MACHINE LEARNING (CS-5710)
ASSIGNMENT - 1

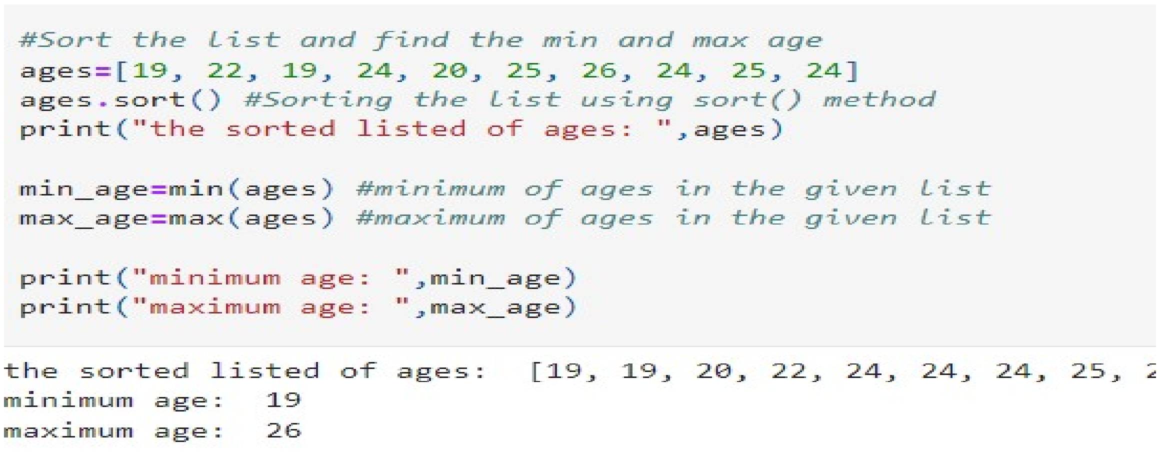
Name: Priyanka Bojja

Student ID: 700739528

Github Link : https://github.com/priyankabojja/ML-Assignments
VideoLink :https://drive.google.com/file/d/1XV3ZHOFldkEwU81b2C2dTSxHlWUAIdxK/view?usp=sharing

QUESTION 1

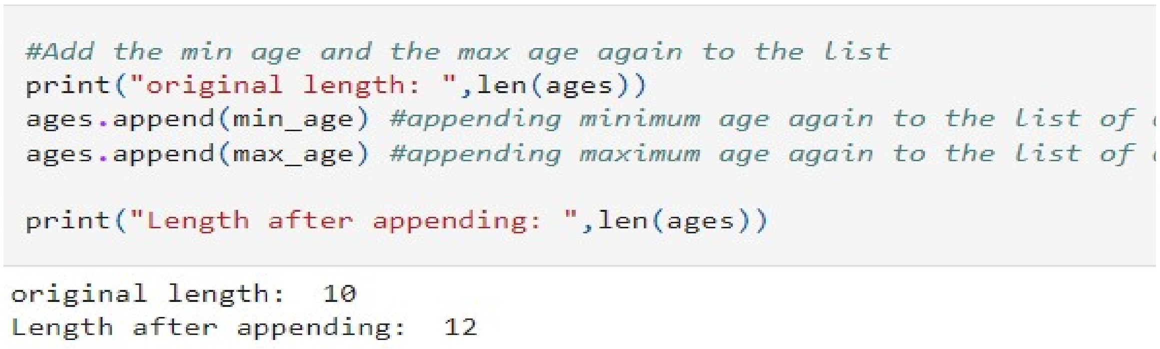
The following is a list of 10 students ages:
ages = [19, 22, 19, 24, 20, 25, 26, 24, 25, 24]
• Sort the list and find the min and max age
• Add the min age and the max age again to the list
• Find the median age (one middle item or two middle items divided by two)
• Find the average age (sum of all items divided by their number)
• Find the range of the ages (max minus min)



```
#Sort the list and find the min and max age
ages=[19, 22, 19, 24, 20, 25, 26, 24, 25, 24]
ages.sort() #Sorting the list using sort() method
print("the sorted listed of ages: ",ages)

min_age=min(ages) #minimum of ages in the given list
max_age=max(ages) #maximum of ages in the given list

print("minimum age: ",min_age)
print("maximum age: ",max_age)
```

```
the sorted listed of ages:  [19, 19, 20, 22, 24, 24, 24, 25, 2
minimum age:  19
maximum age:  26
```

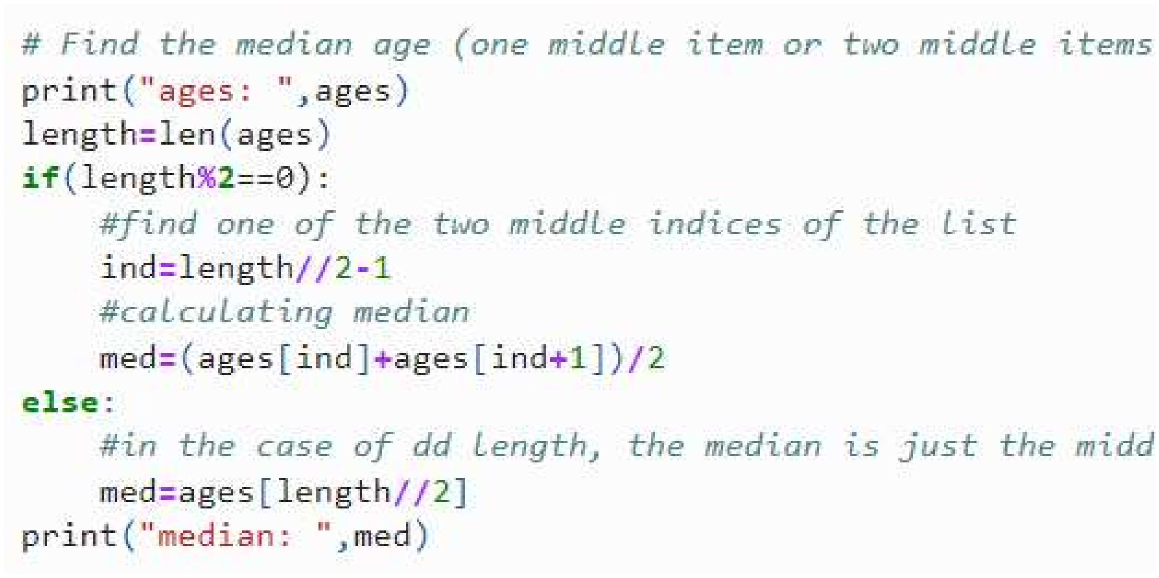
In the above code snippet we initialized a list named ‘ages’ and added some elements into that. Then we used sort() a built-in method that sorts the list elements in ascending order by default. We also used the other built-in functions such as min() and max() to find the minimum and maximum elements in the given list.



```
#Add the min age and the max age again to the list
print("original length: ",len(ages))
ages.append(min_age) #appending minimum age again to the list of
ages.append(max_age) #appending maximum age again to the list of

print("Length after appending: ",len(ages))
```

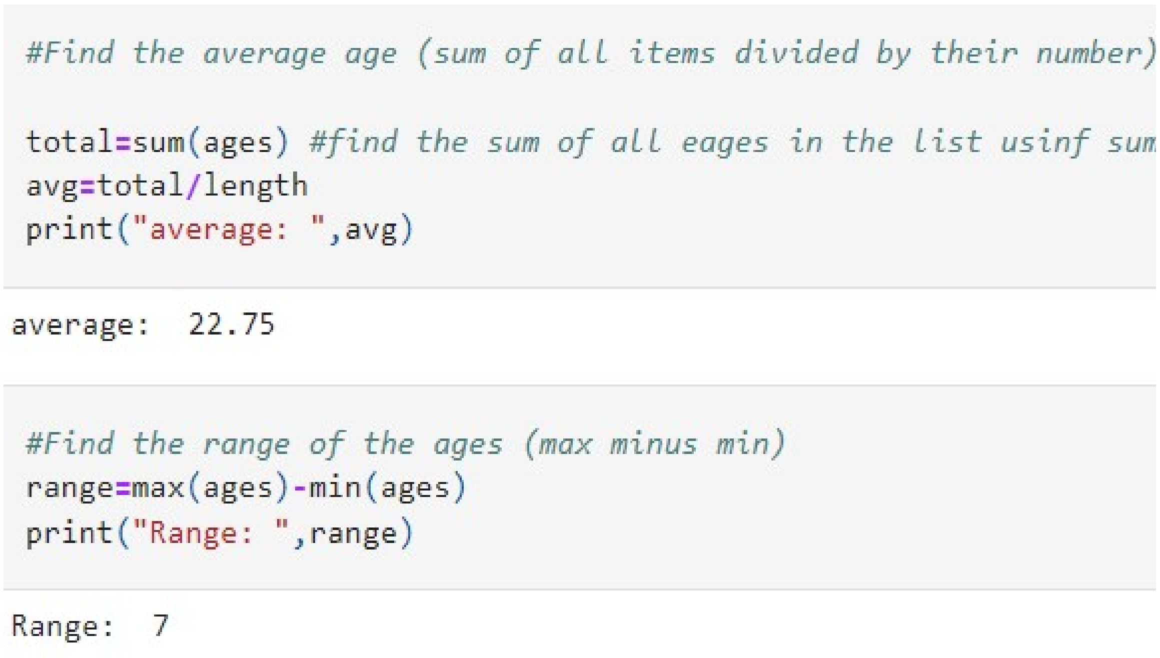
```
original length:  10
Length after appending:  12
```

In this code snippet we used the append() method in list methods to append the minimum and maximum ages into the list and we printed the length of the new list after appending the new elements.



```
# Find the median age (one middle item or two middle items
print("ages: ",ages)
length=len(ages)
if(length%2==0):
    #find one of the two middle indices of the list
    ind=length//2-1
    #calculating median
    med=(ages[ind]+ages[ind+1])/2
else:
    #in the case of dd length, the median is just the midd
    med=ages[length//2]
print("median: ",med)
```

Here, we found the median of the list using the if-else conditional statements and printed the median.



```
#Find the average age (sum of all items divided by their number)

total=sum(ages) #find the sum of all eages in the list usinf sum
avg=total/length
print("average: ",avg)
```

```
average:  22.75
```

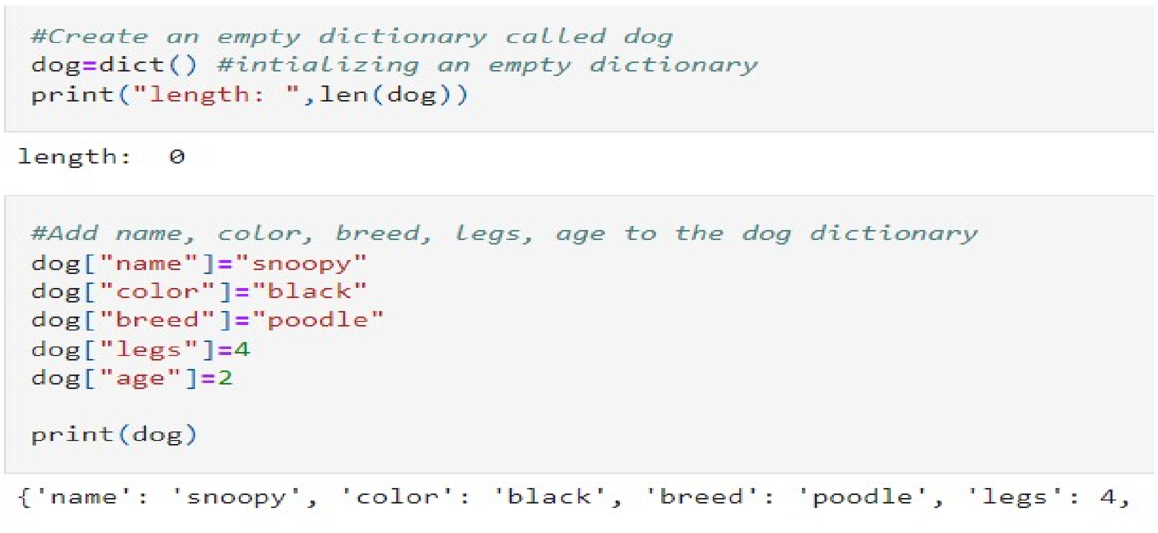
```
#Find the range of the ages (max minus min)
range=max(ages)-min(ages)
print("Range: ",range)
```

```
Range:  7
```

In this code snippet we used the sum() method to find the total of the elements in the given list and we calculated the average. In the next snippet we calculated the range of the list.

QUESTION 2

• Create an empty dictionary called dog
• Add name, color, breed, legs, age to the dog dictionary
• Create a student dictionary and add first_name, last_name, gender, age, marital status, skills,   country, city and address as keys for the dictionary
• Get the length of the student dictionary
• Get the value of skills and check the data type, it should be a list
• Modify the skills values by adding one or two skills
• Get the dictionary keys as a list
• Get the dictionary values as a lisT

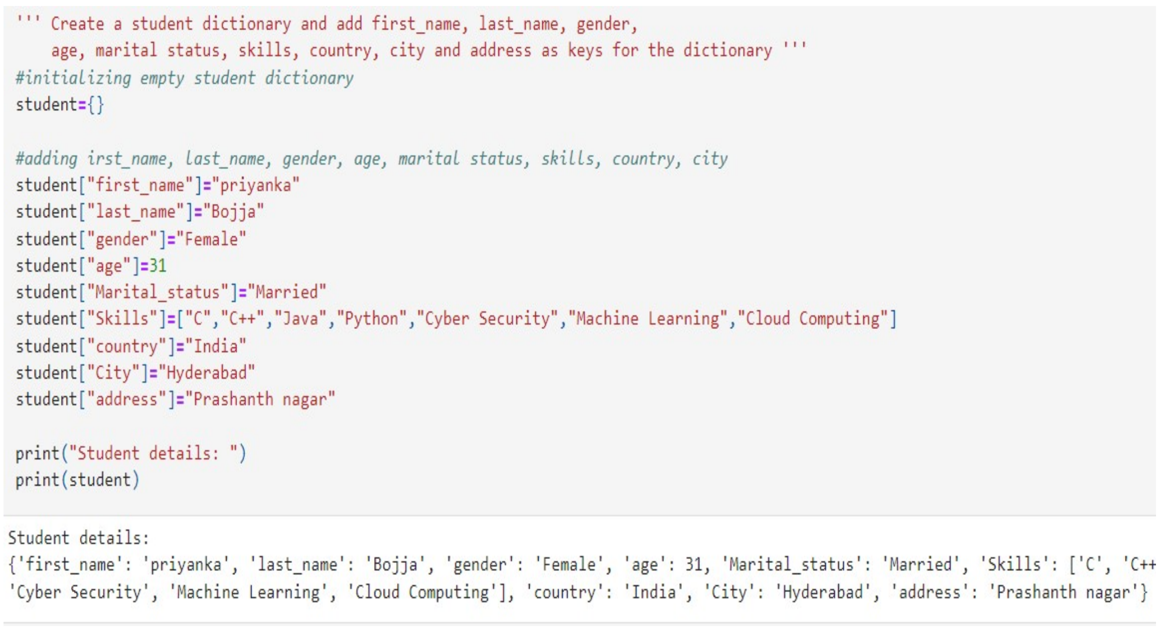


```
#Create an empty dictionary called dog
dog=dict() #intializing an empty dictionary
print("length: ",len(dog))
```

```
length:  0
```

```
#Add name, color, breed, legs, age to the dog dictionary
dog["name"]="snoopy"
dog["color"]="black"
dog["breed"]="poodle"
dog["legs"]=4
dog["age"]=2

print(dog)
```

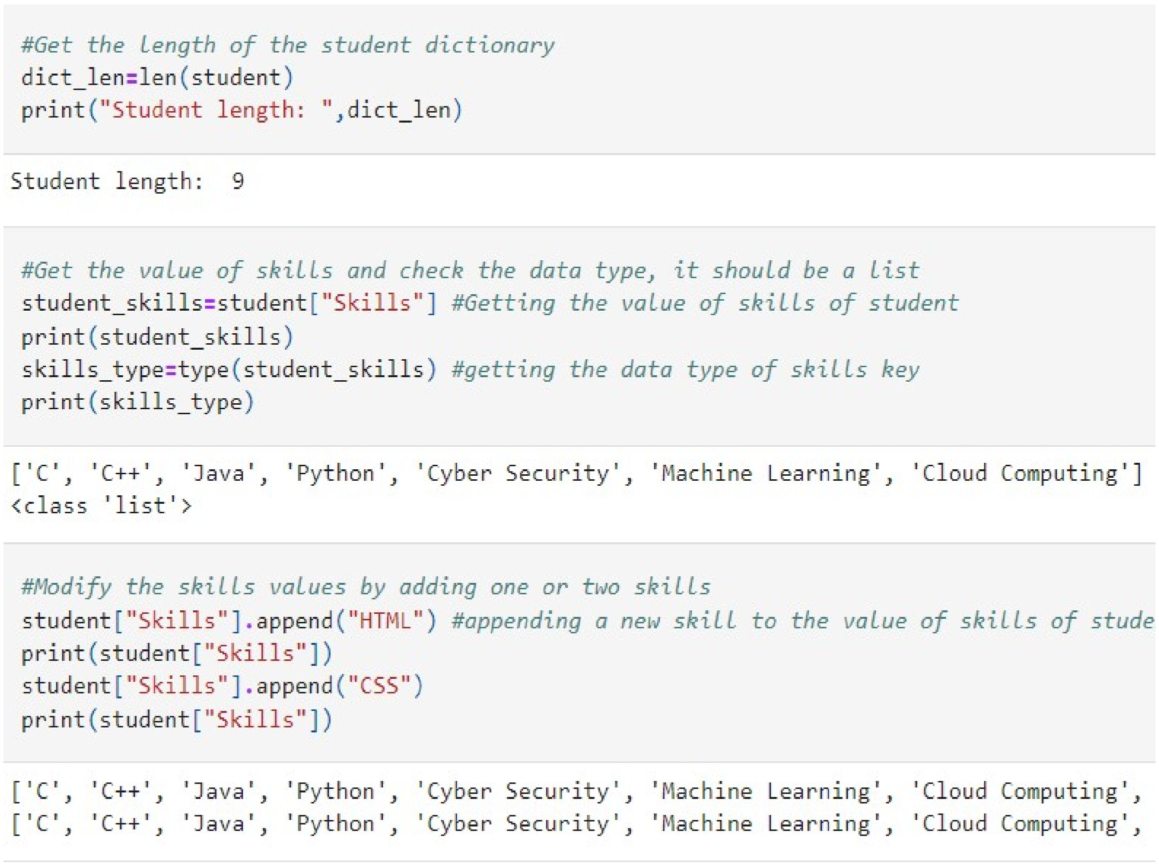
```
{'name': 'snoopy', 'color': 'black', 'breed': 'poodle', 'legs': 4,
```



```
''' Create a student dictionary and add first_name, last_name, gender,
    age, marital status, skills, country, city and address as keys for the dictionary '''
#initializing empty student dictionary
student={}

#adding irst_name, last_name, gender, age, marital status, skills, country, city
student["first_name"]="priyanka"
student["last_name"]="Bojja"
student["gender"]="Female"
student["age"]=31
student["Marital_status"]="Married"
student["Skills"]=["C","C++","Java","Python","Cyber Security","Machine Learning","Cloud Computing"]
student["country"]="India"
student["City"]="Hyderabad"
student["address"]="Prashanth nagar"

print("Student details: ")
print(student)
```

```
Student details:
{'first_name': 'priyanka', 'last_name': 'Bojja', 'gender': 'Female', 'age': 31, 'Marital_status': 'Married', 'Skills': ['C', 'C++
'Cyber Security', 'Machine Learning', 'Cloud Computing'], 'country': 'India', 'City': 'Hyderabad', 'address': 'Prashanth nagar'}
```

In this code snippet we initialized a new dictionary with dict() function then inserted keys and values into that dictionary. Then we created another dictionary with student details as keys and values and printed them.



```
#Get the length of the student dictionary
dict_len=len(student)
print("Student length: ",dict_len)
```

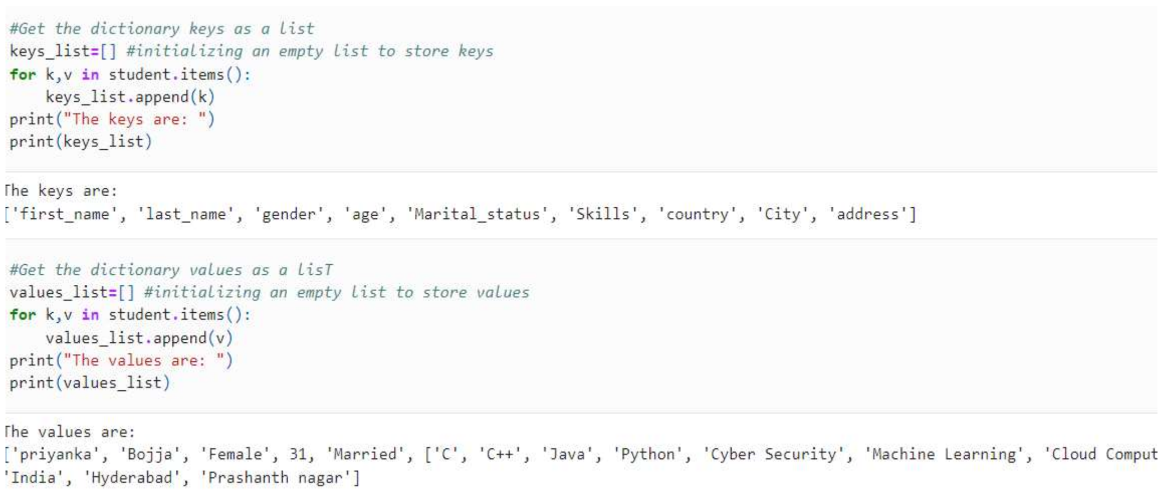
```
Student length:  9
```

```
#Get the value of skills and check the data type, it should be a list
student_skills=student["Skills"] #Getting the value of skills of student
print(student_skills)
skills_type=type(student_skills) #getting the data type of skills key
print(skills_type)
```

```
['C', 'C++', 'Java', 'Python', 'Cyber Security', 'Machine Learning', 'Cloud Computing']
<class 'list'>
```

```
#Modify the skills values by adding one or two skills
student["Skills"].append("HTML") #appending a new skill to the value of skills of stude
print(student["Skills"])
student["Skills"].append("CSS")
print(student["Skills"])
```

```
['C', 'C++', 'Java', 'Python', 'Cyber Security', 'Machine Learning', 'Cloud Computing',
['C', 'C++', 'Java', 'Python', 'Cyber Security', 'Machine Learning', 'Cloud Computing',
```



```
#Get the dictionary keys as a list
keys_list=[] #initializing an empty list to store keys
for k,v in student.items():
    keys_list.append(k)
print("The keys are: ")
print(keys_list)
```

```
The keys are:
['first_name', 'last_name', 'gender', 'age', 'Marital_status', 'Skills', 'country', 'City', 'address']
```

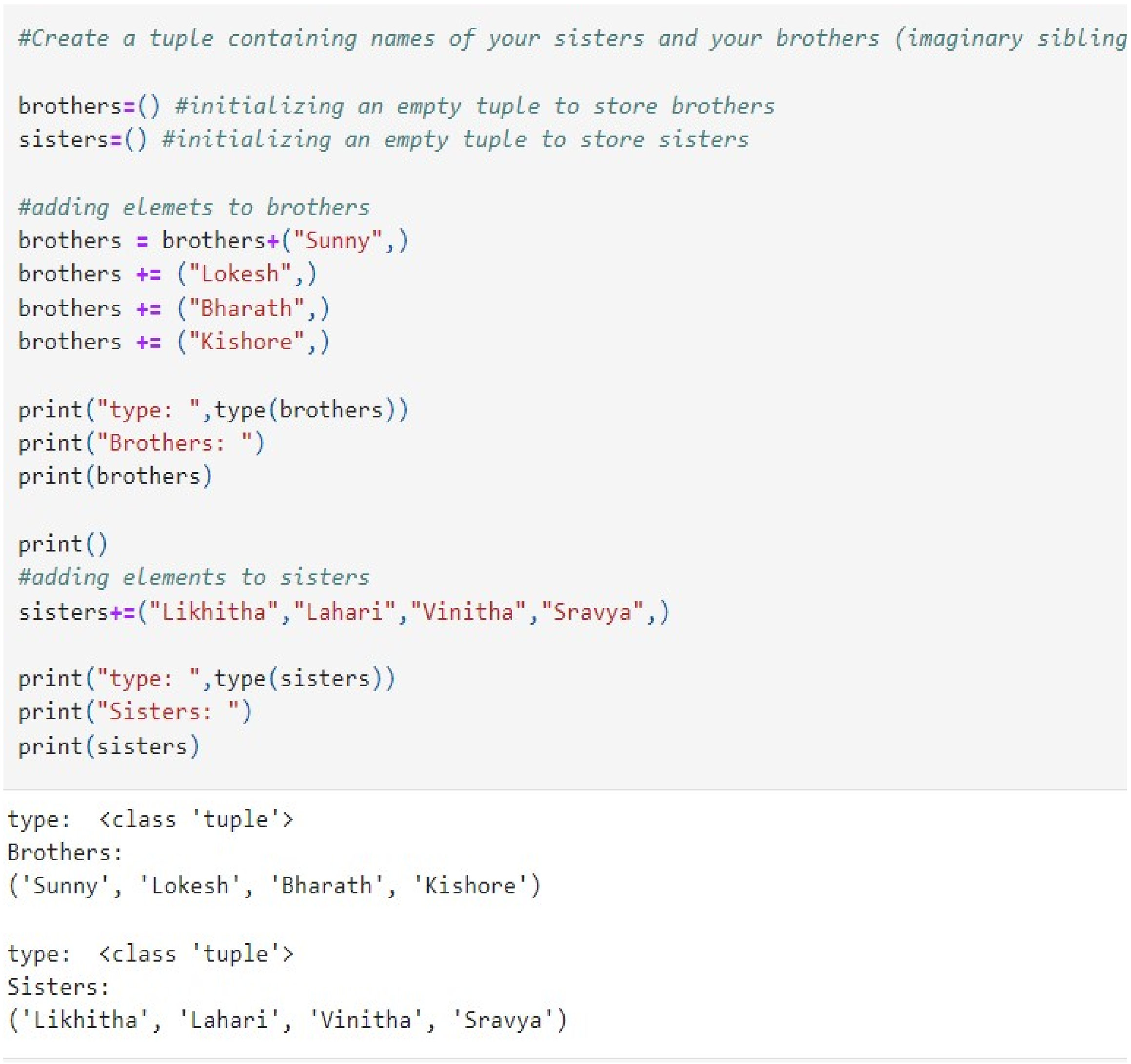
```
#Get the dictionary values as a lisT
values_list=[] #initializing an empty list to store values
for k,v in student.items():
    values_list.append(v)
print("The values are: ")
print(values_list)
```

```
The values are:
['priyanka', 'Bojja', 'Female', 31, 'Married', ['C', 'C++', 'Java', 'Python', 'Cyber Security', 'Machine Learning', 'Cloud Comput
'India', 'Hyderabad', 'Prashanth nagar']
```

In this code snippet we used len() function to find the length of the dictionary and then we used type() function to find the datatype of skills key. Then we modified the skills key by adding some values to that. Then printed the dictionary keys as list and then dictionary values as list.

QUESTION 3

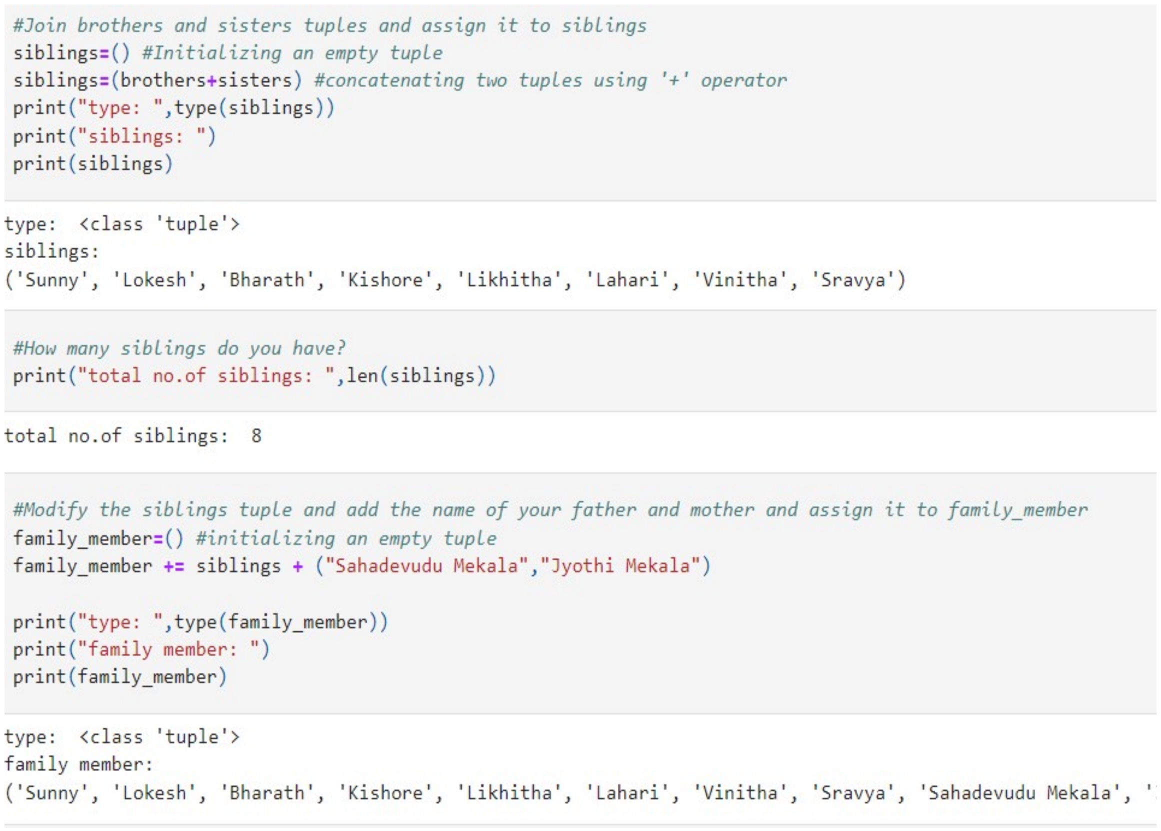
• Create a tuple containing names of your sisters and your brothers (imaginary siblings are fine) • Join brothers and sisters tuples and assign it to siblings
• How many siblings do you have?
• Modify the siblings tuple and add the name of your father and mother and assign it to family_member



```
#Create a tuple containing names of your sisters and your brothers (imaginary sibling

brothers=() #initializing an empty tuple to store brothers
sisters=() #initializing an empty tuple to store sisters

#adding elemets to brothers
brothers = brothers+("Sunny",)
brothers += ("Lokesh",)
brothers += ("Bharath",)
brothers += ("Kishore",)

print("type: ",type(brothers))
print("Brothers: ")
print(brothers)

print()
#adding elements to sisters
sisters+=("Likhitha","Lahari","Vinitha","Sravya",)

print("type: ",type(sisters))
print("Sisters: ")
print(sisters)
```

```
type:  <class 'tuple'>
Brothers:
('Sunny', 'Lokesh', 'Bharath', 'Kishore')

type:  <class 'tuple'>
Sisters:
('Likhitha', 'Lahari', 'Vinitha', 'Sravya')
```

Here in this code we created two tuples and added the values to the tuple. Then we added elements into the other tuple and re-assigned it to the same tuple. As tuples are immutable we added values into the tuples using the compound assignment operator.



```python
#Join brothers and sisters tuples and assign it to siblings
siblings=() #Initializing an empty tuple
siblings=(brothers+sisters) #concatenating two tuples using '+' operator
print("type: ",type(siblings))
print("siblings: ")
print(siblings)
```

```
type:  <class 'tuple'>
siblings:
('Sunny', 'Lokesh', 'Bharath', 'Kishore', 'Likhitha', 'Lahari', 'Vinitha', 'Sravya')
```

```python
#How many siblings do you have?
print("total no.of siblings: ",len(siblings))
```

```
total no.of siblings:  8
```

```python
#Modify the siblings tuple and add the name of your father and mother and assign it to family_member
family_member=() #initializing an empty tuple
family_member += siblings + ("Sahadevudu Mekala","Jyothi Mekala")

print("type: ",type(family_member))
print("family member: ")
print(family_member)
```

```
type:  <class 'tuple'>
family member:
('Sunny', 'Lokesh', 'Bharath', 'Kishore', 'Likhitha', 'Lahari', 'Vinitha', 'Sravya', 'Sahadevudu Mekala', '
```

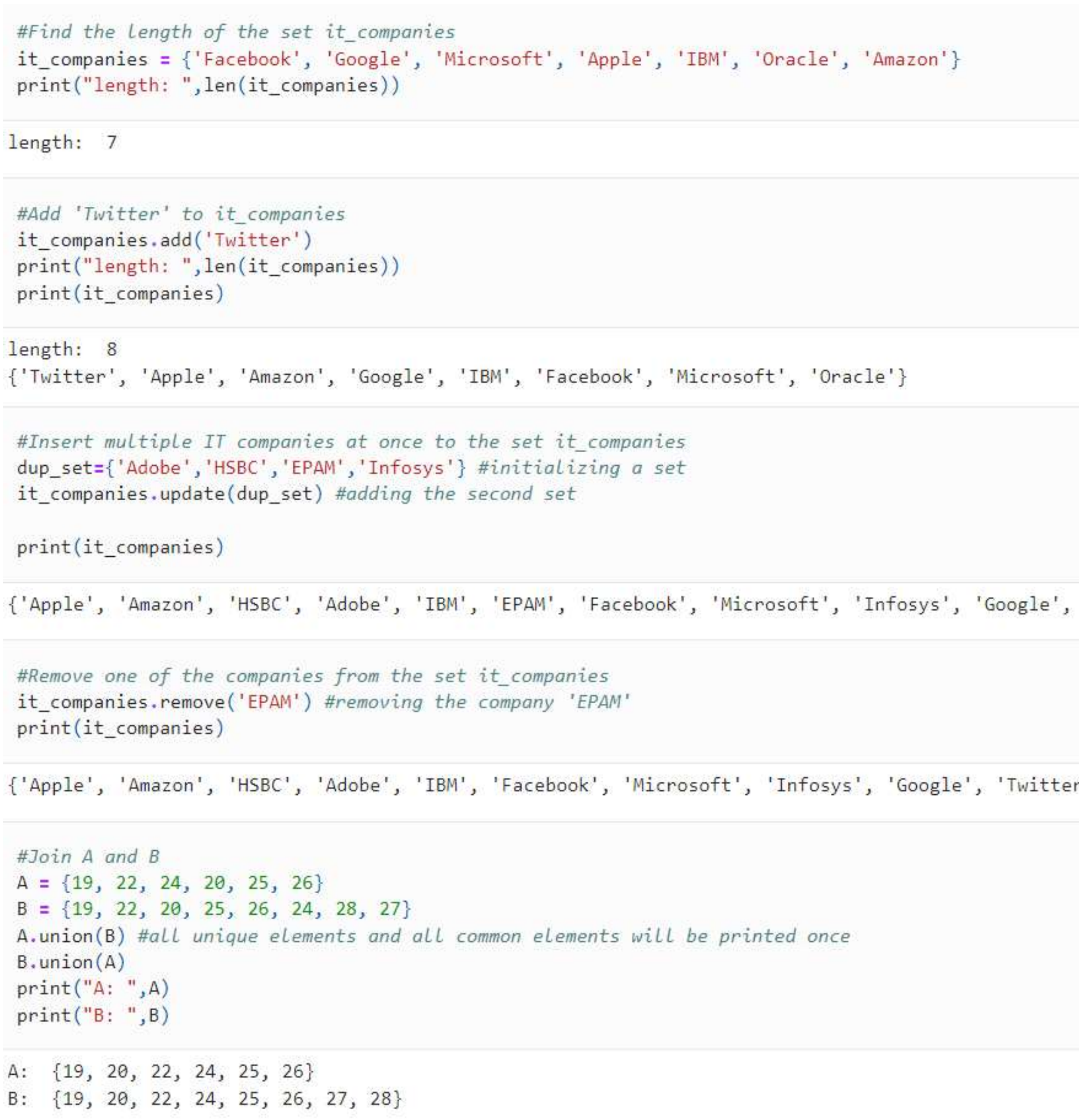
In this code we created two more tuples and added them to the family_member tuple finally and printed it.

QUESTION 4

it_companies = {'Facebook', 'Google', 'Microsoft', 'Apple', 'IBM', 'Oracle', 'Amazon'}
A = {19, 22, 24, 20, 25, 26}
B = {19, 22, 20, 25, 26, 24, 28, 27}
age = [22, 19, 24, 25, 26, 24, 25, 24]

• Find the length of the set it_companies
• Add 'Twitter' to it_companies • Insert multiple IT companies at once to the set it_companies
• Remove one of the companies from the set it_companies • What is the difference between remove and discard
• Join A and B
• Find A intersection B
• Is A subset of B

- Are A and B disjoint sets
- Join A with B and B with A
- What is the symmetric difference between A and B
- Delete the sets completely
- Convert the ages to a set and compare the length of the list and the set



```python
#Find the length of the set it_companies
it_companies = {'Facebook', 'Google', 'Microsoft', 'Apple', 'IBM', 'Oracle', 'Amazon'}
print("length: ",len(it_companies))
```

```
length:  7
```

```python
#Add 'Twitter' to it_companies
it_companies.add('Twitter')
print("length: ",len(it_companies))
print(it_companies)
```

```
length:  8
{'Twitter', 'Apple', 'Amazon', 'Google', 'IBM', 'Facebook', 'Microsoft', 'Oracle'}
```

```python
#Insert multiple IT companies at once to the set it_companies
dup_set={'Adobe','HSBC','EPAM','Infosys'} #initializing a set
it_companies.update(dup_set) #adding the second set

print(it_companies)
```

```
{'Apple', 'Amazon', 'HSBC', 'Adobe', 'IBM', 'EPAM', 'Facebook', 'Microsoft', 'Infosys', 'Google',
```

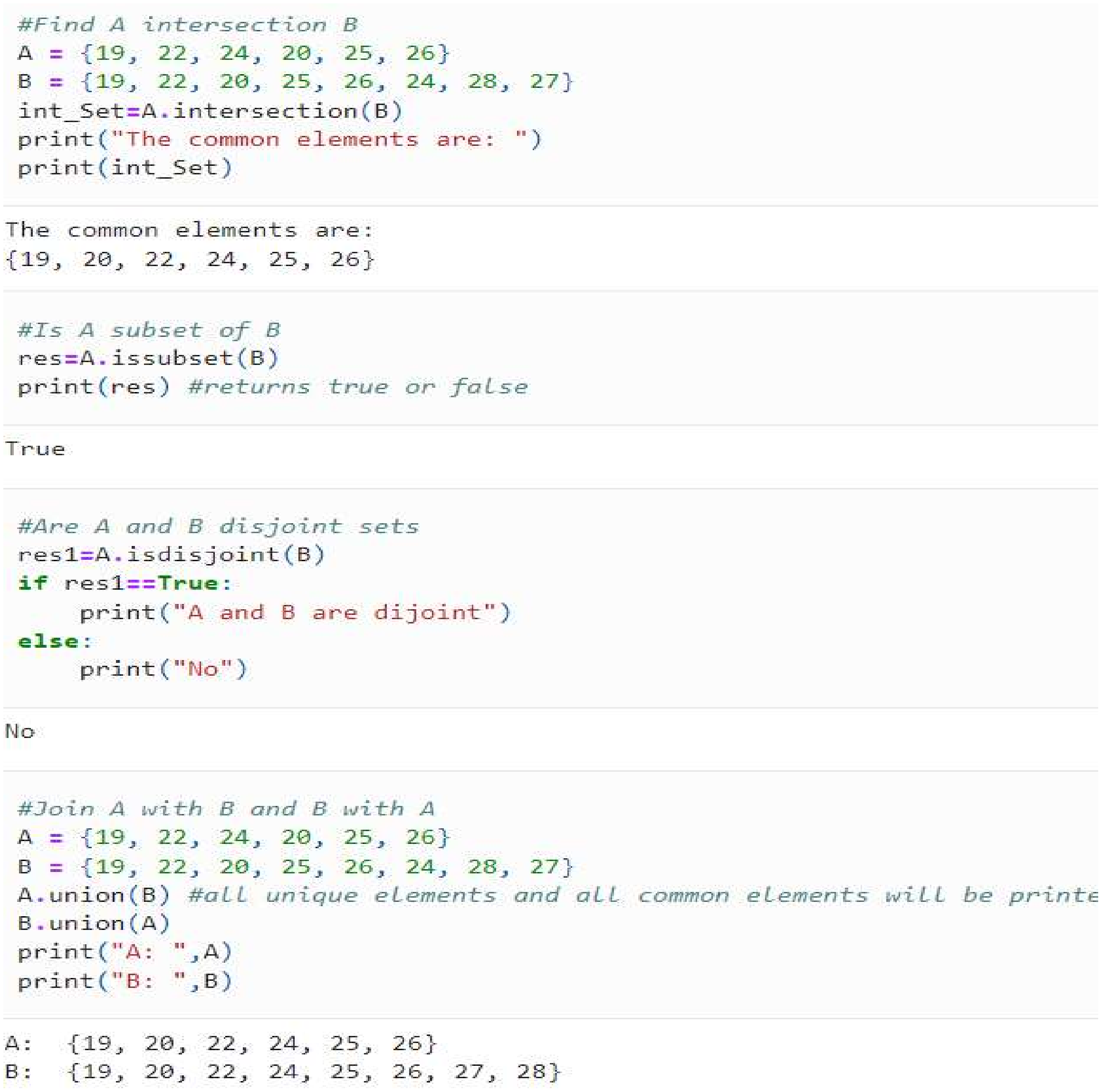
```python
#Remove one of the companies from the set it_companies
it_companies.remove('EPAM') #removing the company 'EPAM'
print(it_companies)
```

```
{'Apple', 'Amazon', 'HSBC', 'Adobe', 'IBM', 'Facebook', 'Microsoft', 'Infosys', 'Google', 'Twitter
```

```python
#Join A and B
A = {19, 22, 24, 20, 25, 26}
B = {19, 22, 20, 25, 26, 24, 28, 27}
A.union(B) #all unique elements and all common elements will be printed once
B.union(A)
print("A: ",A)
print("B: ",B)
```

```
A:  {19, 20, 22, 24, 25, 26}
B:  {19, 20, 22, 24, 25, 26, 27, 28}
```

In this code snippet we calculated the length of the set and added some more elements to the sets and printed the new set. Then we added multiple values into the set at a once and printed it again. Then we checked the remove() function from sets built-in functions and printed the resultant set. After that we applied the set operation called union and printed the resultant.



```python
#Find A intersection B
A = {19, 22, 24, 20, 25, 26}
B = {19, 22, 20, 25, 26, 24, 28, 27}
int_Set=A.intersection(B)
print("The common elements are: ")
print(int_Set)
```

```
The common elements are:
{19, 20, 22, 24, 25, 26}
```

```python
#Is A subset of B
res=A.issubset(B)
print(res) #returns true or false
```

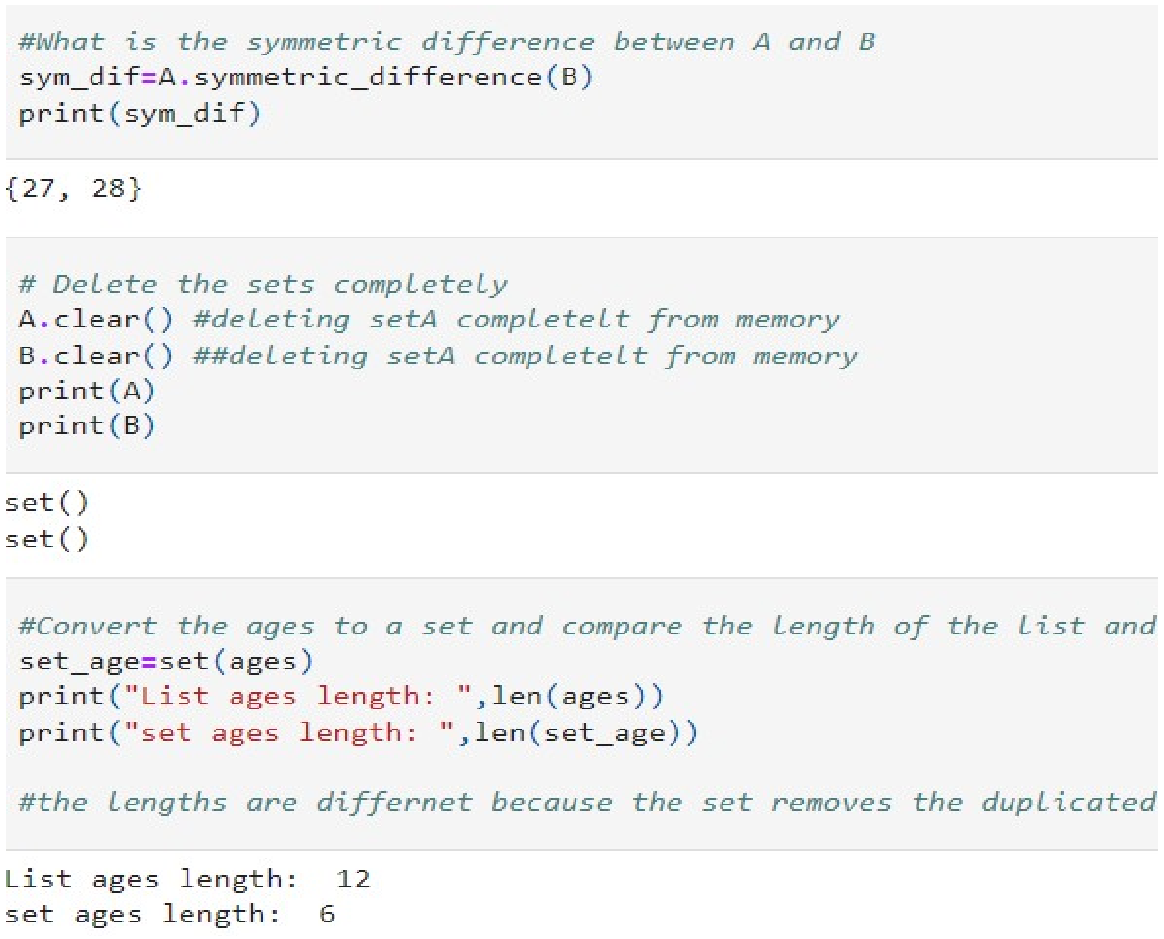
```
True
```

```python
#Are A and B disjoint sets
res1=A.isdisjoint(B)
if res1==True:
    print("A and B are dijoint")
else:
    print("No")
```

```
No
```

```python
#Join A with B and B with A
A = {19, 22, 24, 20, 25, 26}
B = {19, 22, 20, 25, 26, 24, 28, 27}
A.union(B) #all unique elements and all common elements will be printe
B.union(A)
print("A: ",A)
print("B: ",B)
```

```
A:  {19, 20, 22, 24, 25, 26}
B:  {19, 20, 22, 24, 25, 26, 27, 28}
```



```
#What is the symmetric difference between A and B
sym_dif=A.symmetric_difference(B)
print(sym_dif)
```

```
{27, 28}
```

```
# Delete the sets completely
A.clear() #deleting setA completelt from memory
B.clear() ##deleting setA completelt from memory
print(A)
print(B)
```

```
set()
set()
```

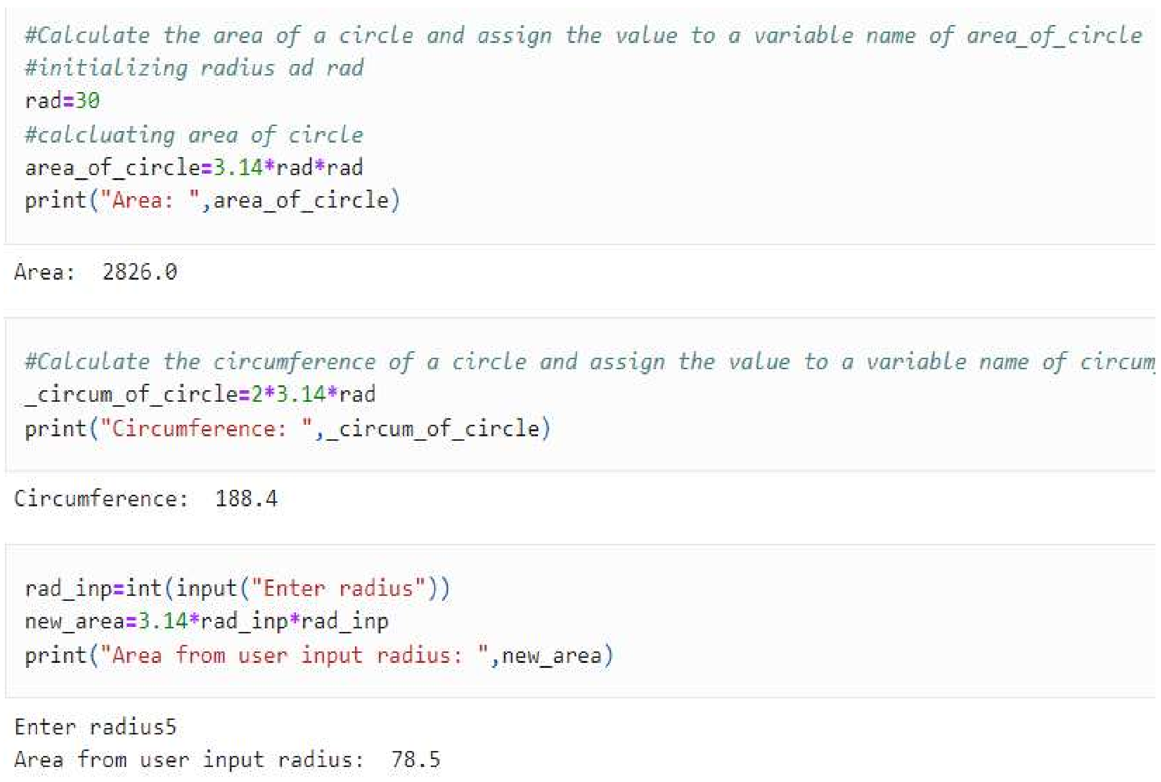
```
#Convert the ages to a set and compare the length of the list and
set_age=set(ages)
print("List ages length: ",len(ages))
print("set ages length: ",len(set_age))

#the lengths are differnet because the set removes the duplicated
```

```
List ages length:  12
set ages length:  6
```

In this code snippet we used the other set functions such as intersection, subset, disjoint and set symmetric difference and printed the results. We deleted the sets completely and printed the empty sets and then converted the list into sets using the set() function and proved that the sets will not allow duplicates.

QUESTION 5

The radius of a circle is 30 meters.
• Calculate the area of a circle and assign the value to a variable name of area_of_circle
• Calculate the circumference of a circle and assign the value to a variable name of circum_of_circle
• Take radius as user input and calculate the area.



```
#Calculate the area of a circle and assign the value to a variable name of area_of_circle
#initializing radius ad rad
rad=30
#calcluating area of circle
area_of_circle=3.14*rad*rad
print("Area: ",area_of_circle)
```

```
Area:  2826.0
```

```
#Calculate the circumference of a circle and assign the value to a variable name of circum
_circum_of_circle=2*3.14*rad
print("Circumference: ",_circum_of_circle)
```

```
Circumference:  188.4
```

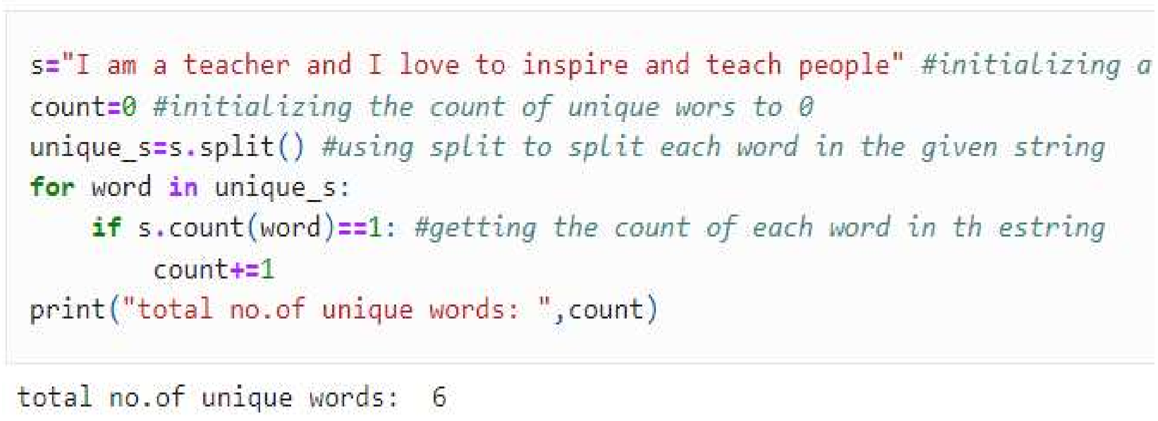
```
rad_inp=int(input("Enter radius"))
new_area=3.14*rad_inp*rad_inp
print("Area from user input radius: ",new_area)
```

```
Enter radius5
Area from user input radius:  78.5
```

In this code snippet we calculated the area of the circle and then circumference of the circle, by taking the radius as user input using the input() function.

QUESTION 6

"I am a teacher and I love to inspire and teach people"
• How many unique words have been used in the sentence? Use the split methods and set to get the unique words.



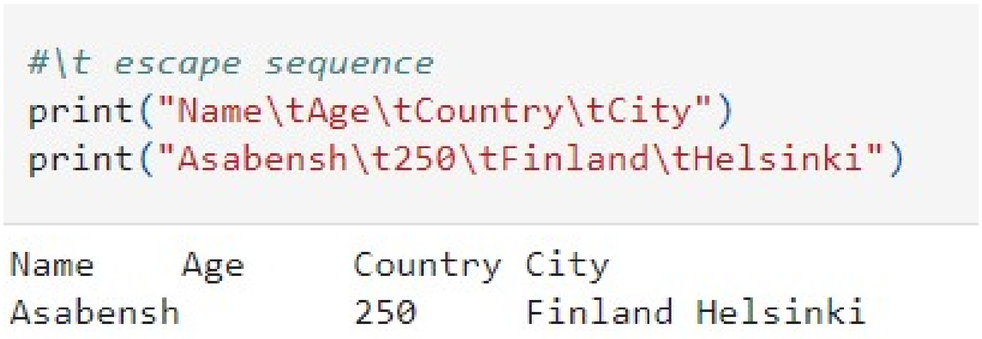
```
s="I am a teacher and I love to inspire and teach people" #initializing a
count=0 #initializing the count of unique wors to 0
unique_s=s.split() #using split to split each word in the given string
for word in unique_s:
    if s.count(word)==1: #getting the count of each word in th estring
        count+=1
print("total no.of unique words: ",count)
```

```
total no.of unique words:  6
```

In this code snippet we used the split() method to split the given string at each space character. Then we compared each word with all the other words in the string and counted the number of unique words in the given string.

QUESTION 7

Use a tab escape sequence to get the following lines.
Name Age Country City
Asabeneh 250 Finland Helsinki



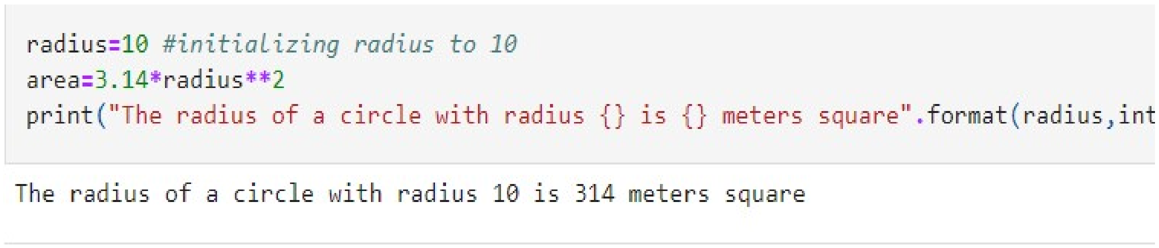
```
#\t escape sequence
print("Name\tAge\tCountry\tCity")
print("Asabensh\t250\tFinland\tHelsinki")
```

```
Name    Age     Country City
Asabensh        250     Finland Helsinki
```

In this code snippet we used '\t' the escape character to get 3 spaces between the words.

QUESTION 8

Use the string formatting method to display the following:
radius = 10
area = 3.14 * radius ** 2



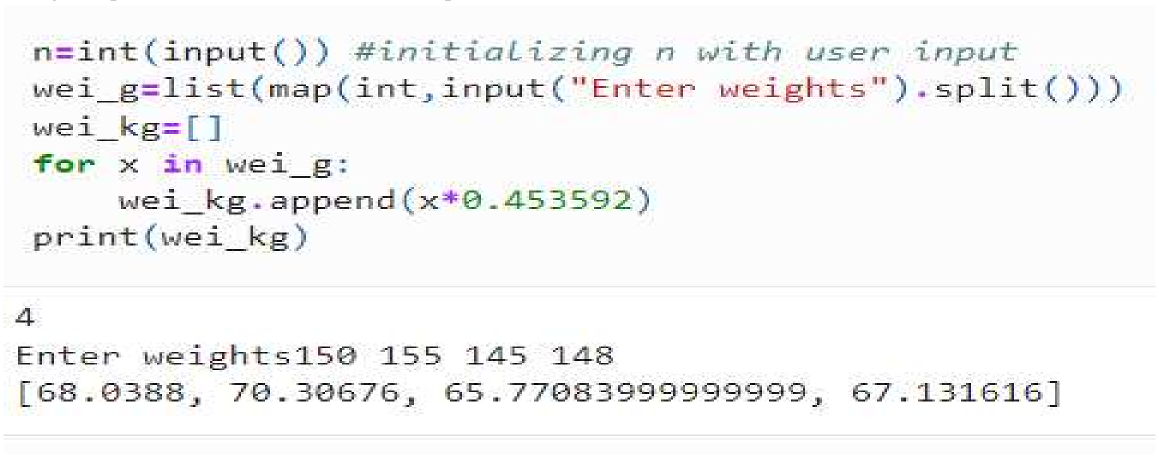
```
radius=10 #initializing radius to 10
area=3.14*radius**2
print("The radius of a circle with radius {} is {} meters square".format(radius,int
```

```
The radius of a circle with radius 10 is 314 meters square
```

“The area of a circle with radius 10 is 314 meters square.”

QUESTION 9

Write a program, which reads weights (lbs.) of N students into a list and convert these weights to kilograms in a separate list using Loop. N: No of students (Read input from user)
Ex: L1: [150, 155, 145, 148]
Output: [68.03, 70.3, 65.77, 67.13]



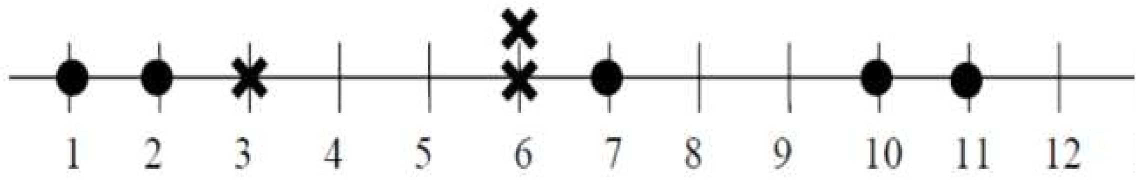
```
n=int(input()) #initializing n with user input
wei_g=list(map(int,input("Enter weights").split()))
wei_kg=[]
for x in wei_g:
    wei_kg.append(x*0.453592)
print(wei_kg)
```

```
4
Enter weights150 155 145 148
[68.0388, 70.30676, 65.77083999999999, 67.131616]
```

In this code snippet we converted a list of values in lbs to kilograms by taking the list elements from user input.

QUESTION 10

The diagram below shows a dataset with 2 classes and 8 data points, each with only o
value, labeled f. Note that there are two data points with the same feature value of 6. T
shown as two x's one above the other.



1. Divide this data equally into two parts. Use first part as training and second pa
   testing. Using KNN classifier, for K=3, what would be the predicted outputs fo
   samples? Show how you arrived at your answer.
2. Compute the confusion matrix for this and calculate accuracy, sensitivity and s
   values.

Solution:
Given data elements are taken in the tabular form as below,

Feature	Label
1	O
2	O
3	X
6	X
6	X
7	O
10	O
11	O

Here, the first four rows of data are considered to be the Training dataset and the next four rows are selected as the Testing dataset.

Now, according to the KNN Classifier we shall now consider K=3 and then the distance between the testing and training data is demonstrated below.

In the below table the columns are the training dataset and rows are the testing dataset

	1(O)	2(O)	3(X)	6(X)
6	5	**4**	**3**	**0**
7	6	**5**	**4**	**1**
10	9	**8**	**7**	**4**
11	10	**9**	**8**	**5**

The highlighted rows are the distance values.
Let us now assume 'O' as negative and 'X' as positive values. Now the prediction on testing data is as below:

	True label	Predicted label	O/P
6	X	X	Tp
7	O	X	Fp
10	O	X	Fp
11	O	X	Fp

Confusion matrix for the above prediction is:

TN	FP
FN	TP

The final confusion matrix is :
0 3
0 1
Accuracy of the classifier = (TP + TN) / (P + N) = 1 / 4 = 0.25
Sensitivity of the classifier = TP / P = 1/1 = 1
Specificity of the classifier = TN / N = 0/3 = 0