

Week 5 Assignment

Deadline: 14 September 2021, 9:00 A.M.

Submission:

1. Create StudentID_Firstname_Wk5 folder, where StudentID is your KU ID and Firstname is your given name.
2. Place files to submits: process_quotes.py and process_students.py in the folder.
3. Compress the folder and submit the compressed file in Google Classroom by the submission deadline (Your compressed file should be named under StudentID_Firstname_Wk5)
4. Submit a summary text file (filename: summary.txt). In this summary, tell us what you have completed and what you have not. Submit in Google Classroom as well.

Grading Criteria:

1. Correctness (75%): Your program must run and give the expected result. Make sure your function names are defined correctly.
2. Cleanliness (25%): Your program must follow PEP8 convention; comments are added for others to understand your code easily.

You can check out about PEP 8 convention here: <https://www.python.org/dev/peps/pep-0008/>

Part 1 : String Processing

Filename: process_quotes.py

Text filename: quotes.txt

In this assignment, instead of typing user inputs by hands, we are going to read inputs from text file to save time. Inside process_quote.py, function read_file() is already given (see code below). The output returned from function read_file() in this part 1 is a list of strings (see below).

Code

```
def read_file(filename):
    ''' Read file with filename
        Read one line as one string and return a list of string.

    :param filename: str
    :return: a list of string
    '''
    lines = open(filename).read().splitlines()
    return lines

filename = "quotes.txt"
lines = read_file(filename)
print(lines)
```

Output from read_file() or lines.

Notice that lines are a list of strings. Since string is a list of characters, lines are nested of characters.

['The ability to speak does not make you intelligent.',

```
"In my experience, there's no such thing as luck.",
'Fear leads to anger, anger leads to hate, hate leads to suffering.',
"Your eyes can deceive you; don't trust them.",
'Try not. Do or do not. There is no try.',
'At some point, we all have to choose, between what the world wants you to be, and who
you are.',
'No man can win every battle, but no man should fall without a struggle.',
'We let the fear of discovery stop us from doing what is right.',
'Your focus determines your reality.',
'We all know the truth: But in times of crisis, the wise build bridges, while the
foolish build barriers.',
'Many of the truths that we cling to depend on our viewpoint.',
'Train yourself to let go of everything you fear to lose.',
'Part of the journey is the end.',
'No amount of money ever bought a second of time.',
"It's not about how much we lost. It's about how much we have left.",
"Today we don't fight for one life, we fight for all of them.",
"It's not enough to be against something. You have to be for something better.",
"I choose to run towards my problems, and not away from them. Because that's that what
heroes do."]
```

Write the program that can process strings as follows

1. Print length of each string
2. Show character of each string from the given index
3. Count specific characters from each string. (case-sensitive)
4. Find indexes of specific characters. (case-sensitive)
5. Find indexes of search word inside a string. This is case-insensitive. Searching for the word 'the' and 'The' are the same. In this problem, partial match is allowed. For example, 'the' is found in 'the', 'them', 'there', 'they'.

Program process_quotes.py is partially given, along with doctest code. Inside process_quotes.py, program is split into the following functions: print_length, search_by_index, count, find_char, find_word, and operate. Each function is documented with docstring how it works, the parameters it receives and the value(s) it returns. When you run the program, make sure all doctest cases for all functions pass.

In this part 1, you are not allowed to use the existing string function or operator. For example, in, substr(), split(), zip(), and more. This program can be completed with basic functions that we have learned in classroom, such as len(), list slicing, list comprehension, upper() or lower().

Here are some outputs.

Output of choice 1:

```
1. Print length
2. Show character by index
3. Count character
4. Find character
5. Find word
Enter choice: 1
```

```

51 : The ability to speak does not make you intelligent.,
48 : In my experience, there's no such thing as luck.,
66 : Fear leads to anger, anger leads to hate, hate leads to suffering.,
44 : Your eyes can deceive you; don't trust them.,
39 : Try not. Do or do not. There is no try.,
94 : At some point, we all have to choose, between what the world wants you to be, and
who you are.,
71 : No man can win every battle, but no man should fall without a struggle.,
62 : We let the fear of discovery stop us from doing what is right.,
35 : Your focus determines your reality.,
104 : We all know the truth: But in times of crisis, the wise build bridges, while the
foolish build barriers.,
60 : Many of the truths that we cling to depend on our viewpoint.,
56 : Train yourself to let go of everything you fear to lose.,
31 : Part of the journey is the end.,
48 : No amount of money ever bought a second of time.,
66 : It's not about how much we lost. It's about how much we have left.,
60 : Today we don't fight for one life, we fight for all of them.,
77 : It's not enough to be against something. You have to be for something better.,
96 : I choose to run towards my problems, and not away from them. Because that's that
what heroes do.,

```

Sample output from Choice 2

```

1. Print length
2. Show character by index
3. Count character
4. Find character indexes
5. Find word
Enter choice: 2
Enter index: 2
e : The ability to speak does not make you intelligent.
  : In my experience, there's no such thing as luck.
a : Fear leads to anger, anger leads to hate, hate leads to suffering.
u : Your eyes can deceive you; don't trust them.
y : Try not. Do or do not. There is no try.
  : At some point, we all have to choose, between what the world wants you to be, and
who you are.
  : No man can win every battle, but no man should fall without a struggle.
  : We let the fear of discovery stop us from doing what is right.
u : Your focus determines your reality.
  : We all know the truth: But in times of crisis, the wise build bridges, while the
foolish build barriers.
n : Many of the truths that we cling to depend on our viewpoint.
a : Train yourself to let go of everything you fear to lose.
r : Part of the journey is the end.
  : No amount of money ever bought a second of time.
' : It's not about how much we lost. It's about how much we have left.
d : Today we don't fight for one life, we fight for all of them.
' : It's not enough to be against something. You have to be for something better.
c : I choose to run towards my problems, and not away from them. Because that's that
what heroes do.
1. Print length
2. Show character by index

```

```

3. Count character
4. Find character indexes
5. Find word
Enter choice: 2
Enter index: 0
T : The ability to speak does not make you intelligent.
I : In my experience, there's no such thing as luck.
F : Fear leads to anger, anger leads to hate, hate leads to suffering.
Y : Your eyes can deceive you; don't trust them.
T : Try not. Do or do not. There is no try.
A : At some point, we all have to choose, between what the world wants you to be, and
who you are.
N : No man can win every battle, but no man should fall without a struggle.
W : We let the fear of discovery stop us from doing what is right.
Y : Your focus determines your reality.
W : We all know the truth: But in times of crisis, the wise build bridges, while the
foolish build barriers.
M : Many of the truths that we cling to depend on our viewpoint.
T : Train yourself to let go of everything you fear to lose.
P : Part of the journey is the end.
N : No amount of money ever bought a second of time.
I : It's not about how much we lost. It's about how much we have left.
T : Today we don't fight for one life, we fight for all of them.
I : It's not enough to be against something. You have to be for something better.
I : I choose to run towards my problems, and not away from them. Because that's that
what heroes do.

```

Sample output from Choice 3

```

1. Print length
2. Show character by index
3. Count character
4. Find character indexes
5. Find word
Enter choice: 3
Enter character: s
2 : The ability to speak does not make you intelligent.
3 : In my experience, there's no such thing as luck.
4 : Fear leads to anger, anger leads to hate, hate leads to suffering.
2 : Your eyes can deceive you; don't trust them.
1 : Try not. Do or do not. There is no try.
3 : At some point, we all have to choose, between what the world wants you to be, and
who you are.
2 : No man can win every battle, but no man should fall without a struggle.
4 : We let the fear of discovery stop us from doing what is right.
2 : Your focus determines your reality.
7 : We all know the truth: But in times of crisis, the wise build bridges, while the
foolish build barriers.
1 : Many of the truths that we cling to depend on our viewpoint.
2 : Train yourself to let go of everything you fear to lose.
1 : Part of the journey is the end.
1 : No amount of money ever bought a second of time.
3 : It's not about how much we lost. It's about how much we have left.
0 : Today we don't fight for one life, we fight for all of them.

```

4 : It's not enough to be against something. You have to be for something better.
6 : I choose to run towards my problems, and not away from them. Because that's that
what heroes do.

1. Print length
2. Show character by index
3. Count character
4. Find character indexes
5. Find word

Enter choice: 3

Enter character: ,

0 : The ability to speak does not make you intelligent.
1 : In my experience, there's no such thing as luck.
2 : Fear leads to anger, anger leads to hate, hate leads to suffering.
0 : Your eyes can deceive you; don't trust them.
0 : Try not. Do or do not. There is no try.
3 : At some point, we all have to choose, between what the world wants you to be, and
who you are.
1 : No man can win every battle, but no man should fall without a struggle.
0 : We let the fear of discovery stop us from doing what is right.
0 : Your focus determines your reality.
2 : We all know the truth: But in times of crisis, the wise build bridges, while the
foolish build barriers.
0 : Many of the truths that we cling to depend on our viewpoint.
0 : Train yourself to let go of everything you fear to lose.
0 : Part of the journey is the end.
0 : No amount of money ever bought a second of time.
0 : It's not about how much we lost. It's about how much we have left.
1 : Today we don't fight for one life, we fight for all of them.
0 : It's not enough to be against something. You have to be for something better.
1 : I choose to run towards my problems, and not away from them. Because that's that
what heroes do.

Sample output from Choice 4

1. Print length
2. Show character by index
3. Count character
4. Find character indexes
5. Find word

Enter choice: 4

Enter character: s

[15, 24] : The ability to speak does not make you intelligent.
[24, 29, 41] : In my experience, there's no such thing as luck.
[9, 31, 51, 56] : Fear leads to anger, anger leads to hate, hate leads to suffering.
[8, 36] : Your eyes can deceive you; don't trust them.
[30] : Try not. Do or do not. There is no try.
[3, 34, 65] : At some point, we all have to choose, between what the world wants you to
be, and who you are.
[40, 62] : No man can win every battle, but no man should fall without a struggle.
[21, 29, 35, 54] : We let the fear of discovery stop us from doing what is right.
[9, 20] : Your focus determines your reality.
[34, 42, 44, 53, 68, 86, 102] : We all know the truth: But in times of crisis, the wise
build bridges, while the foolish build barriers.
[17] : Many of the truths that we cling to depend on our viewpoint.

[10, 53] : Train yourself to let go of everything you fear to lose.
[21] : Part of the journey is the end.
[33] : No amount of money ever bought a second of time.
[3, 29, 36] : It's not about how much we lost. It's about how much we have left.
[] : Today we don't fight for one life, we fight for all of them.
[3, 27, 30, 60] : It's not enough to be against something. You have to be for something better.
[6, 22, 34, 66, 74, 91] : I choose to run towards my problems, and not away from them. Because that's that what heroes do.

1. Print length
2. Show character by index
3. Count character
4. Find character indexes
5. Find word
Enter choice: 4
Enter character: e
[2, 17, 23, 33, 42, 47] : The ability to speak does not make you intelligent.
[6, 9, 12, 15, 20, 22] : In my experience, there's no such thing as luck.
[1, 6, 17, 24, 28, 39, 45, 48, 60] : Fear leads to anger, anger leads to hate, hate leads to suffering.
[5, 7, 15, 17, 20, 41] : Your eyes can deceive you; don't trust them.
[25, 27] : Try not. Do or do not. There is no try.
[6, 16, 25, 35, 39, 42, 43, 53, 75, 92] : At some point, we all have to choose, between what the world wants you to be, and who you are.
[15, 17, 26, 69] : No man can win every battle, but no man should fall without a struggle.
[1, 4, 9, 12, 25] : We let the fear of discovery stop us from doing what is right.
[12, 14, 19, 28] : Your focus determines your reality.
[1, 14, 33, 49, 54, 67, 75, 79, 100] : We all know the truth: But in times of crisis, the wise build bridges, while the foolish build barriers.
[10, 25, 37, 39, 52] : Many of the truths that we cling to depend on our viewpoint.
[11, 19, 28, 30, 44, 54] : Train yourself to let go of everything you fear to lose.
[10, 17, 25, 27] : Part of the journey is the end.
[16, 19, 21, 34, 46] : No amount of money ever bought a second of time.
[25, 54, 59, 62] : It's not about how much we lost. It's about how much we have left.
[7, 27, 32, 36, 57] : Today we don't fight for one life, we fight for all of them.
[9, 20, 33, 48, 54, 63, 71, 74] : It's not enough to be against something. You have to be for something better.
[7, 32, 57, 62, 67, 87, 90] : I choose to run towards my problems, and not away from them. Because that's that what heroes do.

Sample output from Choice 5

1. Print length
2. Show character by index
3. Count character
4. Find character indexes
5. Find word
Enter choice: 5
Enter a word: you
[35] : The ability to speak does not make you intelligent.
: In my experience, there's no such thing as luck.
: Fear leads to anger, anger leads to hate, hate leads to suffering.
[0, 22] : Your eyes can deceive you; don't trust them.

: Try not. Do or do not. There is no try.
 [67, 86] : At some point, we all have to choose, between what the world wants you to be, and who you are.
 : No man can win every battle, but no man should fall without a struggle.
 : We let the fear of discovery stop us from doing what is right.
 [0, 22] : Your focus determines your reality.
 : We all know the truth: But in times of crisis, the wise build bridges, while the foolish build barriers.
 : Many of the truths that we cling to depend on our viewpoint.
 [6, 39] : Train yourself to let go of everything you fear to lose.
 : Part of the journey is the end.
 : No amount of money ever bought a second of time.
 : It's not about how much we lost. It's about how much we have left.
 : Today we don't fight for one life, we fight for all of them.
 [41] : It's not enough to be against something. You have to be for something better.
 : I choose to run towards my problems, and not away from them. Because that's that what heroes do.

1. Print length
2. Show character by index
3. Count character
4. Find character indexes
5. Find word

Enter choice: 5

Enter a word: the

[0] : The ability to speak does not make you intelligent.
 [18] : In my experience, there's no such thing as luck.
 : Fear leads to anger, anger leads to hate, hate leads to suffering.
 [39] : Your eyes can deceive you; don't trust them.
 [23] : Try not. Do or do not. There is no try.
 [51] : At some point, we all have to choose, between what the world wants you to be, and who you are.
 : No man can win every battle, but no man should fall without a struggle.
 [7] : We let the fear of discovery stop us from doing what is right.
 : Your focus determines your reality.
 [12, 47, 77] : We all know the truth: But in times of crisis, the wise build bridges, while the foolish build barriers.
 [8] : Many of the truths that we cling to depend on our viewpoint.
 : Train yourself to let go of everything you fear to lose.
 [8, 23] : Part of the journey is the end.
 : No amount of money ever bought a second of time.
 : It's not about how much we lost. It's about how much we have left.
 [55] : Today we don't fight for one life, we fight for all of them.
 : It's not enough to be against something. You have to be for something better.
 [55] : I choose to run towards my problems, and not away from them. Because that's that what heroes do.

Part 2 : Student Processing

Filename: `process_students.py`

Text files: `students_small.txt` and `students_large.txt`

In this part, we also are going to read inputs from text file. There are 2 text files for you to test: `students_small.txt` and `students_large.txt`. Function `read_file()` is given (see code below), and it is different from part 1. Basically, `read_file()` in part 2 will `split()` each line in the text file furthermore, using commas. Hence, each line gives us a list of strings. When we combine all lines, `read_file()` will return the nested list of strings. See output of `read_file()` function below.

Code

```
def read_file(filename):
    ''' Read file with filename
        Read one line of student information and return a list of string.

    :param filename: str
    :return: a list of string
    '''
    lines = open(filename).read().splitlines()
    table = [x.split(",") for x in lines if x != ""]
    return table

filename = "students_small.txt"
table = read_file(filename)
print(table)
```

Output of `read_file()` or `table`. Notice that the returned table is nested list of strings.

```
[['Firstname', 'Lastname', '01420111', '01219114', '01355112', '01417167'],
 ['Ann', 'Smith', 'B+', 'A', 'A', 'B'],
 ['Barry', 'Williams', 'A', 'C', 'B', 'D+'],
 ['Cathy', 'Johnson', 'C+', 'B', 'D+', 'C'],
 ['Ann', 'Harris', 'C', 'D', 'B', 'A'],
 ['David', 'Jones', 'B', 'C+', 'D', 'D'],
 ['Lily', 'Brown', 'B', 'C+', 'A', 'A'],
 ['Eric', 'Garcia', 'D', 'B+', 'F', 'D'],
 ['Francis', 'Miller', 'A', 'B', 'C', 'D']]
```

Inside the text files, `students_small.txt` and `students_large.txt`, for each student, there are first name, last names, and letter grades from 4 courses. Assume that no two course share the same course number.

Mainly, the program `process_students.py` can be separated into 2 parts: 1) the data preparation part and 2) data processing part.

- 1) The data preparation part will extract lists of first names, last names, and course numbers from `table`. Furthermore, the letter grades will be converted to point grades. For example, letter grade 'B+' is converted to 3.5. Functions that correspond to this data preparation part are: `extract_name_list`, `extract_course_list`, `convert_one_grade_point`, `convert_all_grade_points`, `get_grade_point_table`. Check out about these functions and their docstring & doctest cases in `process_students.py`.
- 2) For the data processing part, the program will do 4 things:
 - a. Compute average grade for each student

- b. Compute average grade for each course
 - c. Search grades by first name
 - d. Search students with grade below the threshold
- 3) Functions inside process_students.py that correspond to this part are: compute_ave_student_grade, compute_ave_course_grade, find_item_list, get_column_list, and find_below_index_list. Check out about these functions in process_students.py also.

Inside process_students.py, there are 2 additional functions: print_partial_students (given) and operate. When you run the program, make sure all doctest cases for all functions pass.

Here are the outputs.

Output of choice 1:

students_small.txt	students_large.txt
1. Compute average student grades 2. Compute average course grades 3. Find grades by first name 4. Find students with below grade Enter choice: 1 Ann Smith : 3.62 Barry Williams : 2.62 Cathy Johnson : 2.25 Ann Harris : 2.50 David Jones : 1.88 Lily Brown : 3.38 Eric Garcia : 1.38 Francis Miller : 2.50	1. Compute average student grades 2. Compute average course grades 3. Find grades by first name 4. Find students with below grade Enter choice: 1 Ann Smith : 3.62 Barry Williams : 2.62 Cathy Johnson : 2.25 Ann Harris : 2.50 David Jones : 1.88 Lily Brown : 3.38 Eric Garcia : 1.38 Francis Miller : 2.50 Ann Davis : 1.75 Gary Martinez : 2.62 Harry Lopez : 3.62 Irene Wilson : 2.88 Jack Anderson : 2.50 Karen Thomas : 3.00 Lily Taylor : 1.50 Mary Moore : 2.88 Nancy Martin : 3.62 Owen Thomson : 1.62 Peter Lee : 3.12 Mary White : 3.12

Output of choice 2:

students_small.txt	students_large.txt
1. Compute average student grades 2. Compute average course grades 3. Find grades by first name 4. Find students with below grade Enter choice: 2 01420111 : 2.88 01219114 : 2.69 01355112 : 2.31 01417167 : 2.19	1. Compute average student grades 2. Compute average course grades 3. Find grades by first name 4. Find students with below grade Enter choice: 2 01420111 : 2.48 01219114 : 2.95 01355112 : 2.60 01417167 : 2.45

Sample outputs of choice 3:

students_small.txt					
1. Compute average student grades					
2. Compute average course grades					
3. Find grades by first name					
4. Find students with below grade					
Enter choice: 3					
Enter name to search: Ann					
		:	01420111	01219114	01355112 01417167
Ann	Smith	:	3.5	4.0	4.0 3.0
Ann	Harris	:	2.0	1.0	3.0 4.0
1. Compute average student grades					
2. Compute average course grades					
3. Find grades by first name					
4. Find students with below grade					
Enter choice: 3					
Enter name to search: David					
		:	01420111	01219114	01355112 01417167
David	Jones	:	3.0	2.5	1.0 1.0
students_large.txt					
1. Compute average student grades					
2. Compute average course grades					
3. Find grades by first name					
4. Find students with below grade					
Enter choice: 3					
Enter name to search: Ann					
		:	01420111	01219114	01355112 01417167
Ann	Smith	:	3.5	4.0	4.0 3.0
Ann	Harris	:	2.0	1.0	3.0 4.0
Ann	Davis	:	0.0	4.0	2.0 1.0
1. Compute average student grades					
2. Compute average course grades					
3. Find grades by first name					
4. Find students with below grade					
Enter choice: 3					
Enter name to search: Lily					
		:	01420111	01219114	01355112 01417167
Lily	Brown	:	3.0	2.5	4.0 4.0
Lily	Taylor	:	1.0	2.0	2.0 1.0
1. Compute average student grades					
2. Compute average course grades					
3. Find grades by first name					
4. Find students with below grade					
Enter choice: 3					
Enter name to search: Peter					
		:	01420111	01219114	01355112 01417167
Peter	Lee	:	3.0	3.5	3.0 3.0

Sample outputs of choice 4:

students_small.txt					
1. Compute average student grades					
2. Compute average course grades					
3. Find grades by first name					
4. Find students with below grade					
Enter choice: 4					
Enter course to search: 01355112					
Enter threshold: 2					
: 01420111 01219114 01355112 01417167					
Cathy	Johnson	:	2.5	3.0	1.5 2.0
David	Jones	:	3.0	2.5	1.0 1.0
Eric	Garcia	:	1.0	3.5	0.0 1.0
students_large.txt					
1. Compute average student grades					
2. Compute average course grades					
3. Find grades by first name					
4. Find students with below grade					
Enter choice: 4					
Enter course to search: 01420111					
Enter threshold: 1.5					
: 01420111 01219114 01355112 01417167					
Eric	Garcia	:	1.0	3.5	0.0 1.0
Ann	Davis	:	0.0	4.0	2.0 1.0
Jack	Anderson	:	1.0	3.0	2.0 4.0
Lily	Taylor	:	1.0	2.0	2.0 1.0
1. Compute average student grades					
2. Compute average course grades					
3. Find grades by first name					
4. Find students with below grade					
Enter choice: 4					
Enter course to search: 01417167					
Enter threshold: 2.0					
: 01420111 01219114 01355112 01417167					
Barry	Williams	:	4.0	2.0	3.0 1.5
David	Jones	:	3.0	2.5	1.0 1.0
Eric	Garcia	:	1.0	3.5	0.0 1.0
Francis	Miller	:	4.0	3.0	2.0 1.0
Ann	Davis	:	0.0	4.0	2.0 1.0
Lily	Taylor	:	1.0	2.0	2.0 1.0
Owen	Thomson	:	2.0	2.0	1.0 1.5