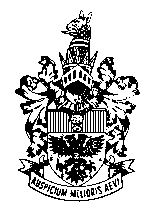
RAFFLES INSTITUTION



Founded 1823

RAFFLES PROGRAMME

Year Two Computer Elective Programme

Mock Paper

Name: ( ) Class: Sec 2 ( ) Date:

1 Basic List & Dictionary [10 marks]

Question 1: Most Common Digit [10 marks]

A. Write a function count\_digits that takes in an integer and returns a dictionary of the number of occurences of each digit. [5 marks]

Sample execution:

>>> count\_digits(1212121)

{1: 4, 2: 3}

>>> count\_digits(1212333)

{1: 2, 2: 2, 3: 3}

>>> count\_digits(12345)

{1: 1, 2: 1, 3: 1, 4: 1, 5: 1}

B. Write a function most\_common\_digit that takes in an integer and returns a list of the most common digits (potentially more than one) in the integer. [5 marks]

Sample execution:

>>> most\_common\_digit(1212121)

[1]

>>> most\_common\_digit(12345)

[1, 2, 3, 4, 5]

>>> most\_common\_digit(12586269025) # fib(50) = 12586269025

[2]

>>> most\_common\_digit(1548008755920) # fib(60) = 1548008755920

[0, 5]

>>> most\_common\_digit(190392490709135) # fib(70) = 190392490709135

[9]

2 Iteration & Recursion [25 marks]

1. Define an iterative function, odds(), that takes a list and returns every other one, starting with the first. [5m]

>>> print(odds([]))

[]

>>> print(odds(['a']))

['a']

>>> print(odds(['a','b']))

['a']

>>> print(odds(['a','b','c']))

['a','c']

>>> print(odds(['a','b','c','d','e','f','g','h']))

['a','c','e','g']

1. Define a recursive function, odds\_r(), that does exactly the same thing as 2a) [5m]
2. Using the function oddsorodds\_r(), write an function evens() that takes a list and returns the elements in even positions, starting with the second element. [5m]

>>> print(evens([]))

[]

>>> print(evens (['a']))

[]

>>> print(evens (['a','b']))

['b']

>>> print(evens (['a','b','c']))

['b']

>>> print(evens (['a','b','c','d','e','f','g','h']))

['b','d','f','h']

1. Write an iterative function, is\_palindrome(), that takes as input a string, and returns a Boolean indicating if the input string is a palindrome. Note: A palindrome is a word / phrase that can be read the same forward or backward. [5m]
2. Write a recursive function, is\_palindrome\_r(), that does exactly the same thing as 2d) [5m]

2 Files, Dictionary, Lists [20 marks]

1. Write a program to process a given textfile, **alice.txt**, by building a histogram of the words in the file. Your function, **process\_file()**, should accept a filename as its input parameter, and returns a dictionary of the each word and its frequency.
   1. Your program should read the textfile, break each line into words, strips whitespace and punctuation from the words, and converts them to lowercase. (Hint: The 'string' module provides strings named 'whitespace', which contains space, tab, newline, etc., and 'punctuation' which contains the punctuation characters.)
   2. Words with hyphen(s) in them should be treated as multiple words, e.g. wide-eyed is considered two words. [10 m]
2. Based on the histogram information from part (a), write the following functions:
   1. **total\_words()**: Count and print the total number of words in the file, and [2m]
   2. **different\_words()**: Print the number of different words used in the file [2m]
3. Using the histogram built in part (a), write a function, **most\_common()**,that will
   1. return a list of word-frequency analysis, sorted in reverse order by frequency, and
   2. print out the 10 most common words in alice.txt [6m]

**Program run for Question 1**

hist = process\_file('alice.txt')

print( 'Total number of words:', total\_words(hist))

print( 'Number of different words:', different\_words(hist))

t = most\_common(hist)

print( 'The most common words are:')

## Write the codes to print out the 10 most common words

Total number of words: 26695

Number of different words: 2639

The 10 most common words are:

the 1642

and 872

to 729

a 632

she 541

it 530

of 514

said 462

i 410

alice 386