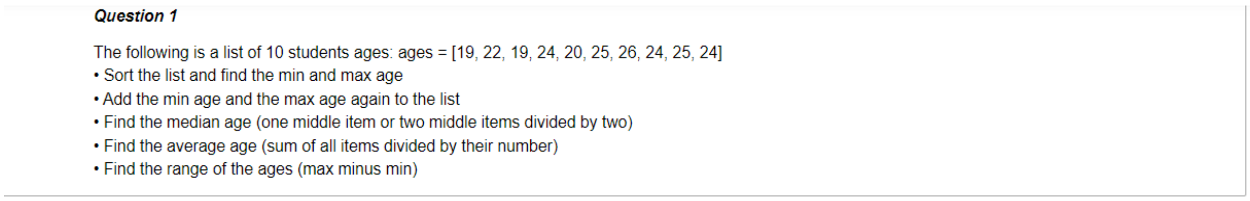
Machine Learning Assignment 1

Github: https://github.com/YaswanthSompalle/Machine-Learning.git

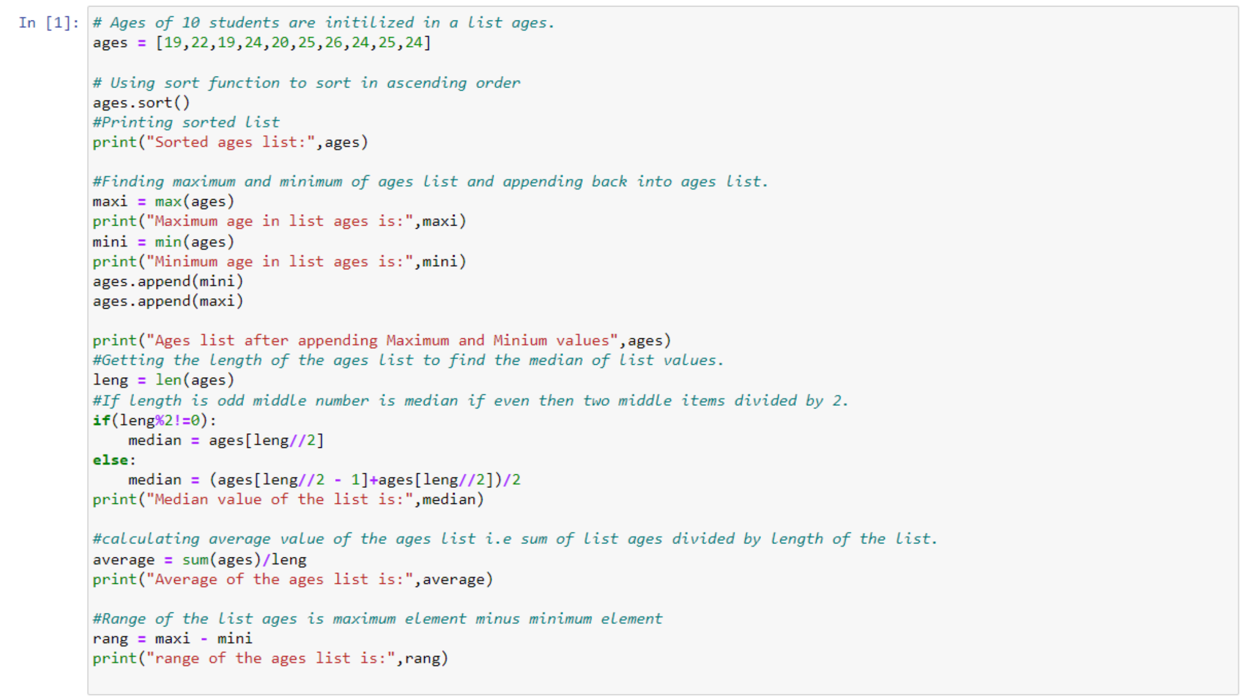
Video: https://drive.google.com/file/d/1rpceHFgnnLIta4YhkFRo9zdT48yh7I_l/view?usp=sharing

Question 1:



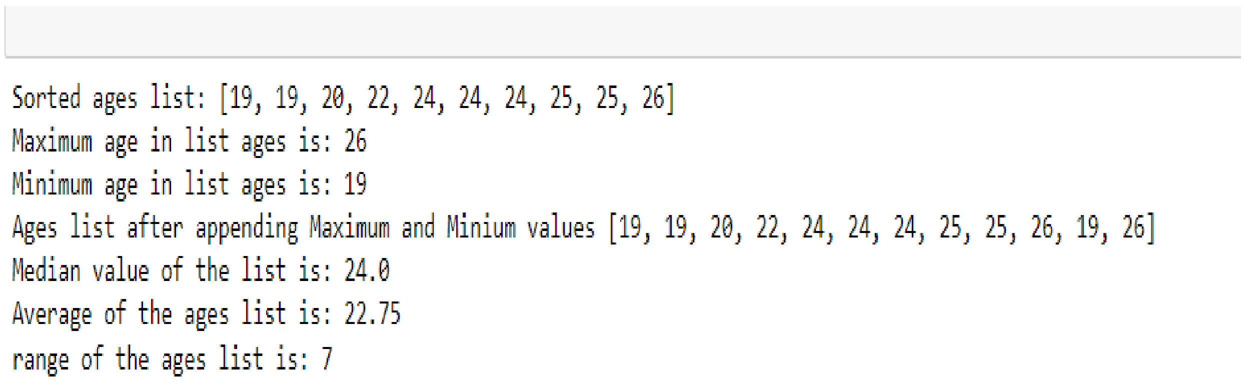
Question 1

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)



```
In [1]: # Ages of 10 students are initilized in a list ages.
        ages = [19,22,19,24,20,25,26,24,25,24]

        # Using sort function to sort in ascending order
        ages.sort()
        #Printing sorted list
        print("Sorted ages list:",ages)

        #Finding maximum and minimum of ages list and appending back into ages list.
        maxi = max(ages)
        print("Maximum age in list ages is:",maxi)
        mini = min(ages)
        print("Minimum age in list ages is:",mini)
        ages.append(mini)
        ages.append(maxi)

        print("Ages list after appending Maximum and Minium values",ages)
        #Getting the length of the ages list to find the median of list values.
        leng = len(ages)
        #If length is odd middle number is median if even then two middle items divided by 2.
        if(leng%2!=0):
            median = ages[leng//2]
        else:
            median = (ages[leng//2 - 1]+ages[leng//2])/2
        print("Median value of the list is:",median)

        #calculating average value of the ages list i.e sum of list ages divided by length of the list.
        average = sum(ages)/leng
        print("Average of the ages list is:",average)

        #Range of the list ages is maximum element minus minimum element
        rang = maxi - mini
        print("range of the ages list is:",rang)
```

Output:



```
Sorted ages list: [19, 19, 20, 22, 24, 24, 24, 25, 25, 26]
Maximum age in list ages is: 26
Minimum age in list ages is: 19
Ages list after appending Maximum and Minium values [19, 19, 20, 22, 24, 24, 24, 25, 25, 26, 19, 26]
Median value of the list is: 24.0
Average of the ages list is: 22.75
range of the ages list is: 7
```

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Explanation:

In the above code we are declaring ages as a list with specified values and sorting it using the inbuilt sort() function where it sort list elements in Ascending order and printing it.

```
ages. Sort()
print("Sorted ages list:”, ages)
```

Later we are finding maximum and minimum values of the list by using max(ages) and min(ages) methods and later we are appending values back to the ages list the output values are first and last elements of the sorted list. maxi = max(ages) mini = min(ages)

In the next part of the code, we are calculating the median value of the list i.e. If the length of the list is odd middle number is the median value if not middle 2 number divided by 2.

```
leng = len(ages)
if(leng%2!=0):
        median = ages[leng//2]
else:
        median = (ages[leng//2 - 1]+ages[leng//2])/2
print("Median value of the list is:",median)
```

The average of the list is fount by calculating the sum of it using sum(ages) function and length of the list by len(ages). At last range is calculated using maximum and minimum values.

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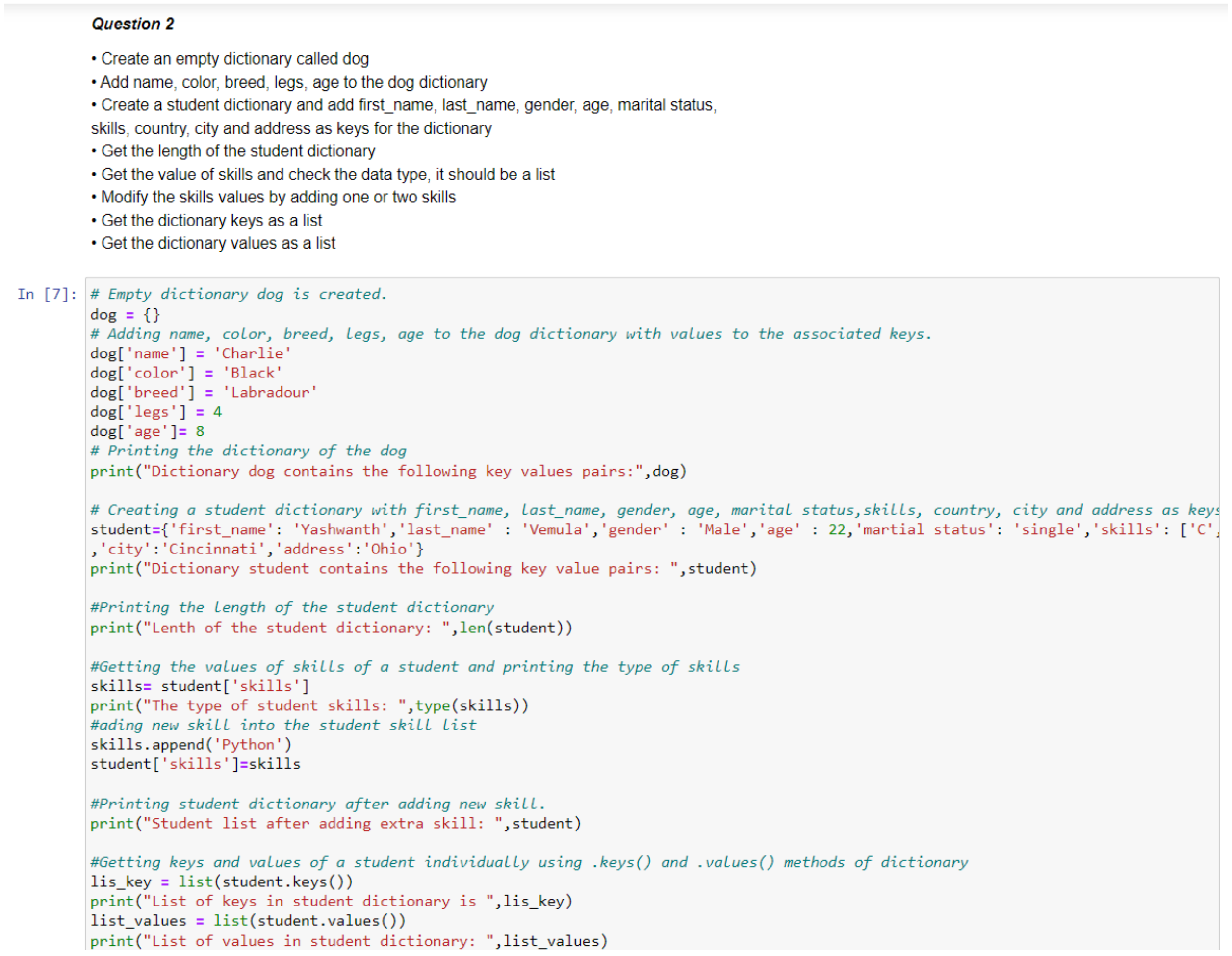
Question 2:

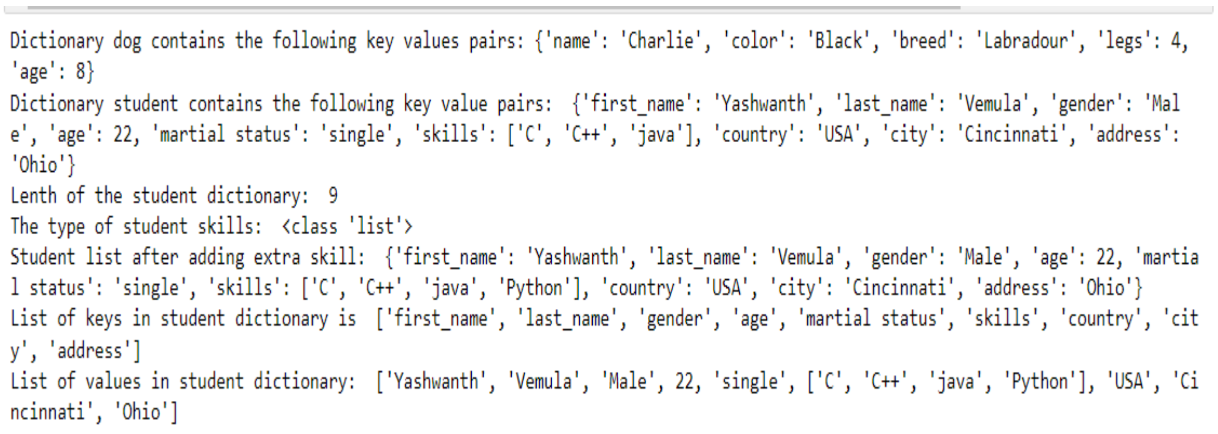


Question 2

- 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

```
In [7]: # Empty dictionary dog is created.
        dog = {}
        # Adding name, color, breed, legs, age to the dog dictionary with values to the associated keys.
        dog['name'] = 'Charlie'
        dog['color'] = 'Black'
        dog['breed'] = 'Labradour'
        dog['legs'] = 4
        dog['age']= 8
        # Printing the dictionary of the dog
        print("Dictionary dog contains the following key values pairs:",dog)

        # Creating a student dictionary with first_name, last_name, gender, age, marital status,skills, country, city and address as keys
        student={'first_name': 'Yashwanth','last_name' : 'Vemula','gender' : 'Male','age' : 22,'martial status': 'single','skills': ['C',
        ,'city':'Cincinnati','address':'Ohio'}
        print("Dictionary student contains the following key value pairs: ",student)

        #Printing the length of the student dictionary
        print("Lenth of the student dictionary: ",len(student))

        #Getting the values of skills of a student and printing the type of skills
        skills= student['skills']
        print("The type of student skills: ",type(skills))
        #ading new skill into the student skill list
        skills.append('Python')
        student['skills']=skills

        #Printing student dictionary after adding new skill.
        print("Student list after adding extra skill: ",student)

        #Getting keys and values of a student individually using .keys() and .values() methods of dictionary
        lis_key = list(student.keys())
        print("List of keys in student dictionary is ",lis_key)
        list_values = list(student.values())
        print("List of values in student dictionary: ",list_values)
```

Output:



```
Dictionary dog contains the following key values pairs: {'name': 'Charlie', 'color': 'Black', 'breed': 'Labradour', 'legs': 4,
'age': 8}
Dictionary student contains the following key value pairs:  {'first_name': 'Yashwanth', 'last_name': 'Vemula', 'gender': 'Mal
e', 'age': 22, 'martial status': 'single', 'skills': ['C', 'C++', 'java'], 'country': 'USA', 'city': 'Cincinnati', 'address':
'Ohio'}
Lenth of the student dictionary:  9
The type of student skills:  <class 'list'>
Student list after adding extra skill:  {'first_name': 'Yashwanth', 'last_name': 'Vemula', 'gender': 'Male', 'age': 22, 'martia
l status': 'single', 'skills': ['C', 'C++', 'java', 'Python'], 'country': 'USA', 'city': 'Cincinnati', 'address': 'Ohio'}
List of keys in student dictionary is  ['first_name', 'last_name', 'gender', 'age', 'martial status', 'skills', 'country', 'cit
y', 'address']
List of values in student dictionary:  ['Yashwanth', 'Vemula', 'Male', 22, 'single', ['C', 'C++', 'java', 'Python'], 'USA', 'Ci
ncinnati', 'Ohio']
```

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Explanation:

In the above code we are declaring a list dog which is empty initially and later we are adding values into it with keys as name, color, breed, legs, age with values associated to each key and printing the dictionary in key value format using print statement.

In the second part we declared student list with keys first name, last name, gender, age, marital status, skills, country, city and address and values associated to each key individually. The values in our case are 'Yaswanth', 'Vemula', 'Male', 22, 'single', ['C', 'C++', 'java', 'Python'], 'USA', 'Cincinnati', 'Ohio'.

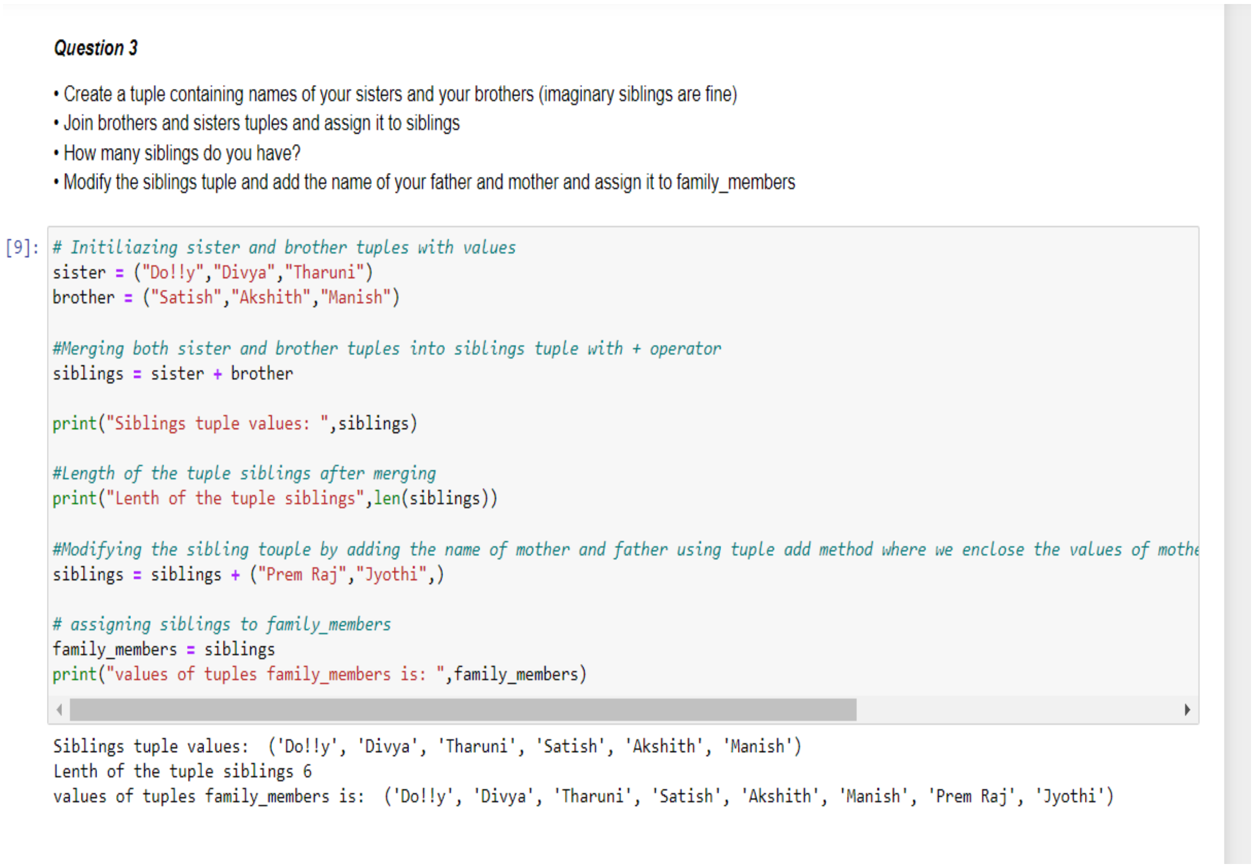
We are finding the length of the student dictionary using len(student). Later we are getting the values of a key skills in student dictionary and printing the type of it which is list in our case.

```
skills= student['skills']
print("The type of student skills: ",type(skills))
```

Later we are getting the keys and values of a student individually and printing them. To get keys and values individually from a dictionary we are using. keys() and .values() methods of dictionary.

```
lis_key = list(student.keys())
print("List of keys in student dictionary is ",lis_key)
list_values = list(student.values())
print("List of values in student dictionary: ",list_values)
```

Question 3:



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_members

```
[9]: # Initiliazing sister and brother tuples with values
sister = ("Do!!y","Divya","Tharuni")
brother = ("Satish","Akshith","Manish")

#Merging both sister and brother tuples into siblings tuple with + operator
siblings = sister + brother

print("Siblings tuple values: ",siblings)

#Length of the tuple siblings after merging
print("Lenth of the tuple siblings",len(siblings))

#Modifying the sibling touple by adding the name of mother and father using tuple add method where we enclose the values of mothe
siblings = siblings + ("Prem Raj","Jyothi",)

# assigning siblings to family_members
family_members = siblings
print("values of tuples family_members is: ",family_members)
```

```
Siblings tuple values:  ('Do!!y', 'Divya', 'Tharuni', 'Satish', 'Akshith', 'Manish')
Lenth of the tuple siblings 6
values of tuples family_members is:  ('Do!!y', 'Divya', 'Tharuni', 'Satish', 'Akshith', 'Manish', 'Prem Raj', 'Jyothi')
```

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Explanation:

In the code above we are initializing tuple sister and brother with values in it. The values of tuple are enc losed in (“”,””).
We are appending 2 tuples sister and brother into one using concatenation operator “+” and storing in siblings’ tuple.

```
    siblings = sister + brother
```

The length of the tuple siblings is found using len() function.

```
    print("Lenth of the tuple siblings",len(siblings))
```

Later we are modifying the tuple siblings by adding the name of mother and father using + operator whe re we enclose the names of mother and father in () with comma at the end because we can’t add values i n tuple we have to convert into list before adding.

```
siblings = siblings + ("Prem Raj","Jyothi",)
    family_members = siblings
    print("values of tuples family_members is: ",family_members)
```

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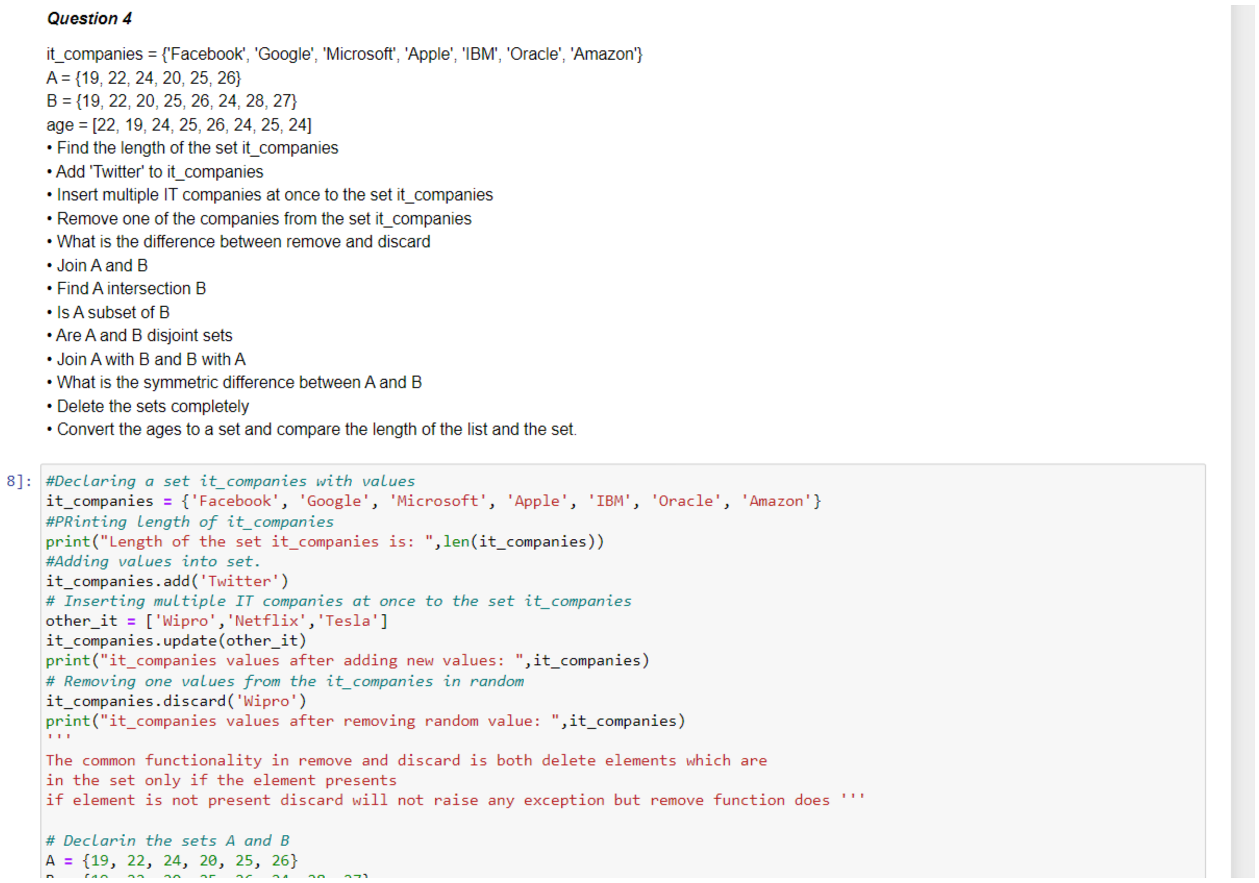
Question 4:



Question 4

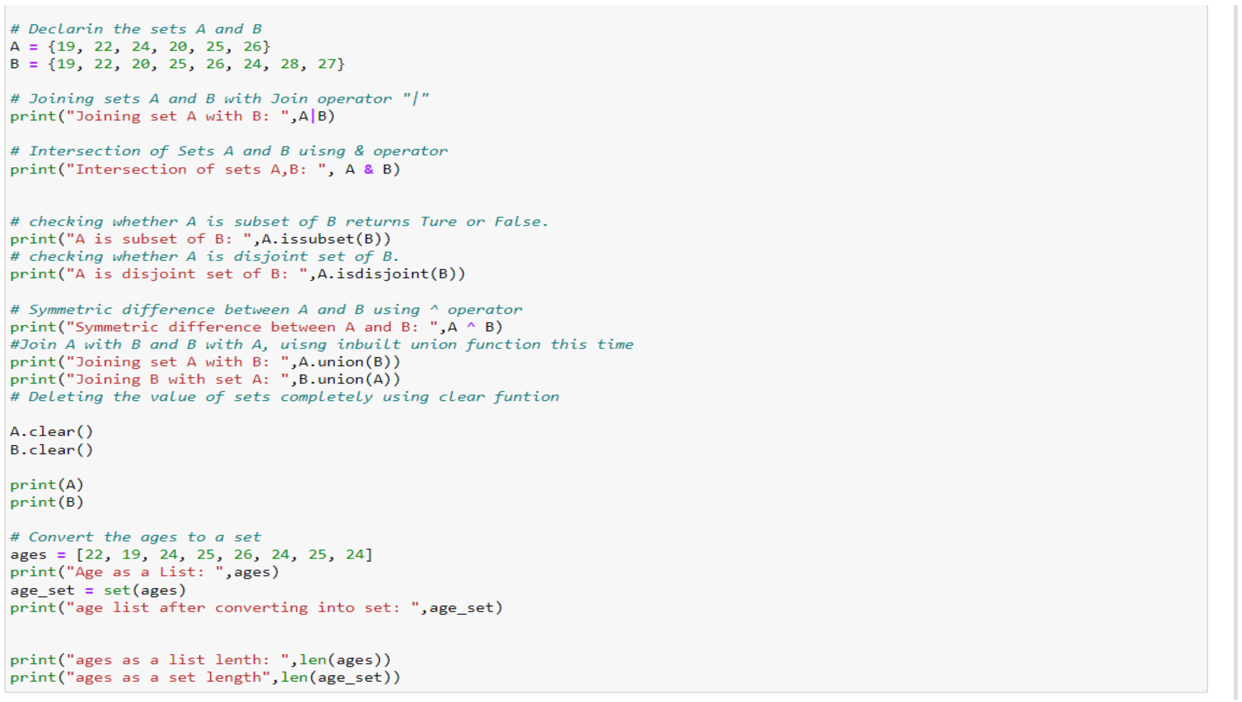
it_companies = {'Facebook', 'Google', 'Microsoft', 'Apple', 'IBM', 'Oracle', 'Amazon'}
A = {19, 22, 24, 20, 25, 26}
B = {19, 22, 20, 25, 26, 24, 28, 27}
age = [22, 19, 24, 25, 26, 24, 25, 24]

- 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.

8]:

```
#Declaring a set it_companies with values
it_companies = {'Facebook', 'Google', 'Microsoft', 'Apple', 'IBM', 'Oracle', 'Amazon'}
#PRinting length of it_companies
print("Length of the set it_companies is: ",len(it_companies))
#Adding values into set.
it_companies.add('Twitter')
# Inserting multiple IT companies at once to the set it_companies
other_it = ['Wipro','Netflix','Tesla']
it_companies.update(other_it)
print("it_companies values after adding new values: ",it_companies)
# Removing one values from the it_companies in random
it_companies.discard('Wipro')
print("it_companies values after removing random value: ",it_companies)
'''
The common functionality in remove and discard is both delete elements which are
in the set only if the element presents
if element is not present discard will not raise any exception but remove function does '''

# Declarin the sets A and B
A = {19, 22, 24, 20, 25, 26}
```



```
# Declarin the sets A and B
A = {19, 22, 24, 20, 25, 26}
B = {19, 22, 20, 25, 26, 24, 28, 27}

# Joining sets A and B with Join operator "|"
print("Joining set A with B: ",A|B)

# Intersection of Sets A and B uisng & operator
print("Intersection of sets A,B: ", A & B)


# checking whether A is subset of B returns Ture or False.
print("A is subset of B: ",A.issubset(B))
# checking whether A is disjoint set of B.
print("A is disjoint set of B: ",A.isdisjoint(B))

# Symmetric difference between A and B using ^ operator
print("Symmetric difference between A and B: ",A ^ B)
#Join A with B and B with A, uisng inbuilt union function this time
print("Joining set A with B: ",A.union(B))
print("Joining B with set A: ",B.union(A))
# Deleting the value of sets completely using clear funtion

A.clear()
B.clear()

print(A)
print(B)

# Convert the ages to a set
ages = [22, 19, 24, 25, 26, 24, 25, 24]
print("Age as a List: ",ages)
age_set = set(ages)
print("age list after converting into set: ",age_set)


print("ages as a list lenth: ",len(ages))
print("ages as a set length",len(age_set))
```

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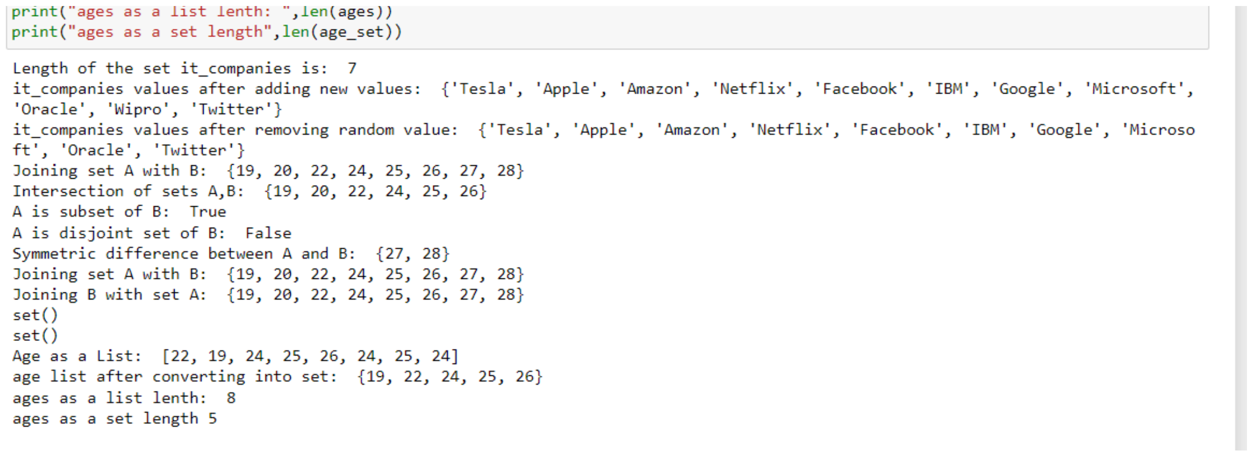
Output:



```
print("ages as a list lenth: ",len(ages))
print("ages as a set length",len(age_set))
```

```
Length of the set it_companies is:  7
it_companies values after adding new values:  {'Tesla', 'Apple', 'Amazon', 'Netflix', 'Facebook', 'IBM', 'Google', 'Microsoft',
'Oracle', 'Wipro', 'Twitter'}
it_companies values after removing random value:  {'Tesla', 'Apple', 'Amazon', 'Netflix', 'Facebook', 'IBM', 'Google', 'Microso
ft', 'Oracle', 'Twitter'}
Joining set A with B:  {19, 20, 22, 24, 25, 26, 27, 28}
Intersection of sets A,B:  {19, 20, 22, 24, 25, 26}
A is subset of B:  True
A is disjoint set of B:  False
Symmetric difference between A and B:  {27, 28}
Joining set A with B:  {19, 20, 22, 24, 25, 26, 27, 28}
Joining B with set A:  {19, 20, 22, 24, 25, 26, 27, 28}
set()
set()
Age as a List:  [22, 19, 24, 25, 26, 24, 25, 24]
age list after converting into set:  {19, 22, 24, 25, 26}
ages as a list lenth:  8
ages as a set length 5
```

Explanation:

Here given 3 sets and a list and asked to perform below operations, using len() we found out the length of the sets and we need to update the set by adding an item, we used .add() to add an item and .update() to add multiple items at a time into the set. And discard() is used to remove an item from the set. And the difference between remove() and discard() is remove method returns an error if the element is not present in the set, discard removes an item and doesn't return an error. Using |Operator we have joined set A&B using & Operator we perform the intersection for A&B. issubset() returns if a set is subset of another .isdisjoint() returns wheather A&B are disjoint or not it returns true/false. ^ is used to perform symmetric difference between A&B. del is used to delete a set. To convert a list into a set we used set(List).

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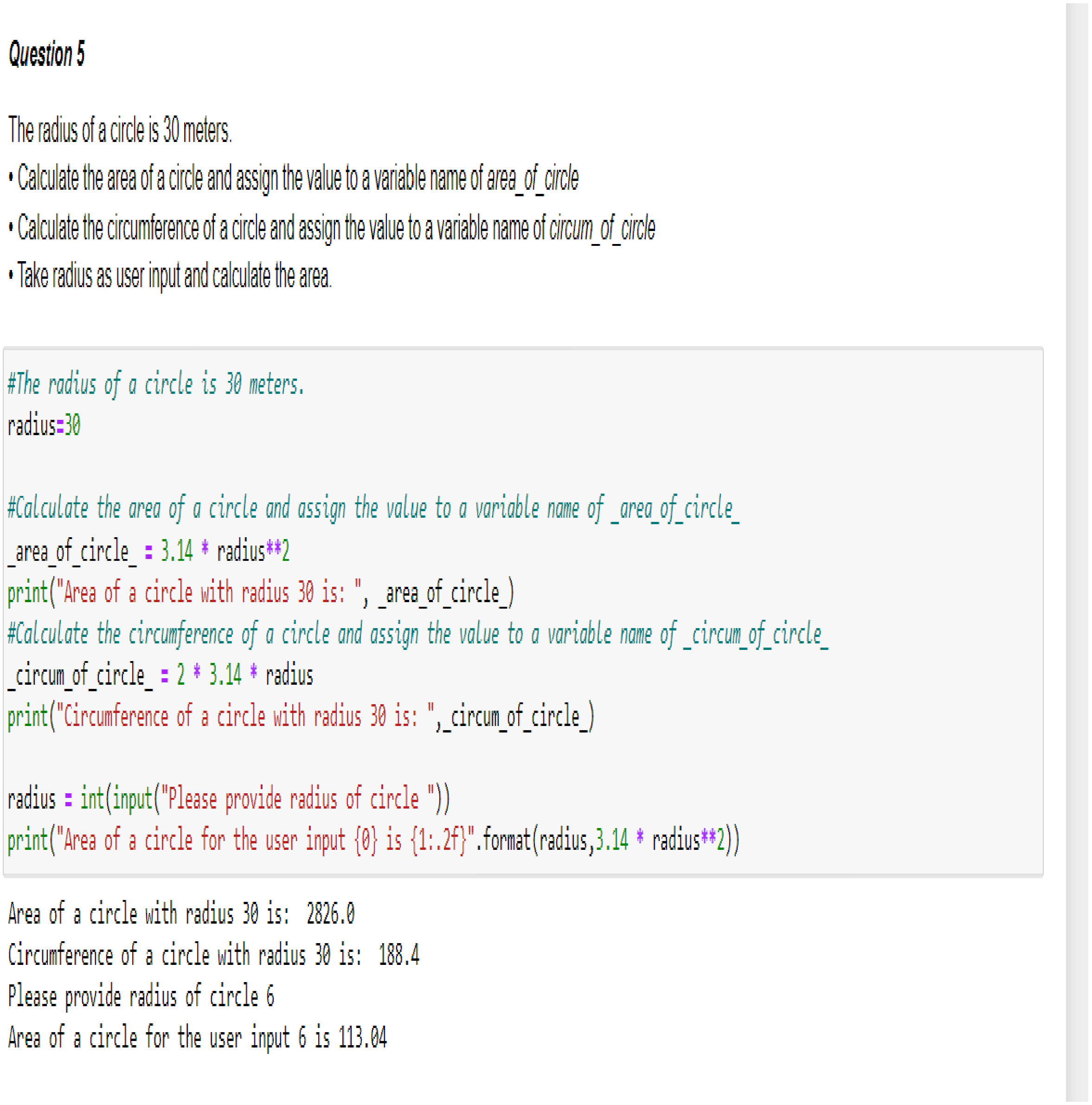
Question 5:



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.

```
In [29]: #The radius of a circle is 30 meters.
radius=30

#Calculate the area of a circle and assign the value to a variable name of _area_of_circle_
_area_of_circle_ = 3.14 * radius**2
print("Area of a circle with radius 30 is: ", _area_of_circle_)
#Calculate the circumference of a circle and assign the value to a variable name of _circum_of_circle_
_circum_of_circle_ = 2 * 3.14 * radius
print("Circumference of a circle with radius 30 is: ",_circum_of_circle_)

radius = int(input("Please provide radius of circle "))
print("Area of a circle for the user input {0} is {1:.2f}".format(radius,3.14 * radius**2))
```

```
Area of a circle with radius 30 is:  2826.0
Circumference of a circle with radius 30 is:  188.4
Please provide radius of circle 6
Area of a circle for the user input 6 is 113.04
```

Explanation:

In the above code we are calculating the area and circumference of the circle by considering radius of the circle as 30 meters as mentioned in question.

We are storing the area of the circle in variable _area_of_circle_ where the formula is 3.14 * (r**2) and circumference in _circum_of_circle_ where formula is 2*3.14*r.

Later we are prompting user for input using statement int(input("Provide radius of circle"))

and calculating the area of user input radius and printing it using format method.

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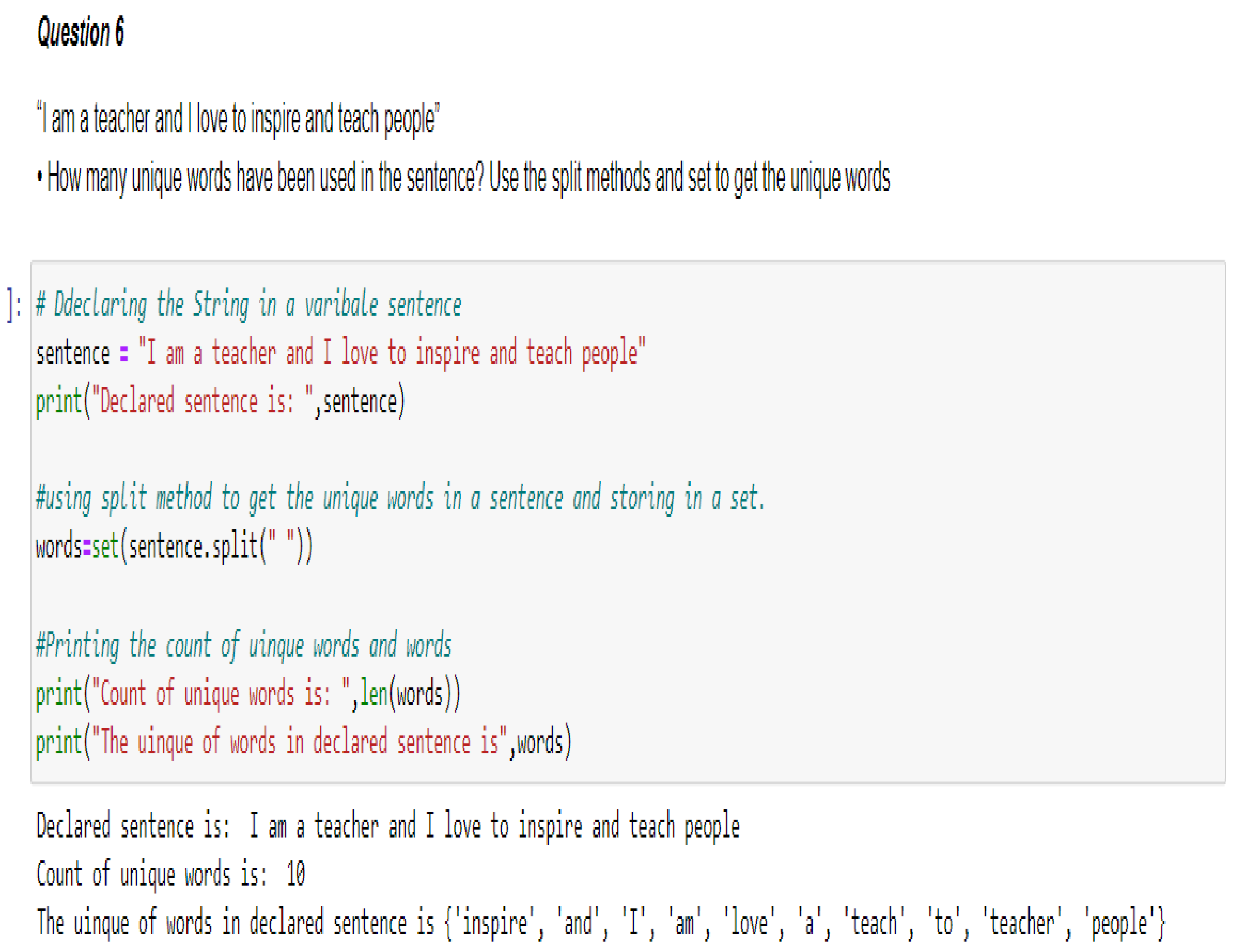
Question 6:



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

```
# Ddeclaring the String in a varibale sentence
sentence = "I am a teacher and I love to inspire and teach people"
print("Declared sentence is: ",sentence)

#using split method to get the unique words in a sentence and storing in a set.
words=set(sentence.split(" "))

#Printing the count of uinque words and words
print("Count of unique words is: ",len(words))
print("The uinque of words in declared sentence is",words)
```

```
Declared sentence is:  I am a teacher and I love to inspire and teach people
Count of unique words is:  10
The uinque of words in declared sentence is {'inspire', 'and', 'I', 'am', 'love', 'a', 'teach', 'to', 'teacher', 'people'}
```

Explanation:

In the above code we are declaring a variable sentence with string inside it as mentioned. Using the split method we are dividing the sentence into individual words where we specify the delimiter as " " which breaks and stores whenever it see space in between words. Storing in words variable which of type set will not allow any duplicates in it.

words=set(sentence.split(" "))
Later we are printing the count of unique words using the len() method and printing individual words in a set.

    print("Count of unique words is: ",len(words))
    print("The uinque of words in declared sentence is",words)

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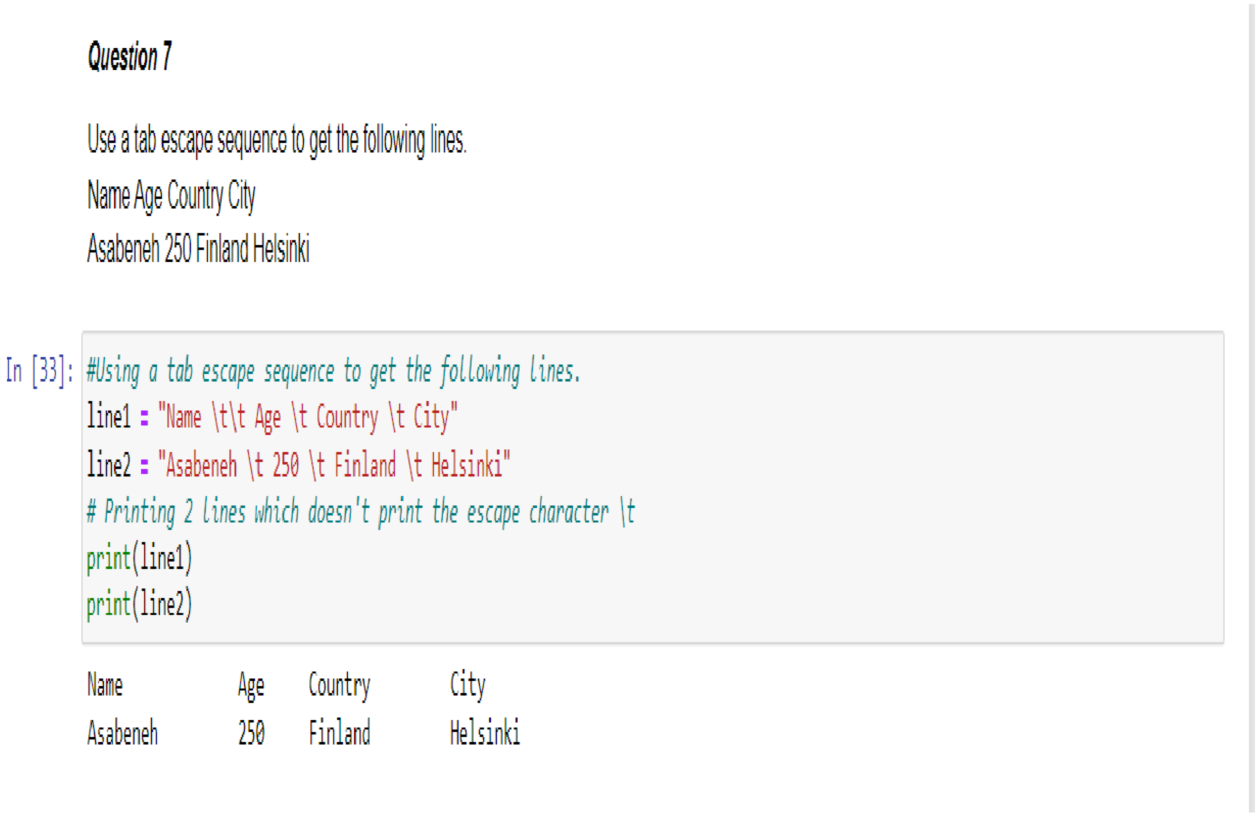
Question 7:



Question 7

Use a tab escape sequence to get the following lines.

Name Age Country City

Asabeneh 250 Finland Helsinki

```
In [33]: #Using a tab escape sequence to get the following lines.
         line1 = "Name \t\t Age \t Country \t City"
         line2 = "Asabeneh \t 250 \t Finland \t Helsinki"
         # Printing 2 lines which doesn't print the escape character \t
         print(line1)
         print(line2)
```

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

Explanation:

We had got the following output as mentioned in question, here in the code we have use \t escape character where it gives a space between strings whenever it sees it. By using \t escape character we had got the following pattern output.

line1 = "Name \t\t Age \t Country \t City"
line2 = "Asabeneh \t 250 \t Finland \t Helsinki"

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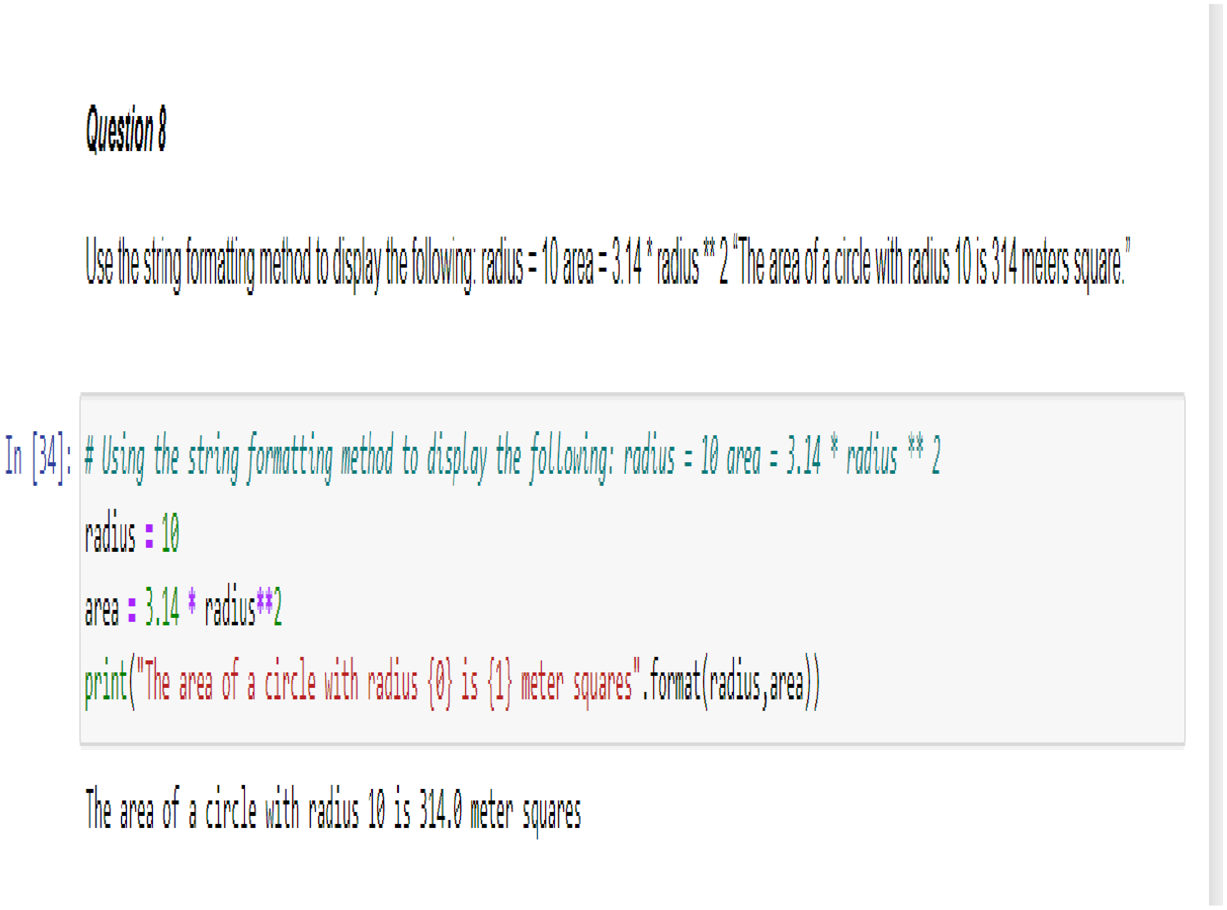
Question 8:



Question 8

Use the string formatting method to display the following: radius = 10 area = 3.14 * radius ** 2 "The area of a circle with radius 10 is 314 meters square."

```
In [34]: # Using the string formatting method to display the following: radius = 10 area = 3.14 * radius ** 2
         radius = 10
         area = 3.14 * radius**2
         print("The area of a circle with radius {0} is {1} meter squares".format(radius,area))
```

```
The area of a circle with radius 10 is 314.0 meter squares
```

Explanation:

In the above code we are calculating the area of a circle by using the formula 3.14 * (r**2) where r value equal to 10 in our case and later we are printing it using string formatting method where we declare format(radius,area) in print statement. This format method inserts values at specified locations in our case we declared locations as 0 for radius and 1 for area but 0,1 are optional we can ignore those.

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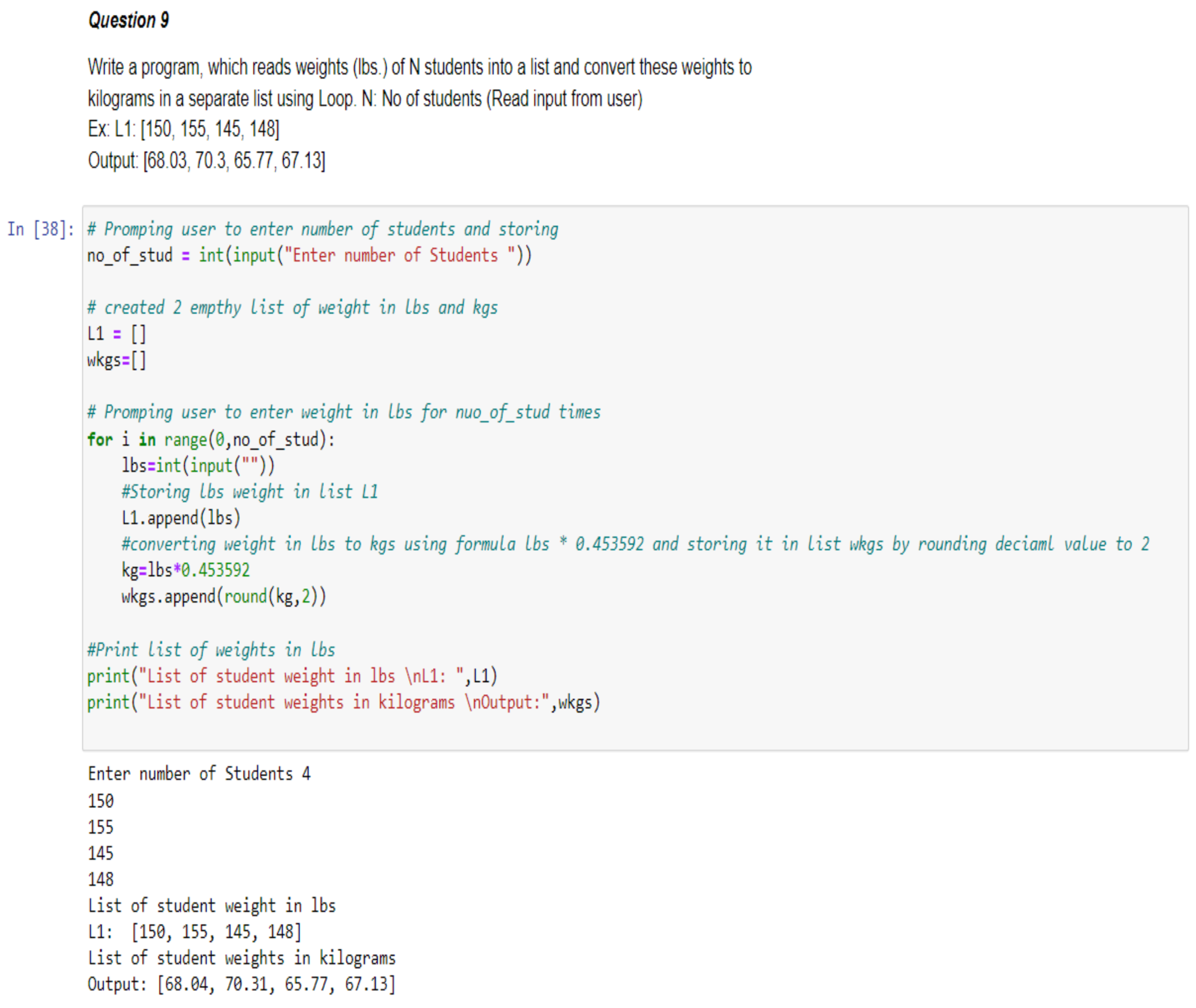
Question 9:



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]

```
In [38]: # Promping user to enter number of students and storing
no_of_stud = int(input("Enter number of Students "))

# created 2 empthy list of weight in lbs and kgs
L1 = []
wkgs=[]

# Promping user to enter weight in lbs for nuo_of_stud times
for i in range(0,no_of_stud):
    lbs=int(input(""))
    #Storing lbs weight in list L1
    L1.append(lbs)
    #converting weight in lbs to kgs using formula lbs * 0.453592 and storing it in list wkgs by rounding deciaml value to 2
    kg=lbs*0.453592
    wkgs.append(round(kg,2))

#Print list of weights in lbs
print("List of student weight in lbs \nL1: ",L1)
print("List of student weights in kilograms \nOutput:",wkgs)
```

```
Enter number of Students 4
150
155
145
148
List of student weight in lbs
L1:  [150, 155, 145, 148]
List of student weights in kilograms
Output: [68.04, 70.31, 65.77, 67.13]
```

Explanation:

In the above code we are prompting user to enter the student count and storing it in no_of_stud variable.

We are declaring 2 empty lists L1[] and wkgs[] to store weight of student in respective lists.

After getting user input we are iterating for no_of_stud to get the weight of student in lbs and within the same iteration we are converting weight in lbs to kilograms by using formula lbs*0.453592 and appending weight in lbs to list L1[] and weight in kilograms to list wkgs[].

```
for i in range(0,no_of_stud):
        lbs=int(input(""))
        L1.append(lbs)
        kg=lbs*0.453592
        wkgs.append(round(kg,2))
```

In the last part of the code, we are printing both the lists.

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Question 10:

The diagram below shows a dataset with 2 classes and 8 data points, each with only one feature value, labeled f. Note that there are two data points with the same feature value of 6. These are shown as two x's one above the other. Provide stepwise mathematical solution, do not write code for it.

1. Divide this data equally into two parts. Use first part as training and second part as testing. Using KNN classifier, for K=3, what would be the predicted outputs for the test samples? Show how you arrived at your answer.

2. Compute the confusion matrix for this and calculate accuracy, sensitivity, and specificity values.

Explanation:

We are given a data set which holds 2 classes represented by O and X. There are 8 data points in a set which are labeled to feature f. The data set is [1,2,3,6,6,7,10,11] we divide the data set equally and use them as training and testing data samples using KNN classifier where K = 3 each object is grouped to its three nearest neighbors the distance between these objects can be calculated using Euclidean distance d(p,q)=sqrt((p-q)^2). The training and testing samples used are [1,2,3,6] and [6,7,10,11]. From this method we have calculated the distance between each data point and the nearest neighbors for the test samples or 6=[2,3,6] , 7=[3,6,6,], 10=[6,6,7], 11=[6,6,7].

The confusion matrix for the following is

	Predicted	
Actual	2 (True Positive)	0 (False Negative)
	0 (False Positive)	2 (True Negative)

Accuracy = (T.Positive + T.Negative)/ Total=(2+2)/4=1

Sensitivity = T.Positive/(T.Positive + F.Negative)/ Total=(2/2)=1

Specificity = T.Negative/(F.Positive + T.Negative)/ Total=(2/2)=1