**Name: Session:**

**Programming I**

**Lab Exercise 1.5.2022**

1. Pi is a transcendental number. In mathematics, a **transcendental number** is a real or complex number that is not algebraic—that is, it is not a root of a non-zero polynomial equation with rational coefficients. The best-known transcendental numbers are π and *e*. Being an infinite sequence of numbers, you can find all possible names, birthdays, etc. embedded in it. I have provided you the number π to one billion digits. Your task is to write a program to find the location of your name within π. If the name is not found in the first billion digits, report that. Since your name has letters and pi contains numbers, you will have to convert the letters in you name to ASCII values and then build a string out of those ASCII values. It is highly recommended that you use all capital letters in your name as uppercase are all two digit values (65 – 90) and lower case are mostly three digit numbers (97 – 122) which makes for a longer string and less likely to be found.

Modify your program to find your birthday in Pi.

1. Build a Capitals of the World database. There are two files in the folder; capitalFinder.py and capitals.txt. The file capitals.txt contains the names of 196 countries and their capitals. The main program is as follows:

##Read in data from text file

file = open('capitals.txt', 'r')

lines = file.readlines()

print(str(len(lines)) + ' capitals loaded')

##Create country and capitals list

countries = []

capitals = []

##Process each country and capital data

for line in lines:

cap = line.split(' - ')

countries.append(cap[0])

capitals.append(cap[1])

#Create dictionary of countries

countryDict = {}

for i in range(0, len(countries)):

countryDict[i+1] = countries[i]

##Process the query

again = True

while again:

countryNumber = printCountries()

country = countryDict[countryNumber]

print ("Capital of", country, "is", findCapital(country))

repeat = input("Another country? (y/n)")

if repeat == 'n':

again = False

print("Thank you for using Capital Finder Pro")

You will also require 2 additional functions (findCapital and printCountries):

#This function returns the name of the capital of a given country

def findCapital(country):

for i in range(len(countries)):

if countries[i] == country:

return capitals[i]

return "Country not found"

#This function prints the countries in the database

def printCountries():

print("Contries in database")

for i in range(0, len(countries)):

print(i+1, countries[i])

print()

number = int(input("Enter the country number: "))

return number

Modify you program to make it menu driven to allow the user to enter a country number.

When your program is working, submit the output and attach it to this sheet to turn in.

3. Write a secret message generator. You secret message will be encrypted using Caesar Cipher. The key for your Caesar Cipher will be the ASCII value of the sum of the characters in your name. This key should have a value 13 to 127. (Hint: use modular arithmetic to limit your values). Here is a sample output of your program:

Enter a phrase: This is a test

Enter your first name: Frederick

Encrypted message = ËßàêàêØëÜêë

Enter your first name to decrypt: Frederick

Original message = This is a test

When your program is working, print your source code and output. Attach source code and output to this sheet and turn in.