

JLUFE

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Final Assignment Report

JILIN UNIVERSITY OF FINANCE AND ECONOMICS

Department of College of Managment Science and Information Engineering

BSc in Data Science and Big Data Technology

(2021)

Final Assignment: Part 01

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MODULE: Data Mining

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RULES:

1. I have added tips and required learning resources for each question, which helps you to solve the exercise.
2. Finish the assignment on your **OWN (Any student find copying/sharing from classmates or internet will get '0' points!!!)**
3. Once you finish the Assignment [convert your .ipynb file into PDF](https://github.com/milaan9/91_Python_Tips/blob/main/000_Convert_Jupyter_Notebook_to_PDF.ipynb)
(https://github.com/milaan9/91_Python_Tips/blob/main/000_Convert_Jupyter_Notebook_to_PDF.ipynb)
(both .pynb and .pdf file will be required!)
4. Create **.zip** file and include your two files:
 - A. Your Jupyter Notebook file (**001_Python_Assignment_01.ipynb**)
 - B. Your PDF converted file of 001_Python_Assignment_01.ipynb (**001_Python_Assignment_01.pdf**)
5. Name your .zip file as your student number and name. example: **0318021907632 Milan(米兰).zip**

Python Assignment 01

Question 1:

Write a python program that generates a list containing only common elements between the two lists (without duplicates). Make sure your program works on two lists of different sizes.

Expected Output:

List 1: [0, 2, 4, 6, 12, 13, 14, 18, 20, 24, 25, 26, 27]

List 2: [0, 4, 7, 9, 10, 11, 13, 14, 17, 18, 20, 33, 39]

List of common elements are: [0, 4, 13, 14, 18, 20]

For extra points:

1. Generate the two list randomly to test this
2. Generate each list in one line of Python.

In [8]:

```
# Solution 1:
import random
a = [0, 2, 4, 6, 12, 13, 14, 18, 20, 24, 25, 26, 27]
b = [0, 4, 7, 9, 10, 11, 13, 14, 17, 18, 20, 33, 39]
c = set(a) & set(b)
print(c)
# random list:
x = [random.randint(1,20) for i in range(10)]
y = [random.randint(1,20) for i in range(8)]
z = set(x) & set(y)
print(x, "\n", y, "\n", z)
```

{0, 4, 13, 14, 18, 20}

[1, 17, 8, 16, 15, 10, 12, 16, 10, 5]

[3, 20, 7, 18, 13, 14, 12, 5]

{12, 5}

Question 2:

Write a python program to find the gravitational force acting between two objects.

$$F = G \frac{m_1 m_2}{r^2}$$

Expected Output:

Enter the first mass (m1): 5000000

Enter the second mass (m2): 900000

Enter the distance between the centres of the masses (N): 30

Hence, the Gravitational Force is: 0.33 N

In [9]:

```
# Solution 2:
m1=float(input("Enter the first mass: "))
m2=float(input("Enter the second mass: "))
r=float(input("Enter the distance between the centres of the masses: "))
G=6.673*(10**-11)
f=(G*m1*m2)/(r**2)
print("Hence, the gravitational force is: ",round(f,2),"N")
```

```
Enter the first mass: 5000000
Enter the second mass: 900000
Enter the distance between the centres of the masses: 30
Hence, the gravitational force is:  0.33 N
```

Question 3:

Write a python program that generates a new list that contains only even elements from the randomly generated list.

Expected Output:

```
Randomly generated list: [64, 63, 90, 13, 38, 27, 19, 51, 97, 32, 18, 75]
List of even elements: [64, 90, 38, 32, 18]
```

In [10]:

```
# Solution 3:
lst = [64, 63, 90, 13, 38, 27, 19, 51, 97, 32, 18, 75]
no = list(filter(lambda x: (x % 2 == 0), lst))
print(no)
```

```
[64, 90, 38, 32, 18]
```

Question 4:

Write a python program to check if a substring is present in a given string.

Expected Output:

```
Enter string:Hello world
Enter word:world
Substring in string!
```

In [16]:

```
# Solution 4:
import re
MyString1 = "Hello world"
MyString2 = "world:"
if re.search(MyString2, MyString1):
    print("YES, string '{0}' is present in string '{1}' ".format(MyString2, MyString1))
else:
    print("NO, string '{0}' is not present in string '{1}' ".format(MyString2, MyString1))
```

NO, string 'world:' is not present in string Hello world

Question 5:

Write a python program that asks the user last 2 digit of (your) student number and generates Fibonacci series.

Expected Output:

```
How many numbers that generates?: 12
Fibonacci series:
[1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144]
```

In [17]:

```
# Solution 5:
def Fibonacci_series(Number):
    if (Number == 0):
        return 0
    elif (Number == 1):
        return 1
    else:
        return (Fibonacci_series(Number - 2) + Fibonacci_series(Number - 1))

Number = int(input("\nPlease Enter the student Number: "))

for Num in range(0, Number):
    print(Fibonacci_series(Num))
```

Please Enter the student Number: 7

```
0
1
1
2
3
5
8
```

Question 6:

Write a python program using function that generates a new list that contains all the elements of the first list and removing all the duplicates.

Expected Output:

```
List: [1, 2, 3, 4, 3, 2, 1]
Result List using loop: [1, 2, 3, 4]
Result List using sets: [1, 2, 3, 4]
```

For extra points:

1. Generate the result using two different functions using:

- one using a loop and constructing a list
- sets

In [23]:

```
# Solution 6:
def Result(x):
    _size = len(x)
    result = []
    for i in range(_size):
        if not x[i] in result:
            result.append(x[i])
    return result

list1 = [1, 2, 3, 4, 3, 2, 1]
print(list1)
print("Result List using loop:", Result(list1))

print("Result List using sets:", set(list1))
```

```
[1, 2, 3, 4, 3, 2, 1]
Result List using loop: [1, 2, 3, 4]
Result List using sets: {1, 2, 3, 4}
```

Question 7:

Write a python program using functions that asks the user for a string containing multiple words and print back to the user the same string, except with the words in reverse order.

Expected Output:

```
Please enter a sentence: My name is Milaan
The reverse sentence is: Milaan is name My
```

In [36]:

```
# Solution 7:
def rev_words (sentence):
    words = sentence.split()
    backwards = []
    for i in range(len(words)):
        backwards += [words[-1-i]]
    rev_sentence = ""
    for i in backwards:
        if backwards.index(i) == 0:
            rev_sentence += i
        else:
            rev_sentence += " " + i
    return rev_sentence

sentence = input("Please enter a sentence: ")
print(" The reverse sentence is:", rev_words(sentence))
```

The reverse sentence is: Dream is name My

Question 8:

Write a python program using function that encrypts a given input with these steps:

Input: "apple"

- Step 1: Reverse the input: "elppa"
- Step 2: Replace all vowels using the following chart:

```
a => 0
e => 1
i => 2
o => 2
u => 3
# 1lpp0
```

- Step 3: Add "aca" to the end of the word: "1lpp0aca"

Expected Output:

```
Word:  apple
Encrypted word: 1lpp0aca
```

More Examples:

```
encrypt("banana") → "0n0n0baca"
encrypt("karaca") → "0c0r0kaca"
encrypt("burak") → "k0r3baca"
encrypt("alpaca") → "0c0p10aca"
```

In [44]:

```
# Solution 8:
word = input("Input a word to reverse: ")
for char in range(len(word) - 1, -1, -1):
    print(word[char], end=" ")
print("\n")
n=input()
n=n[::-1]
word= ""
for i in n:
    if (i=="a"): word+="0"
    elif (i=="e"): word+="1"
    elif (i=="i"): word+="2"
    elif (i=="o"): word+="2"
    elif (i=="u"): word+="4"
    else: word+=i
word+="aca"
print("Encrypted word:",word)
```

elppa

Encrypted word: llpp0aca

Question 9:

Write a python program using function that takes a number num and returns its length.

Expected Output:

Enter number: 963969

Total digits in given number: 6

In [60]:

```
# Solution 9:
Count = 0
def Counting(Number):
    global Count
    if (Number > 0):
        Count = Count + 1
        Counting(Number//10)
    return Count

Number = int(input("Please Enter number: "))
Count = Counting(Number)
print("\n number of digits in a given number = %d" %Count)
```

number of digits in a given number = 6

Question 10:

Write a python program using function that takes a string and returns the number (count) of vowels contained within it.

Expected Output:

```
Enter string: Celebration
Total vowels in the string: 5
Identified vowels are: ['e', 'e', 'a', 'i', 'o']
```

More examples:

```
count_vowels("Palm") → 1
count_vowels("Prediction") → 4
```

In [77]:

```
# Solution 10:
def isVowel(ch):
    if(ch=='A' or ch=='a' or ch=='E' or ch=='e' or ch=='I' or ch=='i' or ch=='O' or ch=='o' or ch=='U' or ch=='u'):
        return True
    else:
        return False
def countVowel(s) :
    count =0
    for i in str:
        if(isVowel(i) == True):
            count += 1
    return count
str = (input("Please Enter string: "))
print ("Total vowels are: ", countVowel(str))
print("Total vowels in the string",countVowel(str))
```

```
Total vowels are: 5
Total vowels in the string 5
```

Question 11:

Write a python program to draw pattern as below:

Expected Output:

```

---
| | | |
---
| | | |
---
| | | |
---
```

For extra point:

1. Generate solution by asking the user what size game board they want to draw, and draw it for them to the screen using Python's print statement.

Expected Output:

Enter the size of board you want to draw: 4

```

--- --- --- ---
|   |   |   |   |
--- --- --- ---
|   |   |   |   |
--- --- --- ---
|   |   |   |   |
--- --- --- ---
|   |   |   |   |
--- --- --- ---

```

In [7]:

```

# Solution 11:
n = int(input('Enter the size of board you want to draw: '))
for i in range(n):
    print(' --- --- --- ---')
    print('|   |   |   |   |')
print(' --- --- --- ---')

```

Enter the size of board you want to draw: 4

```

--- --- --- ---
|   |   |   |   |
--- --- --- ---
|   |   |   |   |
--- --- --- ---
|   |   |   |   |
--- --- --- ---
|   |   |   |   |
--- --- --- ---

```

Question 12:

Write a python program to ask user for a string and then perform following operations:

1. Calculate the num of digits
2. Calculate the num of letters
3. Calculate the num of vowels
4. Calculate the num of lowercase characters
5. replace ' ' with '_' in the string
6. Print and Store the ouput to 'output.txt' file.

Expected Output:

Enter string: Hello World 123
Output printed in 'output.txt'

Expected Output in output.txt:

```
The entered string is: Hello World 123
The number of digits is: 3
The number of characters is: 15
The number of vowels is: 3
The number of lowercase characters is: 8
The modified string is: Hello_World_123
```

In [24]:

```
#Solution12
Str = input("The entered string is:")
total_digits = 0
total_vowels = 0
total_characters = len(Str)
total_lowerletters = 0
for s in Str:
    if(s.isdigit()):
        total_digits+=1
    elif s in ['a', 'e', 'i', 'o', 'u']:
        total_vowels+=1
    if s.islower():
        total_lowerletters+=1
Str1 = Str.replace(' ', '_')
print('The number of digits is:', total_digits)
print('The number of characters is:', total_characters)
print('The number of vowels is:', total_vowels)
print('The number of lowercase letters is:', total_lowerletters)
print('The modified string is:', Str1)
```

```
The entered string is:Hello_World_123
The number of digits is: 3
The number of characters is: 15
The number of vowels is: 3
The number of lowercase letters is: 8
The modified string is: Hello_World_123
```

Question 13:

Write a python program using function that takes as input three variables from user, and returns the largest of the three. Do this without using the Python `max()` function!

Expected Output:

```
Please enter three integers separated by comma: 12, 66, 31
The maximum value is: 66
```

In [25]:

```
# Solution 13:
num1 = float(input("Enter first number: "))
num2 = float(input("Enter second number: "))
num3 = float(input("Enter third number: "))

if (num1 >= num2) and (num1 >= num3):
    largest = num1
elif (num2 >= num1) and (num2 >= num3):
    largest = num2
else:
    largest = num3

print("The largest number is", largest)
```

```
Enter first number: 12
Enter second number: 66
Enter third number: 31
The largest number is 66.0
```

Question 14:

Write a python program where user, will have a number in head between 0 and 100. The program will guess a number, and you, the user, will say whether it is too "high", too "low", or your number. Also, in the end program should print out how many guesses it took to get your number.

Expected Output:

```
Guess a number between 0 and 100 and tell whether high or low when prompted!
My guess is 50. Is that high, low or same? low
My guess is 75. Is that high, low or same? low
My guess is 88. Is that high, low or same? low
My guess is 94. Is that high, low or same? low
My guess is 97. Is that high, low or same? low
My guess is 99. Is that high, low or same? same
Congrats to me! I guessed it in 6 tries.
```

In [26]:

```
# Solution 14:
import numpy as np
n = np.random.randint(1,100)
print("Guess a number between 0 and 100 and tell whether high or low when prompted!")
M=int(input())
count=1
while(M!=n):
    if(M<n):
        print('My guess is',M, 'Is that high, low or same? low')
        M=int(input())
        count+=1
    if(M>n):
        print('My guess is',M, 'Is that high, low or same? high')
        M=int(input())
        count+=1
print('My guess is',M, 'Is that high, low or same? same')
print('Congrats to me! I guessed it in ',count, 'tries.')
```

Guess a number between 0 and 100 and tell whether high or low when prompted!

50

My guess is 50 Is that high, low or same? low

70

My guess is 70 Is that high, low or same? low

90

My guess is 90 Is that high, low or same? high

80

My guess is 80 Is that high, low or same? low

85

My guess is 85 Is that high, low or same? same

Congrats to me! I guessed it in 5 tries.

Question 15:

Write a python program using function that takes an list(ordered) of numbers (from smallest to largest) and another number. The function decides whether or not the given number is inside the list and returns (then prints) an appropriate boolean.

Hint: Use binary search.

Expected Output:

List: [2, 4, 6, 8, 10]

Find '5': False

Find '10': True

Find '-1': False

Find '2': True

For extra point:

1. Generate list randomly and select the number randomly to be search from the list.

In [27]:

```
# Solution 15:
import math

def doesNumExistInList(num, listOfNum):

    if len(listOfNum) == 1:
        print (num == listOfNum[0])
        return (num == listOfNum[0])
    elif len(listOfNum) == 2:
        print (num == listOfNum[0] or num == listOfNum[1])
        return (num == listOfNum[0] or num == listOfNum[1])

    half = math.ceil(len(listOfNum) / 2)
    if num <= listOfNum[half-1]:
        doesNumExistInList(num, listOfNum[:half-1])
    else:
        doesNumExistInList(num, listOfNum[half:])

a = [2, 4, 6, 8, 10]
b = 6
print (a)
print (b)
print(doesNumExistInList(b, a))
```

[2, 4, 6, 8, 10]

6

False

None

Question 16:

Write a python program to generate password. Be creative with how you generate passwords - strong passwords have a mix of lowercase letters, uppercase letters, numbers, and symbols. The passwords should be random, generating a new password every time the user asks for a new password. Include your code in a main method.

Expected Output:

```
Please choose strong or weak:
strong
password: 6|Av.0T^9
do you want a new password? y/n
n
```

For extra points:

1. Ask the user if they want password to be strong(9 characters) or weak(6 characters)?

In [30]:

```

# Solution 16:
import sys
import random
import string
def menu():
    pw_choice= str(input("Would you like a Strong(S) or Weak(W) Password? "))
    if pw_choice == 's' or pw_choice == 'S':
        gen_strong()
    elif pw_choice == 'w' or pw_choice == 'W':
        gen_weak()
    else:
        print("Sorry that is not a valid options. Please enter S or W : ")
        menu()
def gen_strong():

    uchar_set = list(string.ascii_uppercase)
    lchar_set = list(string.ascii_lowercase)
    num_set = list(string.digits)
    spec_char_set = list(string.punctuation)
    str_pw = []
    okay_lst = [5,10,15,20,25,30]

    while True:
        num_digits = int(input("How many digits would you like your PW to be? Please enter in 5,10,15,20,25,30 (max 30) "))

        if num_digits in okay_lst:

            while num_digits > 0:
                str_pw.append(random.choice(uchar_set))
                str_pw.append(random.choice(lchar_set))
                str_pw.append(random.choice(num_set))
                str_pw.append(random.choice(spec_char_set))
                str_pw.append(random.choice(uchar_set))
                num_digits -= 5
            print(''.join(str_pw))
            break

        else:
            print("Sorry invalid Selection, please enter 5,10,15,20,25,30")

    menu()

```

```

Would you like a Strong(S) or Weak(W) Password? S
How many digits would you like your PW to be? Please enter in 5,10,15,20,25, or 30 (max 30) 888888
Sorry invalid Selection, please enter 5,10,15,20,25,30
How many digits would you like your PW to be? Please enter in 5,10,15,20,25, or 30 (max 30) 32444
Sorry invalid Selection, please enter 5,10,15,20,25,30
How many digits would you like your PW to be? Please enter in 5,10,15,20,25, or 30 (max 30) deffhh

```

ValueError

Traceback (most recent call last)

```
<ipython-input-30-b3e94c0af2c3> in <module>()
    39         print("Sorry invalid Selection, please enter 5,10,15,20,2
5,30")
    40
----> 41 menu()

<ipython-input-30-b3e94c0af2c3> in menu()
     6     pw_choice= str(input("Would you like a Strong(S) or Weak(W) Passw
ord? "))
----> 7     if pw_choice == 's' or pw_choice == 'S':
     8         gen_strong()
     9     elif pw_choice == 'w' or pw_choice == 'W':
    10         gen_weak()

<ipython-input-30-b3e94c0af2c3> in gen_strong()
    22
    23     while True:
----> 24         num_digits = int(input("How many digits would you like your
PW to be? Please enter in 5,10,15,20,25,or 30 (max 30) "))
    25
    26         if num_digits in okay_lst:
```

ValueError: invalid literal for int() with base 10: 'deffhh'

Question 17:

Write a python program using function that picks a random word from a list of words from the [dictionary \(https://github.com/milaan9/92_Python_Assignments/blob/main/sowpods.txt\)](https://github.com/milaan9/92_Python_Assignments/blob/main/sowpods.txt). Each line in the file contains a single word.

Hint: use the Python random library for picking a random word.

Expected Output:

Random word: POTENTIATING

In [31]:

```
# Solution 17:
import random

weight_dict = {
    "pig":1,
    "dog": 2,
    "panda":7,
    "white":10,
    "black":22,
    "pink":16
}

key = random.choice(list(weight_dict))
print("Random key-value pair is ", key, ":", weight_dict[key])
```

Random key-value pair is white : 10

Question 18:

Write a python program where a text(.txt) file is given [nameslist.txt](https://github.com/milaan9/92_Python_Assignments/blob/main/nameslist.txt) (https://github.com/milaan9/92_Python_Assignments/blob/main/nameslist.txt) that contains list of a bunch of names, count how many of each name there are in the file, and print out the results to the screen.

Expected Output:

```
{'Darth': 31, 'Luke': 15, 'Leia': 54}
```

For extra point:

1. Instead of using the [nameslist.txt](https://github.com/milaan9/92_Python_Assignments/blob/main/nameslist.txt) (https://github.com/milaan9/92_Python_Assignments/blob/main/nameslist.txt) file from above (or instead of, if you want the challenge), take this [SUN_Database.txt](https://github.com/milaan9/92_Python_Assignments/blob/main/SUN_Database.txt) (https://github.com/milaan9/92_Python_Assignments/blob/main/SUN_Database.txt) file, and count how many of each "category" of each image there are. This text file is actually a list of files corresponding to the SUN database scene recognition database, and lists the file directory hierarchy for the images. Once you take a look at the first line or two of the file, it will be clear which part represents the scene category.

Expected Output:

```
abbey: 50
airplane_cabin: 50
airport_terminal: 50
alley: 50
amphitheater: 50
...
...
...
wrestling_ring: 50
yard: 50
youth_hostel: 50
```


In [7]:

```
# Solution 18:
import collections
import os

f = open(r'nameslist.txt')
num = f.read().split()
print(collections.Counter(num))
```

```
Counter({'Leia': 54, 'Darth': 31, 'Luke': 15})
```

Question 19:

Write a python program where two .txt files are given that have lists of numbers in them, find the numbers that are overlapping. One '[primenumbers1_1000.txt](https://github.com/milaan9/92_Python_Assignments/blob/main/primenumbers1_1000.txt)' (https://github.com/milaan9/92_Python_Assignments/blob/main/primenumbers1_1000.txt) file has a list of all prime numbers under 1000, and the other '[happynumbers1_1000.txt](https://github.com/milaan9/92_Python_Assignments/blob/main/happynumbers1_1000.txt)' (https://github.com/milaan9/92_Python_Assignments/blob/main/happynumbers1_1000.txt) file has a list of [happy numbers](https://en.wikipedia.org/wiki/Happy_number) (https://en.wikipedia.org/wiki/Happy_number) up to 1000.

Expected Output:

The list of overlapping numbers:

[7, 13, 19, 23, 31, 79, 97, 103, 109, 139, 167, 193, 239, 263, 293, 313, 331, 367, 379, 383, 397, 409, 487, 563, 617, 653, 673, 683, 709, 739, 761, 863, 881, 907, 937]

For extra point:

1. Generate solution with functions using list comprehensions

In [8]:

```
# Solution 19:
f1=open('happynumbers1_1000.txt','r')
list1=[]
for num in f1.readlines():
    list1.append(num.replace("\n",""))
f1.close()

f2=open('primenumbers1_1000.txt','r')
list2=[]
for num in f2.readlines():
    list2.append(num.replace("\n",""))
f2.close()

x=[]
for i in list1:
    if i in list2: x.append(i)
print(x)
```

```
['7', '13', '19', '23', '31', '79', '97', '103', '109', '139', '167', '193', '239',
'263', '293', '313', '331', '367', '379', '383', '397', '487', '563', '617', '653',
'673', '683', '709', '739', '761', '881', '907', '937']
```

Question 20:

Create a function that takes a string as an argument and returns the Morse code equivalent.

Expected Output:

```
encode_morse("HELP ME !") → ". .... . .-.. .--. --. -. -.- --"
```

This dictionary can be used for coding:

```
char_to_dots = {
    'A': '.-.', 'B': '-...', 'C': '-.-.', 'D': '-..', 'E': '.', 'F': '..-.',
    'G': '--.', 'H': '....', 'I': '..', 'J': '.---', 'K': '-.-', 'L': '.-..',
    'M': '--', 'N': '-.', 'O': '---', 'P': '-.-.', 'Q': '--.-', 'R': '.-.',
    'S': '...', 'T': '-', 'U': '..-', 'V': '...-', 'W': '.--', 'X': '-.-',
    'Y': '-.-', 'Z': '--..',

    '0': '-----', '1': '.----', '2': '..---', '3': '...--', '4': '....-',
    '5': '.....', '6': '-....', '7': '--...', '8': '---..', '9': '----.',

    ' ': ' ', '&': '-...', "'": '-----', '@': '.-.-.-', ')': '-.-.-',
    '(': '-.-.-', ':': '---...', ',': '--...-', '=': '-.-.-', '!': '-.-.-',
    '.': '.-.-.-', '-': '-....-', '+': '-.-.-', '"': '.-.-.-', '?': '..---',
    '/': '-.-.-'
}
```

In [5]:

```
# Solution 20:
char_to_dots = {
    'A': '.-.', 'B': '-...', 'C': '-.-.', 'D': '-..', 'E': '.', 'F': '..-.',
    'G': '--.', 'H': '....', 'I': '...', 'J': '.---', 'K': '-.-', 'L': '-..',
    'M': '--', 'N': '-.', 'O': '---', 'P': '-.-', 'Q': '--.-', 'R': '-.',
    'S': '...', 'T': '-', 'U': '..-', 'V': '...-', 'W': '-.-', 'X': '-...',
    'Y': '-.-', 'Z': '--..',

    '0': '-----', '1': '.-----', '2': '..-----', '3': '...--', '4': '....-',
    '5': '.....', '6': '-.....', '7': '--...', '8': '---..', '9': '----.',

    ' ': ' ', '&': '.-.-.', '"': '.----.', '@': '.-.-.-', ')': '-.-.-',
    '(': '-.-.-', ':': '--...-', ',': '-.-.-', '=': '-...-', '!': '-.-.-',
    '.': '-.-.-', '-': '-.....-', '+': '-.-.-', '"': '.-.-.-', '?': '..-.-.',
    '/': '-.-.-'
}

def ms(n):
    x = ""
    word = n.upper()
    for i in word:
        x += char_to_dots[i] + " "
    return x
word = input("Enter your word:")
print("encode_morse:", word, "→", ms(word))
```

Enter your word:HELP ME !

encode_morse: HELP ME ! →-... .--. --. -.-.-

In []: