Lambton College | In Toronto

AML-1204
Python Programming in Canada

Assignment

Part-1) The simplest encryption algorithm! (mark 30%)

A Caesar cypher is a weak form of encryption that involves "rotating" each letter by a fixed number of places. To rotate a letter means to shift it through the alphabet, wrapping around to the beginning if necessary, so 'B' rotated by 2 is 'D' and 'Z' rotated by 2 is 'B'. To rotate a word, rotate each letter by the same amount. For example, "cheer" rotated by 7 is "jolly".

Fun fact: In the movie 2001: A Space Odyssey, the ship computer is called HAL, which is IBM rotated by -1.

Write a function called ceaser_cypher that takes a string and an integer as parameters, and returns
a new string that contains the letters from the original string rotated by the given amount.

Hint: You might want to use the built-in function which converts a character to a numeric code, and converts numeric codes to characters.
Constrains: You will need to differentiate between upper and lowercase characters. For example, If A is rotated by, it will become C(upper-case), but if a is rotated by 2, it will become c (lower-case).

Part-2) Binary Search Algorithm Implementation in Python (mark 40%)

Binary search is one of the most common algorithms for finding items in sequential data types such as a list. Here is a good introduction and pseudo-code for this algorithm. Write a function in Python that takes a list of integers, and a specific integer and uses binary search to find if the desired integer is present in the list. If the integer is present, the function will return True, otherwise, it will return False.

https://www.khanacademy.org/computing/computer-science/algorithms/binary-search/a/implementing-binary-search-of-an-array

Part-3) Formula Implementation (mark 30%)

It is important to mention that as Python developers, you will need to convert a lot of mathematical formulas to Python codes. This specific part is dedicated to make sure you are able to just do that!

The mathematician Srinivasa Ramanujan found an infinite series that can be used to generate a numerical approximation of 1/π:

$$\frac{1}{\pi} = \frac{2\sqrt{2}}{9801} \sum_{k=0}^{\infty} \frac{(4k)!(1103 + 26390k)}{(k!)^4 396^{4k}}$$

Write a function called *estimate_pi* that uses this formula to compute and return an estimate of π. It should use a while loop to compute terms of the summation until the last term is smaller than

1e-15, which is Python notation for 10^{-15} .

Hint: To implement factorial, you can use https://docs.python.org/3/library/math.html#math.factorial

Submission Procedure

You need to submit a zip file or rar file (StudentNumber.zip or StudentNumber.rar) that has the following two files in it:

1) **Your python code (StudentNumber_assignment.py) :** in your Python code, use comment to separate your parts. Here is an example

```
# Part-1) The simplest encryption algorithm!

#put your code here

# Part-2) Binary Search Algorithm Implementation in Python

#put your code here

# Part-3) Formula Implementation

#put your code here
```

2) Python Code execution screenshot in a PDF (StudentNumber_assignment.PDF), please make sure you put at least three screenshots (one for each part)

Note: Replace StudentNumber with your student ID. For example, if your student id is C071234567 your compressed file should be called C071234567.zip or C071234567.rar

Deadline: Please refer to the deadline indicated on the assignment page