexpialidocious";
            # determine if "ice" is found in the string, program will output the result acc
            if (myString.Contains("ice") == true)
            {
                Console.WriteLine("Good news! 'ice' is in the word " + myString);
            }
            else
            {
                Console.WriteLine("Sorry! 'ice' is not in the word " + myString);
            }
        }
    }
```



Question 2c C#

Which of the following words is the longest:
Supercalifragilisticexpialidocious, Honorificabilitudinitatibus, or Bababadalgharaghtakamminarronnkonn?

In [ ]:
```
using System;

namespace BDAT1004PS1Q2C
{
    class Program
    {
        static void Main(string[] args)
        {
            # this is a trick question, because s1 and s3 both have equal lengths. But my pi
            # if either string has less letters, then the program will show the other strin

            string s1 = "Supercalifragilisticexpialidocious";
            string s2 = "Honorificabilitudinitatibus";
            string s3 = "Bababadalgharaghtakamminarronnkons";

            int l1 = s1.Length;
            int l2 = s2.Length;
            int l3 = s3.Length;

            # comparing each string with one another
            if (l1 > l2 & l1 > l3)
                Console.WriteLine("{0} is the longest", "Supercalifragilisticexpialidocious'
            else if (l2 > l1 & l2 > l3)
                Console.WriteLine("{0} is the longest", "Honorificabilitudinitatibus");
            else if (l3 > l1 & l3 > l2)
                Console.WriteLine("{0} is the longest", "Bababadalgharaghtakamminarronnkonn'
            else if (l1 == l2 || l1 == l3)
                Console.WriteLine("There is no string that is the longest, because there are
        }
    }
}
```



```
To automatically close the console when debugging stops, enable Tools->Options->Debugging->Automatically close the conso
le when debugging stops.
Press any key to close this window . . .
```

Question 2d C#

Which composer comes first in the dictionary: 'Berlioz', 'Borodin', 'Brian', 'Bartok', 'Bellini', 'Buxtehude', 'Bernstein'. Which one comes last ?

In [ ]:
```
using System;

namespace BDAT1004PS1Q2D
{
    class Program
    {
        static void Main(string[] args)
        {
            string[] composer = { "Berlioz", "Borodin", "Brian", "Bartok", "Bellini", "Buxte

            # initially, it's safe to assume that our first and last words in the dictionary
            # first element in the "composer" array which is "Berlioz"
            string first = composer[0], last = composer[0];

            # in the for loop, it will compare the other elements with the first and last e
            # one will be the first and last words in our dictionary
            for (int j = 0; j <composer.Length; j++)
            {
                int result_1 = first.CompareTo(composer[j]);
                int result_2 = last.CompareTo(composer[j]);

                # when comparing, if the result equals to 0 it means both composer elements
                # equals to 1, this means the first composer element is greater than the se
                # equals to -1, then the second composer element is greater than the first

                if (result_1 == 1)
                    first = composer[j];
                if (result_2 == -1)
                    last = composer[j];
            }
            Console.WriteLine("First composer in the dictionary is: " + first);
            Console.WriteLine("Last composer in the dictionary is: " + last);
        }
    }
```

```
Microsoft Visual Studio Debug Console
First composer in the dictionary is: Bartok
Last composer in the dictionary is: Buxtehude

C:\Users\daryo\source\repos\BDAT1004PS1Q2D\BDAT1004PS1Q2D\bin\Debug\netcoreapp3.1\BDAT1004PS1Q2D.exe (process 27784) exi
ted with code 0.
To automatically close the console when debugging stops, enable Tools->Options->Debugging->Automatically close the conso
le when debugging stops.
Press any key to close this window . . .
```

Question 3 C#

Implement function triangleArea(a,b,c) that takes as input the lengths of the 3 sides of a triangle and returns the area of the triangle. By Heron's formula, the area of a triangle with side lengths a, b, and c is
s(s - a)(s -b)(s -c), where s = (a + b + c) /2.
>>> triangleArea(2,2,2)
1.7320508075688772

In [ ]:
```
using System;

namespace BDAT1004PS1Q3
{
    class Program
    {
        public static double triangleArea (double a, double b, double c)
        {
```

```
            # using the Heron's formula
            double s = (a + b + c) / 2;
            double area = Math.Sqrt(s * (s - a) * (s - b) * (s - c));
            return area;
        }
        static void Main(string[] args)
        {
            double a, b, c;

            # ask the user to input a number for each side of the triangle
            Console.WriteLine("Enter triangle side #1");
            a = double.Parse(Console.ReadLine());

            Console.WriteLine("Enter triangle side #2");
            b = double.Parse(Console.ReadLine());

            Console.WriteLine("Enter triangle side #3");
            c = double.Parse(Console.ReadLine());

            double area = triangleArea(a, b, c);
            Console.WriteLine(area);
        }
    }
```

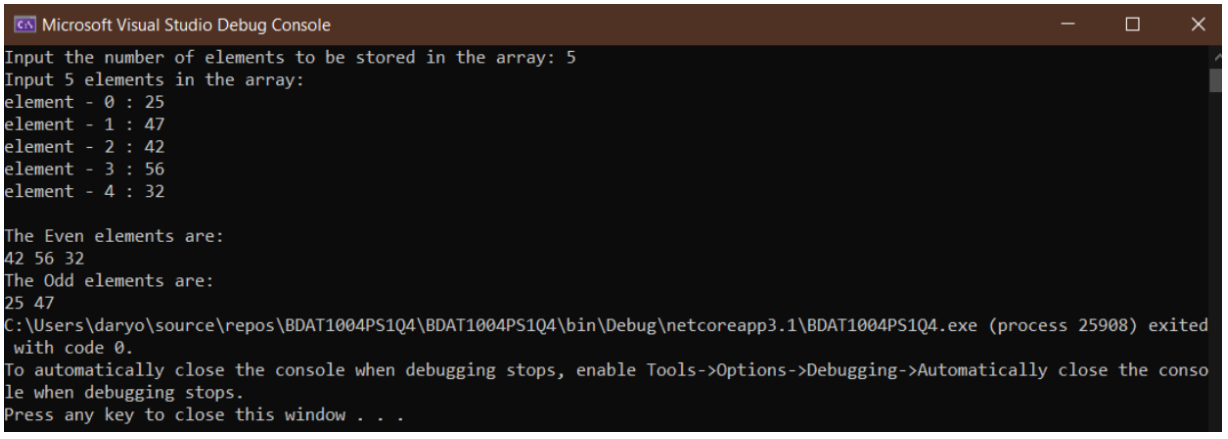
```
Microsoft Visual Studio Debug Console
Enter triangle side #1
2
Enter triangle side #2
2
Enter triangle side #3
2
1.7320508075688772

C:\Users\daryo\source\repos\BDAT1004PS1Q3\BDAT1004PS1Q3\bin\Debug\netcoreapp3.1\BDAT1004PS1Q3.exe (process 28076) exited
 with code 0.
To automatically close the console when debugging stops, enable Tools->Options->Debugging->Automatically close the conso
le when debugging stops.
Press any key to close this window . . .
```

Question 4 C#

Write a program in C# Sharp to separate odd and even integers in separate arrays.
Go to the editor
Test Data :
Input the number of elements to be stored in the array :5
Input 5 elements in the array :
element - 0 : 25
element - 1 : 47
element - 2 : 42
element - 3 : 56
element - 4 : 32
Expected Output:
The Even elements are:
42 56 32
The Odd elements are :
25 47

In [ ]:
```
using System;

namespace BDAT1004PS1Q4
{
    class Program
    {
        static void Main(string[] args)
        {
            # three arrays are defined which the user can use, even = even numbers, odd = od
            # the user's elements
            int[] arr = new int[8];
            int[] even = new int[8];
            int[] odd = new int[8];
            int i, j = 0, k = 0, n;

            # ask the user for the number of elements they want to have in the array
```

```
            Console.Write("Input the number of elements to be stored in the array: ");
            n = Convert.ToInt32(Console.ReadLine());

            Console.Write("Input {0} elements in the array: \n", n);
            for (i = 0; i < n; i++)
            {
                # ask the user to enter an integer for each element
                Console.Write("element - {0} : ", i);
                arr[i] = Convert.ToInt32(Console.ReadLine());
            }

            # in this for loop, it will test each element to determine whether they are even
            for (i = 0; i < n; i++)
            {
                if (arr[i] % 2 == 0)
                {
                    even[j] = arr[i];
                    j++;
                }
                else
                {
                    odd[k] = arr[i];
                    k++;
                }
            }

            # the results are determined here and displayed to the user based on the even o
            Console.Write("\nThe Even elements are: \n");
            for (i = 0; i < j; i++)
            {
                Console.Write(even[i]+" ");
            }

            Console.Write("\nThe Odd elements are: \n");
            for (i = 0; i < k; i++)
            {
                Console.Write(odd[i]+" ");
            }
        }
    }
```

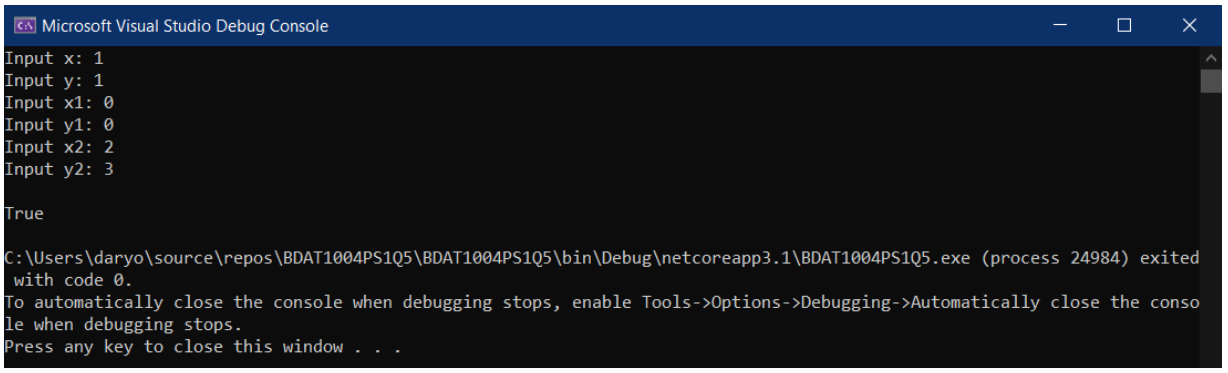


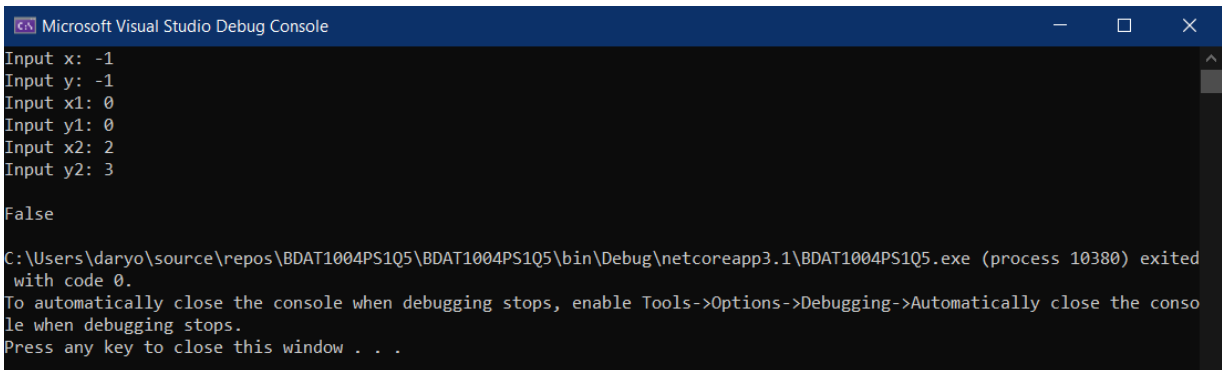
Question 5 C#

Write a function inside(x, y, x1, y1, x2, y2) that returns True or False depending on whether the point(x, y) lies in the rectangle with lower left corner(x1, y1) and upper right corner(x2, y2).

In [ ]:
```
using System;

namespace BDAT1004PS1Q5
{
    class Program
    {
        public static bool inside(int x, int y, int x1, int y1, int x2, int y2)
        {
            # it's safe to assume that the boolean variable called "flag" has a False initi
            # a few tests
```

```
            bool flag = false;
            if ((x >= x1) && (x <= x2) && (y >= y1) && (y <= y2))
                flag = true;

            return flag;
        }
        static void Main(string[] args)
        {

            # ask the user to type the input integer for each variable
            string x, y, x1, y1, x2, y2;

            Console.Write("Input x: ");
            x = Console.ReadLine();
            Console.Write("Input y: ");
            y = Console.ReadLine();
            Console.Write("Input x1: ");
            x1 = Console.ReadLine();
            Console.Write("Input y1: ");
            y1 = Console.ReadLine();
            Console.Write("Input x2: ");
            x2 = Console.ReadLine();
            Console.Write("Input y2: ");
            y2 = Console.ReadLine();

            # this will call the function "inside" and pass the values of each variable to
            bool l = inside(Convert.ToInt32(x), Convert.ToInt32(y), Convert.ToInt32(x1), Co

            # this will display the result from the function "inside"
            Console.WriteLine("\n" + l);
        }
    }
}
```





Question 6 Python

You can turn a word into pig-Latin using the following two rules (simplified):
• If the word starts with a consonant, move that letter to the end and append 'ay'. For example, 'happy' becomes 'appyhay' and 'pencil' becomes 'encilpay'.
• If the word starts with a vowel, simply append 'way' to the end of the word. For example, 'enter' becomes 'enterway' and 'other' becomes 'otherway' . For our purposes, there are 5 vowels: a, e, i, o, u (so we count y as a consonant).
Write a function pig() that takes a word (i.e., a string) as input and returns its pig-Latin form. Your function should still work if the input word contains upper case characters. Your output should always be lower case however.

In [2]:
```
# Question 6 Python (DONE)

print("Welcome to the fun pig-latin language game!")

# prompt for a phrase and assign the result to a variable
word = input("Please enter your word: ")

def pig(word):
    # create a list with the vowels to look into
    vowels = ["a", "e", "i", "o", "u"]

    word = word.lower()

    if word[0] in vowels:
        print(word + "way")

    else:
        a = word.split(word[0])
        print(a[1] + word[0] + "ay")
```

```
Welcome to the fun pig-latin language game!
Please enter your word: happy
appyhay
```

Question 7 Python

File bloodtype1.txt records blood-types of patients (A, B, AB, O or OO) at a clinic.
Write a function bldcount() that reads the file with name name and reports (i.e., prints) how many patients there are in each bloodtype.
>>> bldcount('bloodtype.txt')
There are 10 patients of blood type A.
There is one patient of blood type B.
There are 10 patients of blood type AB.
There are 12 patients of blood type O.
There are no patients of blood type OO.

In [3]:
```
# Question 7 Python (DONE)

# open the file
name = open("bloodtype1.txt", "r")
blood_list_1 = []
blood_list_2 = []

def bldcount(name):

    # this is the initial value of each blood type
    a = 0
    b = 0
    ab = 0
    o = 0
    oo = 0

    # in this for loop, the information from the file is read per line and added to blood_l
    for line in name:
        blood_list_1 = line.split()
        # in this for loop, the blood types are detected and appended to blood_list_2
        for blood_type in blood_list_1:
            blood_list_2.append(blood_type)

    # in this for loop, based on each blood type, they are counted
    for blood_type in blood_list_2:
        if blood_type == "A":
            a = a + 1
        elif blood_type == "B":
            b = b + 1
        elif blood_type == "AB":
            ab = ab + 1
        elif blood_type == "O":
            o = o + 1
        elif blood_type == "OO":
```

```
            oo = oo + 1

    # depending on the count of a particular blood type, the printed message will display e
    # patient, or more. The codes will also display "no" instead of "0" and "one" instead o
    if a == 0:
        print("There are no patients of blood type A.")
    elif a == 1:
        print("There is one patient of blood type A.")
    else:
        print("There are " + str(a)+ " patients of blood type A.")

    if b == 0:
        print("There are no patients of blood type B.")
    elif b == 1:
        print("There is one patient of blood type B.")
    else:
        print("There are " + str(b)+ " patients of blood type B.")

    if ab == 0:
        print("There are no patients of blood type AB.")
    elif ab == 1:
        print("There is one patient of blood type AB.")
    else:
        print("There are " + str(ab)+ " patients of blood type AB.")

    if o == 0:
        print("There are no patients of blood type O.")
    elif o == 1:
        print("There is one patient of blood type O.")
    else:
        print("There are " + str(o)+ " patients of blood type O.")

    if oo == 0:
        print("There are no patients of blood type OO.")
    elif oo == 1:
        print("There is one patient of blood type OO.")
    else:
        print("There are " + str(oo)+ " patients of blood type OO.")

# the function "bldcount" is called and will display the count of each blood type
```

```
There are 15 patients of blood type A.
There is one patient of blood type B.
There are 13 patients of blood type AB.
There are 15 patients of blood type O.
There are no patients of blood type OO.
```

Question 8 Python

Write a function curconv() that takes as input:
1. a currency represented using a string (e.g., 'JPY' for the Japanese Yen or 'EUR' for the Euro)
2. an amount and then converts and returns the amount in US dollars.
>>> curconv('EUR', 100)
122.96544
>>> curconv('JPY', 100)
1.241401
The currency rates you will need are stored in file currencies.txt

In [4]:
```
# Question 8 Python (DONE)

# list of currencies and their represented short names
AUD = "Australian Dollar"
CHF = "Swiss Franc"
CNY = "Chinese Yuan"
DKK = "Danish Krone"
EUR = "Euro"
GBP = "British Pound"
HKD = "Hong Kong Dollar"
INR = "Indian Rupee"
JPY = "Japanese Yen"
MXN = "Mexican Peso"
MYR = "Malaysian Ringgit"
```

```
NOK = "Norwegian Krone"
NZD = "New Zealand Dollar"
PHP = "Philippine Peso"
SEK = "Swedish Krona"
SGD = "Singapore Dollar"
THB = "Thai Baht"

# ask the user for information about what they want to do
print("Welcome to the #1 currency converter on the planet!")
prefcur = input("What is your preferred currency (name or code)? \n")
curconv = input("What is the amount you would like to convert? \n")

# convert each currency depending on the user's input
if (prefcur == "Australian Dollar") or (prefcur == "AUD"):
    curconv = float(curconv) * 1.0345157

elif (prefcur == "Swiss Franc") or (prefcur == "CHF"):
    curconv = float(curconv) * 1.0237414

elif (prefcur == "Chinese Yuan") or (prefcur == "CNY") :
    curconv = float(curconv) * 0.1550176

elif (prefcur == "Danish Krone") or (prefcur == "DKK"):
    curconv = float(curconv) * 0.1651442

elif (prefcur == "Euro") or (prefcur == "EUR"):
    curconv = float(curconv) * 1.2296544

elif (prefcur == "British Pound") or (prefcur == "GBP"):
    curconv = float(curconv) * 1.5550989

elif (prefcur == "Hong Kong Dollar") or (prefcur == "HKD"):
    curconv = float(curconv) * 0.1270207

elif (prefcur == "Indian Rupee") or (prefcur == "INR"):
    curconv = float(curconv) * 0.0177643

elif (prefcur == "Japanese Yen") or (prefcur == "JPY"):
    curconv = float(curconv) * 0.01241401

elif (prefcur == "Mexican Peso") or (prefcur == "MXN"):
    curconv = float(curconv) * 0.0751848

elif (prefcur == "Malaysian Ringgit") or (prefcur == "MYR"):
    curconv = float(curconv) * 0.3145411

elif (prefcur == "Norwegian Krone") or (prefcur == "NOK"):
    curconv = float(curconv) * 0.1677063

elif (prefcur == "New Zealand Dollar") or (prefcur == "NZD"):
    curconv = float(curconv) * 0.8003591

elif (prefcur == "Philippine Peso") or (prefcur == "PHP"):
    curconv = float(curconv) * 0.0233234

elif (prefcur == "Swedish Krona") or (prefcur == "SEK"):
    curconv = float(curconv) * 0.148269

elif (prefcur == "Singapore Dollar") or (prefcur == "SGD"):
    curconv = float(curconv) * 0.788871

elif (prefcur == "Thai Baht") or (prefcur == "THB"):
    curconv = float(curconv) * 0.0313789

print("Your converted currency in USD is: ")

# this will print the converted currency and format it to display the dollar sign
```

```
Welcome to the #1 currency converter on the planet!
What is your preferred currency (name or code)?
EUR
What is the amount you would like to convert?
100
Your converted currency in USD is:
$122.96544
```

Question 9 Python

Each of the following will cause an exception (an error). Identify what type of exception each will cause.

Question and Error Message
9a)Trying to add incompatible variables, as in adding 6 + 'a'
9a)TypeError: unsupported operand type(s) for +: 'int' and 'str'
9b)Referring to the 12th item of a list that has only 10 items
9b)IndexError: list index out of range
9c)Using a value that is out of range for a function's input, such as calling math.sqrt(-1.0)
9c)ValueError: square root of a negative number
9d)Using an undeclared variable, such as print(x) when x has not been defined
9d)NameError: name 'x' is not defined
9e)Trying to open a file that does not exist, such as mistyping the file name or looking in the wrong directory.
9e)FileNotFoundError: [Errno 2] No such file or directory: 'test.txt'

Question 10 Python

Encryption is the process of hiding the meaning of a text by substituting letters in the message with other letters, according to some system. If the process is successful, no one but the intended recipient can understand the encrypted message. Cryptanalysis refers to attempts to undo the encryption, even if some details of the encryption are unknown (for example, if an encrypted message has been intercepted). The first step of cryptanalysis is often to build up a table of letter frequencies in the encrypted text.
Assume that the string letters is already defined as 'abcdefghijklmnopqrstuvwxyz'. Write a function called frequencies() that takes a string as its only parameter, and returns a list of integers, showing the number of times each character appears in the text. Your function may ignore any characters that are not in letters.
>>> frequencies('The quick red fox got bored and went home.')
[1, 1, 1, 3, 5, 1, 1, 2, 1, 0, 1, 0, 1, 2, 4, 0, 1, 2, 0, 2, 1, 0, 1, 1, 0, 0]
>>> frequencies('apple')

In [5]:
```
# ask the user to enter their preferred word or sentence
word = input("Enter a word or sentence: \n")

# create a dictionary called that will be used to locate the frequencies for each character
def frequencies(f):
    dict = {}
    for n in f:
        keys = dict.keys()
        if n in keys:
            dict[n] += 1
        else:
            dict[n] = 1
    return dict
```

```
Enter a word or sentence:
apple
{'a': 1, 'p': 2, 'l': 1, 'e': 1}
```

In [21]:
```
# ask the user to enter either a word or sentence
word = input("Enter a word or sentence: \n")
word = word.replace(" ","")
word = word.lower()

# create a dictionary of all alphabets and assign each to a number
def frequencies(f):
    alphabets = {'a':0, 'b':1, 'c':2, 'd':3, 'e':4, 'f':5, 'g':6, 'h':7,
```

```
                'i':8, 'j':9, 'k':10, 'l':11, 'm':12, 'n':13, 'o':14,
                'p':15, 'q':16, 'r':17, 's':18, 't':19, 'u':20, 'v':21,
                'w':22, 'x':23, 'y':24, 'z':25}
    # create a list of 0s to hold the number of words
    freq_of_letters = [0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0]

    # this will determine where each letter is located for the above
    for letter in f:
        freq_of_letters[alphabets[letter]] += 1
    return freq_of_letters
```

```
Enter a word or sentence:
The quick red fox got bored and went home
[1, 1, 1, 3, 5, 1, 1, 2, 1, 0, 1, 0, 1, 2, 4, 0, 1, 2, 0, 3, 1, 0, 1, 1, 0, 0]
```