Machine Learning (Assignment # 1)

Question 1

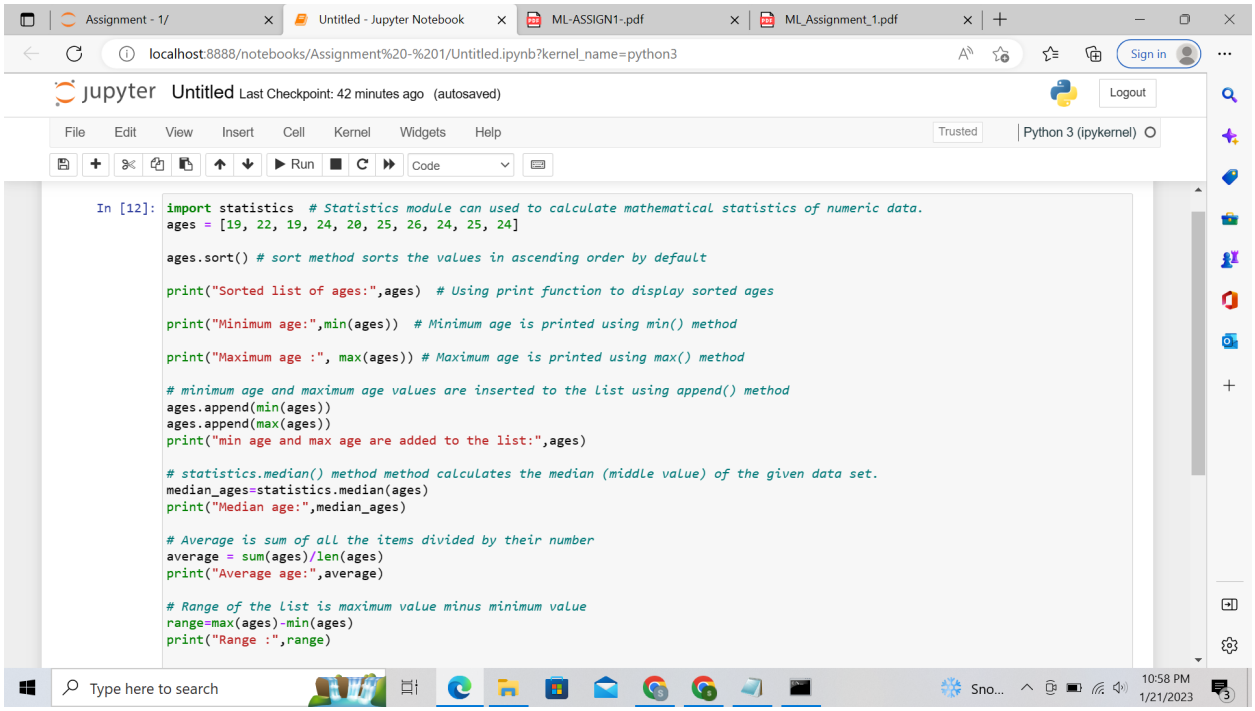
The following is a list of 10 students ages:

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)

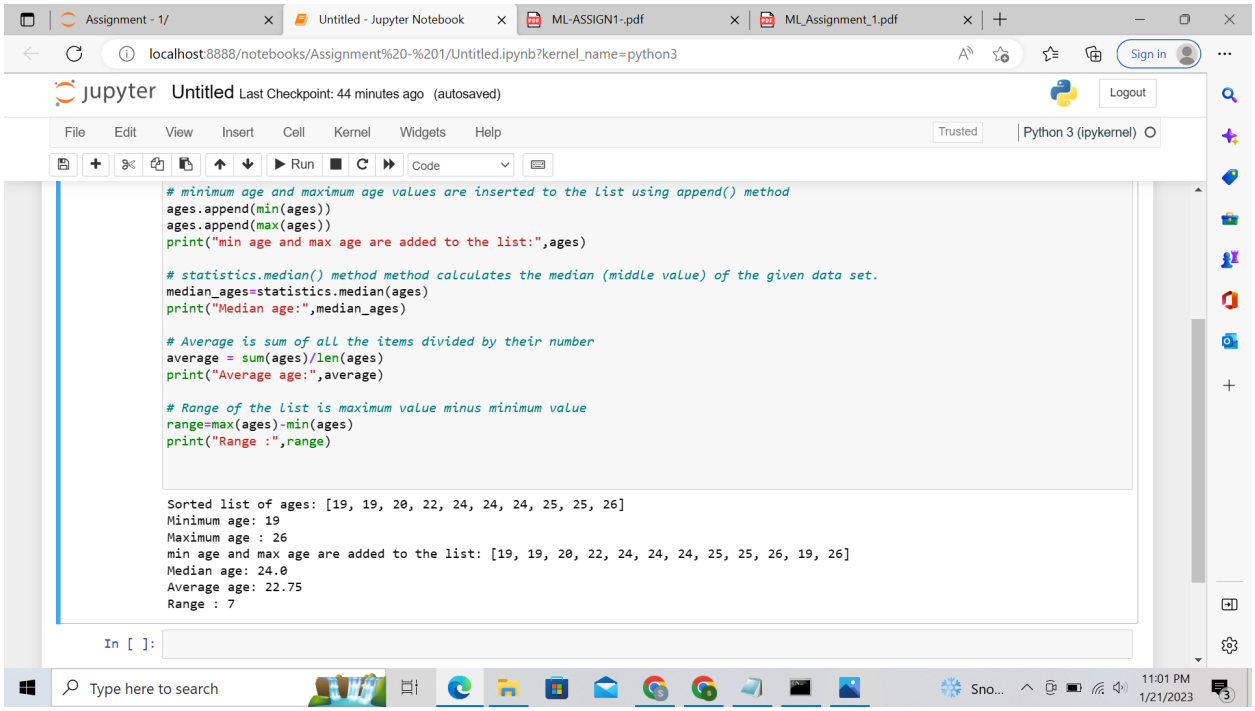
Ans

Python code :



1) Python has a built-in module named statistics that we can use to calculate mathematical statistics of numeric data.
2) So we have imported the statistics module.
3) The ages list is sorted using the sort() method.
4) The minimum age and maximum age is printed using the min() and max() method.
5) The minimum age and maximum age is appended to the list using append() function.
6) The Statistics module has a median method to calculate the median of the list.
7) Average of the list can be calculated by adding all the items using sum() function and divide by the length of the list i.e number of items
8) Range of the list is the maximum value of the list minus the minimum value of the list.

Output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Python 3 (ipykernel)
Run
Code
# minimum age and maximum age values are inserted to the list using append() method
ages.append(min(ages))
ages.append(max(ages))
print("min age and max age are added to the list:",ages)
# statistics.median() method method calculates the median (middle value) of the given data set.
median_ages=statistics.median(ages)
print("Median age:",median_ages)
# Average is sum of all the items divided by their number
average = sum(ages)/len(ages)
print("Average age:",average)
# Range of the list is maximum value minus minimum value
range=max(ages)-min(ages)
print("Range :",range)
Sorted list of ages: [19, 19, 20, 22, 24, 24, 24, 25, 25, 26]
Minimum age: 19
Maximum age : 26
min age and max age are added to the list: [19, 19, 20, 22, 24, 24, 24, 25, 25, 26, 19, 26]
Median age: 24.0
Average age: 22.75
Range : 7
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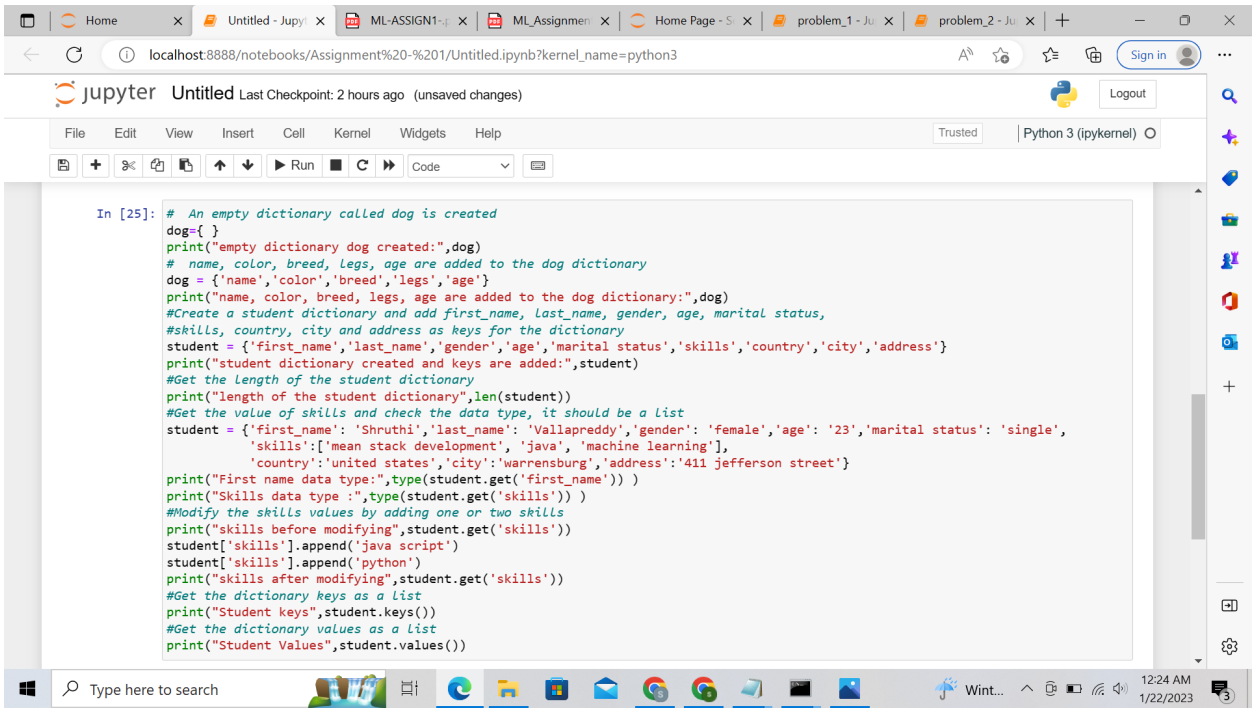
Question 2

- 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

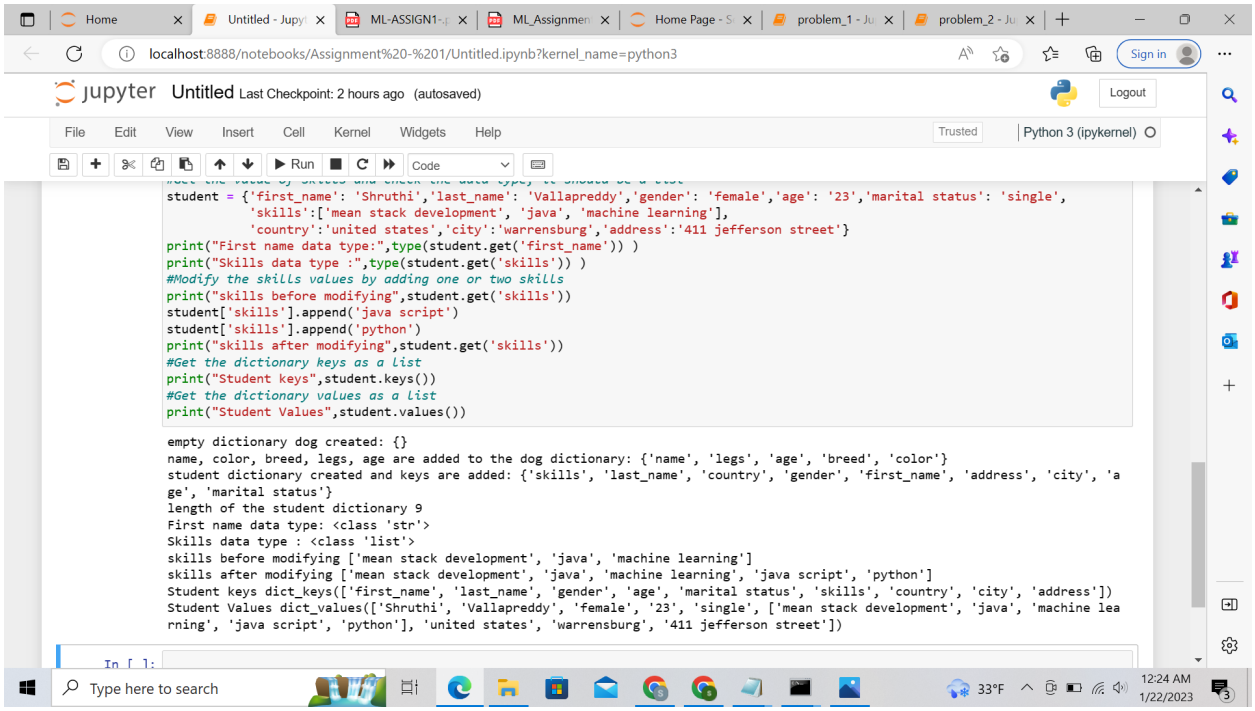
Ans

Python code



1. Empty dictionary named dog is created.
2. Name, color, breed, legs, age to the dog dictionary are added to the dictionary
3. Student dictionary is created and keys are added to the dictionary
4. The length of the dictionary is printed using len() function
5. The values are given to the dictionary. The key skills have the value type of list.
6. The values of skills field is modified by adding two more skills
7. Dictionary keys are printed as a list using student.keys().
8. Dictionary values are printed as a list using student.values().

Output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Python 3 (ipykernel)
Run
Code
student = {'first_name': 'Shruthi','last_name': 'Vallapreddy','gender': 'female','age': '23','marital status': 'single',
'skills':['mean stack development', 'java', 'machine learning'],
'country':'united states','city':'warrensburg','address':'411 jefferson street'}
print("First name data type:",type(student.get('first_name')))
print("Skills data type :",type(student.get('skills')))
#Modify the skills values by adding one or two skills
print("skills before modifying",student.get('skills'))
student['skills'].append('java script')
student['skills'].append('python')
print("skills after modifying",student.get('skills'))
#Get the dictionary keys as a list
print("Student keys",student.keys())
#Get the dictionary values as a list
print("Student Values",student.values())
empty dictionary dog created: {}
name, color, breed, legs, age are added to the dog dictionary: {'name', 'legs', 'age', 'breed', 'color'}
student dictionary created and keys are added: {'skills', 'last_name', 'country', 'gender', 'first_name', 'address', 'city', 'a
ge', 'marital status'}
length of the student dictionary 9
First name data type: <class 'str'>
Skills data type : <class 'list'>
skills before modifying ['mean stack development', 'java', 'machine learning']
skills after modifying ['mean stack development', 'java', 'machine learning', 'java script', 'python']
Student keys dict_keys(['first_name', 'last_name', 'gender', 'age', 'marital status', 'skills', 'country', 'city', 'address'])
Student Values dict_values(['Shruthi', 'Vallapreddy', 'female', '23', 'single', ['mean stack development', 'java', 'machine lea
rning', 'java script', 'python'], 'united states', 'warrensburg', '411 jefferson street'])
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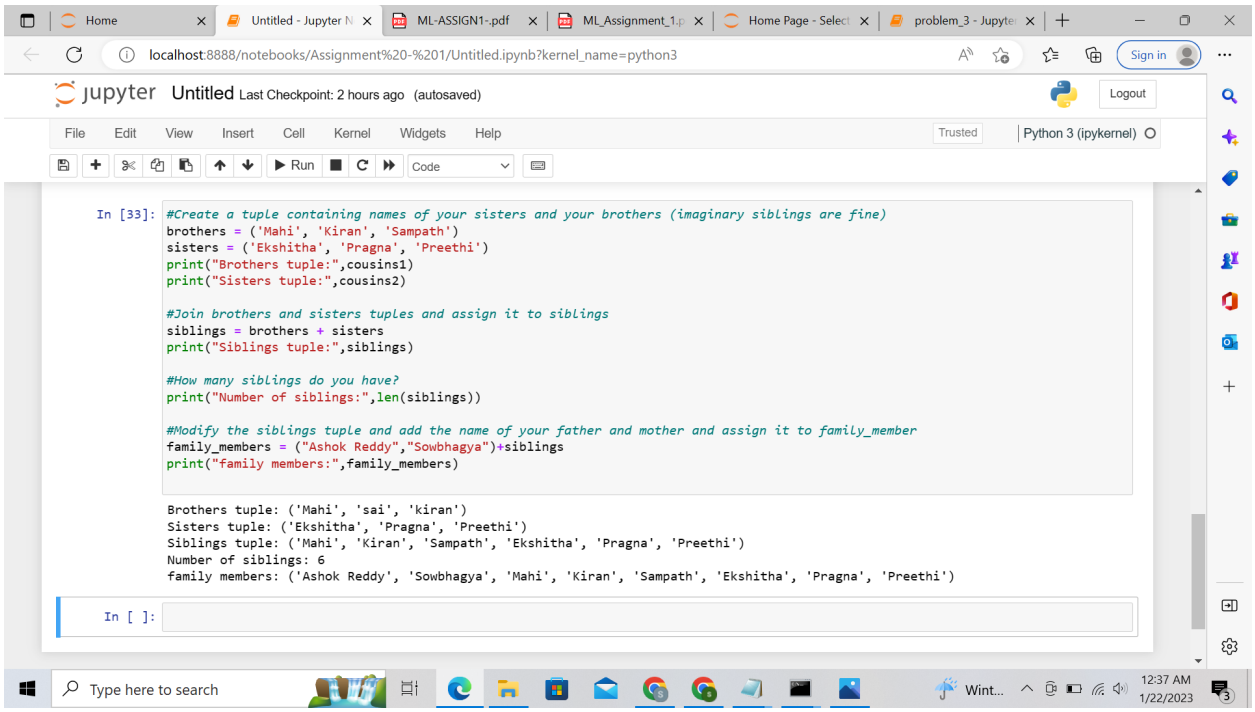
Question 3

- 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

Ans

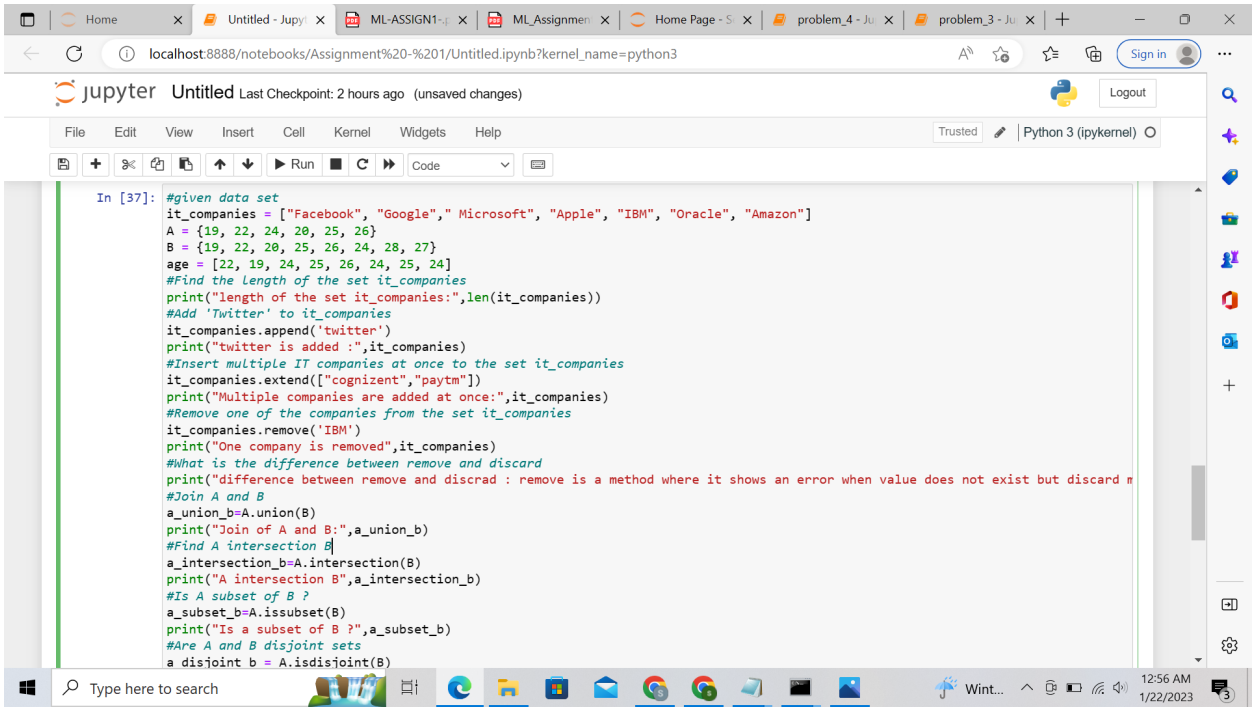


1) Brothers and sisters tuple is created and assigned some values
2) Brothers and sisters tuples are added and assigned to siblings tuple
3) Total number of siblings can be found out using the len() function.
4) Mother and father name is added to the siblings tuple and assigned to family_members tuple

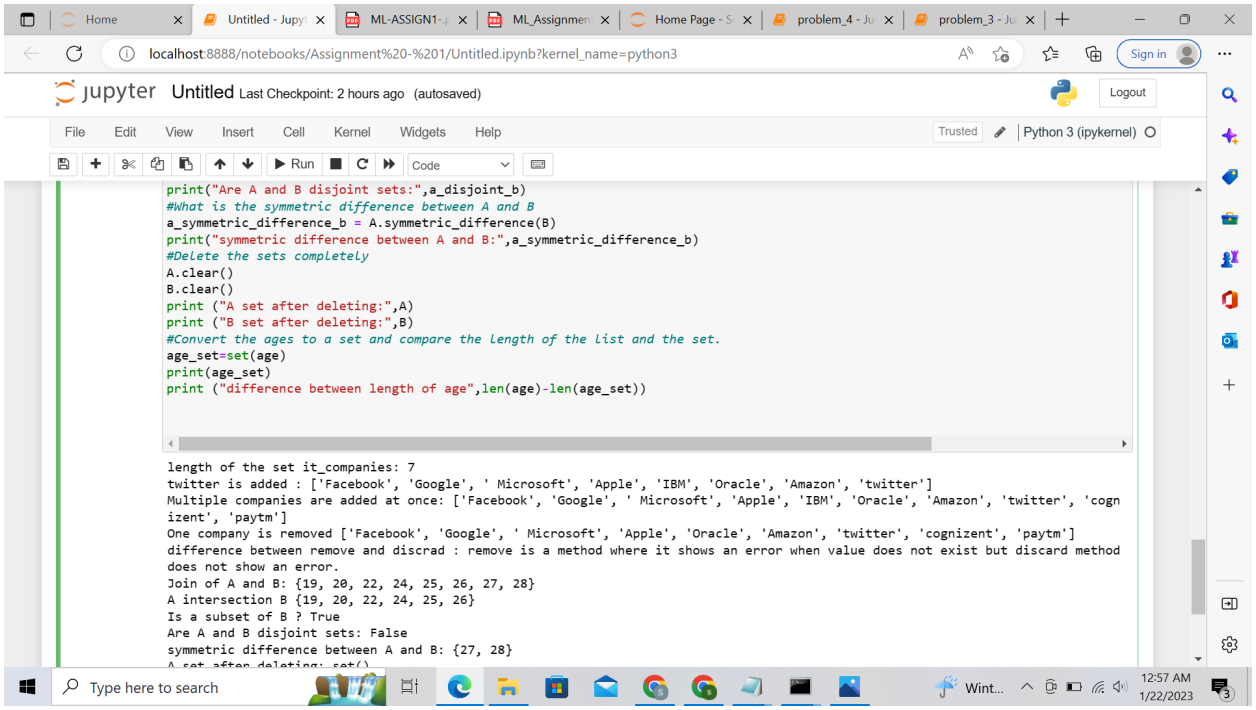
Question 4

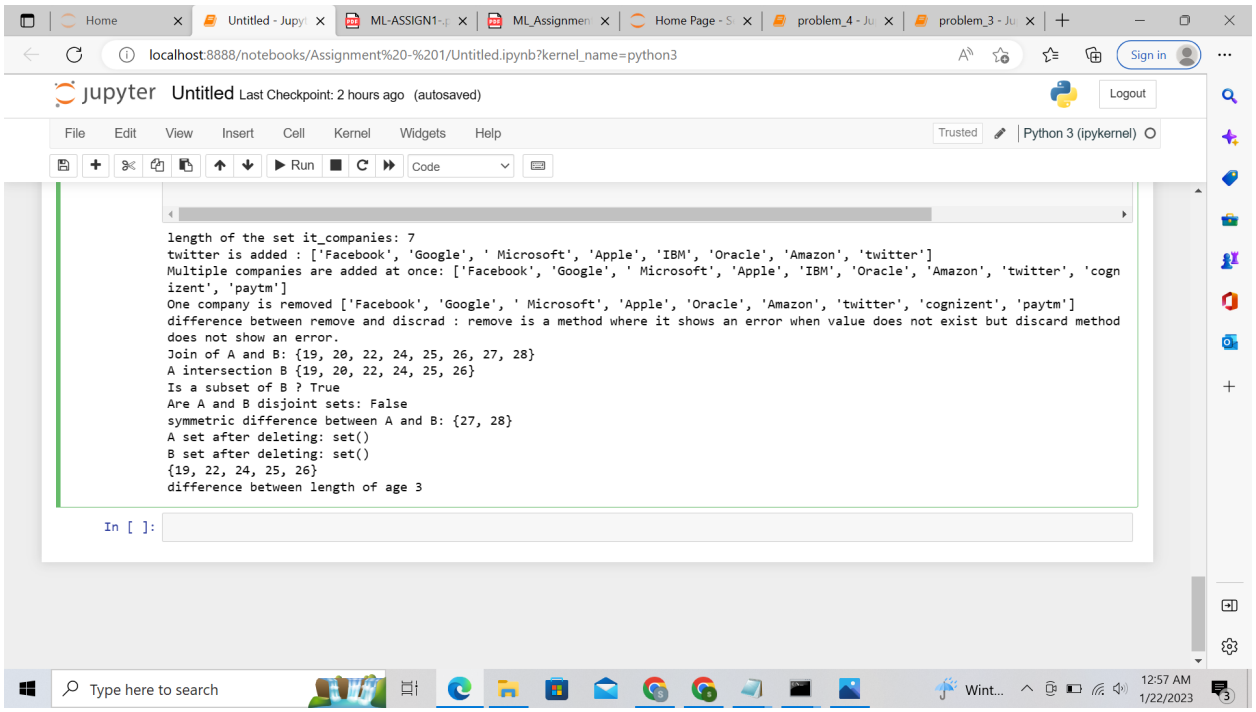
it_companies = {'Facebook', 'Google', 'Microsoft', 'Apple', 'IBM', 'Oracle', 'Amazon'}
A = {19, 22, 24, 20, 25, 26}
B = {19, 22, 20, 25, 26, 24, 28, 27}
age = [22, 19, 24, 25, 26, 24, 25, 24]

- 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.



1) Sets are written with curly brackets, set is a collection which is unordered, unchangeable, and unindexed
2) To add one item to a set use the add() method and To add items from another set into the current set, use the update() method
3) To remove an item in a set, use the remove() or the discard() method. remove method raises an error when value does'nt exists where as discard method doesn't raise an error





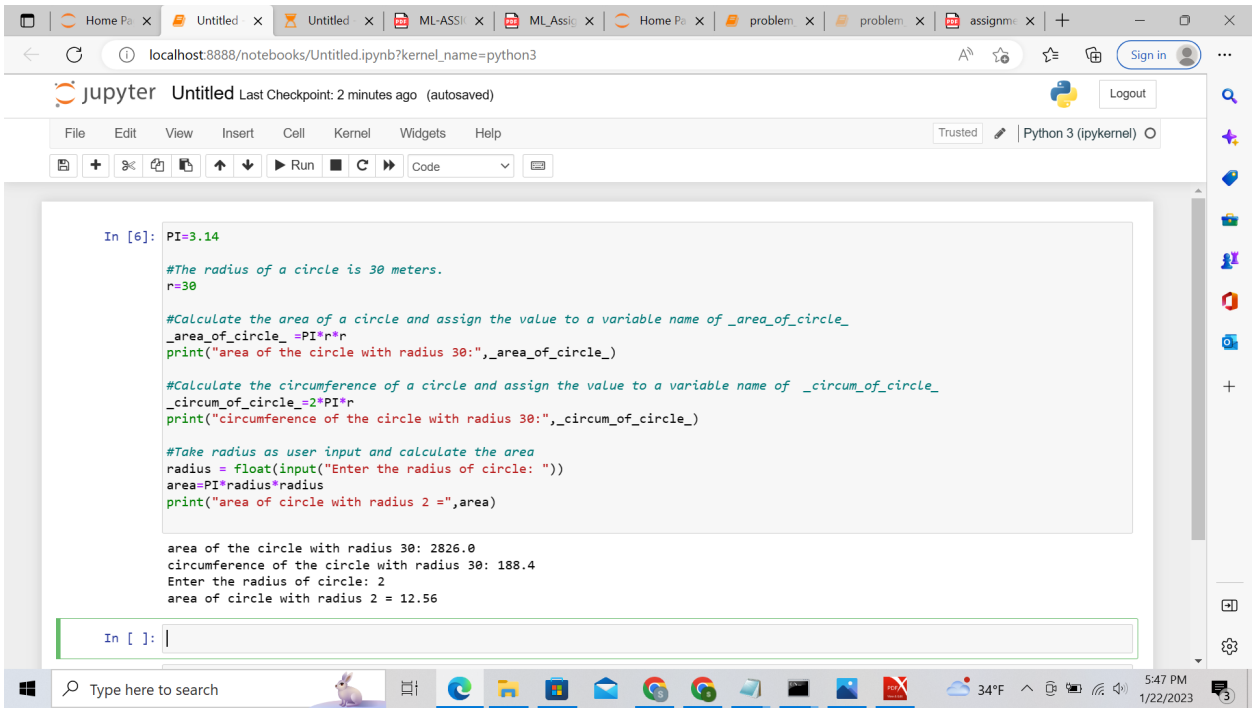
4) Union() return a set that contains all items from both sets, duplicates are excluded, intersection() returns a set that contains the items that exist in both set A, and set B,issubset() return True if all items in set x are present in set y, is disjoint() return True if no items in set x is present in set symmetric _difference() return a set that contains all items from both sets, except items that are present in both sets
5) del keyword will delete the set completely

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

Ans



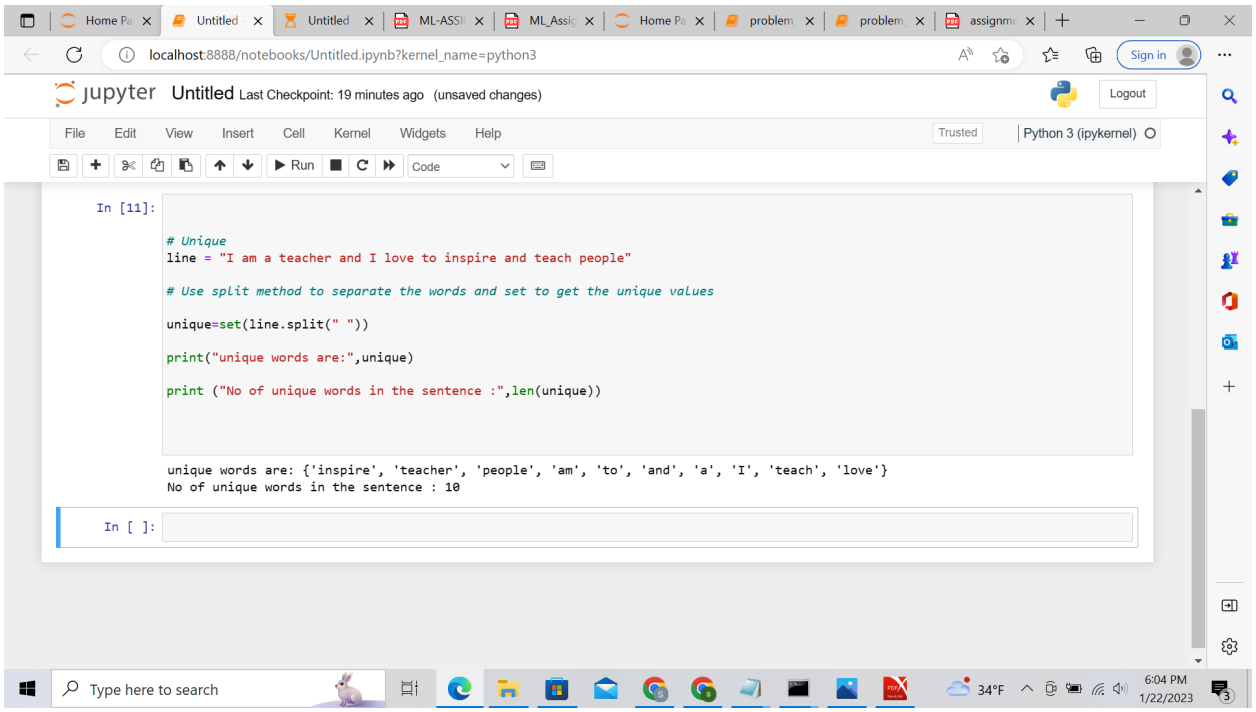
1) * is a multiplication operator.
2) And by using the formula of area and circumference of the circle we can calculate those by using mathematical operators
3) input() allows the user to pass the dynamic input.
4) And the area is calculated and printed

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.

Ans

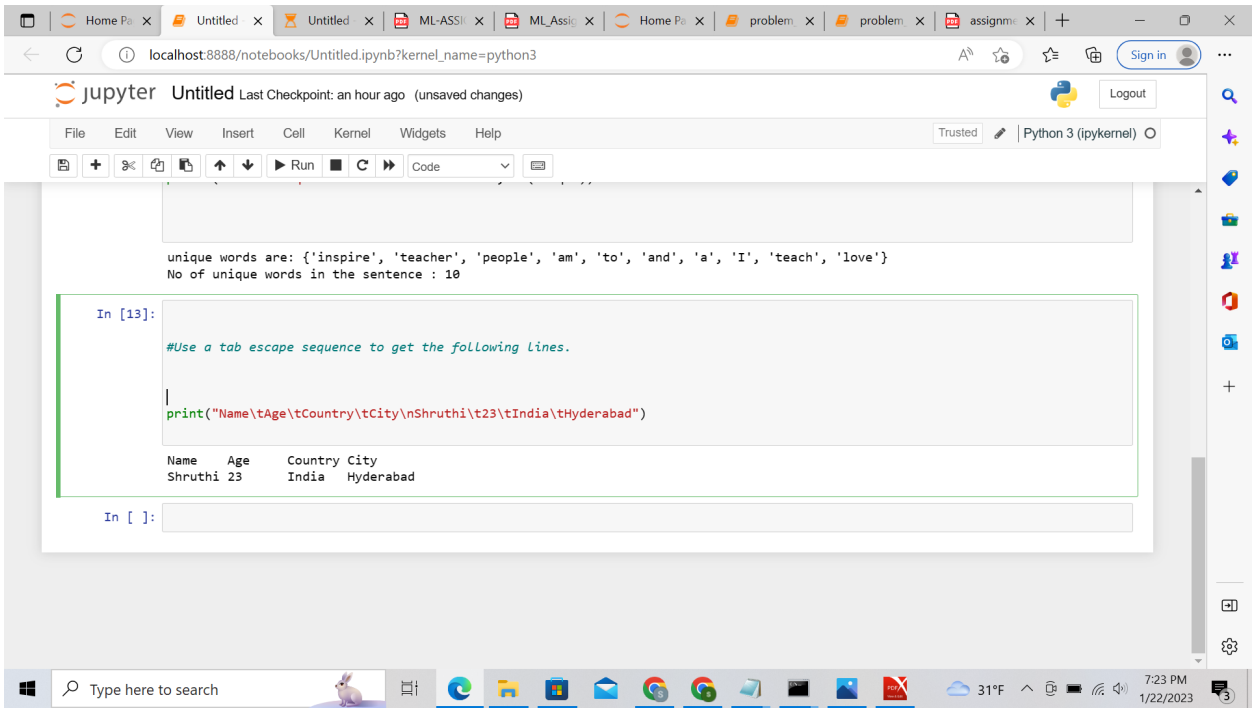


1) Line variable stores the sentence.
2) split (“ ”) is used to split the sentence using spaces
3) And those words are stored in the set.
4) Set only stores the unique words.
5) len() is used to find out the length of the set i.e number of unique words.

Question 7

Use a tab escape sequence to get the following lines.

Name Age Country City
Asabeneh 250 Finland Helsinki



1)To insert characters that are illegal in a string, use an escape character.

2) An escape character is a backslash \ followed by the character you want to insert.

3) \t is used for a tab space,\n for new line

Question 8

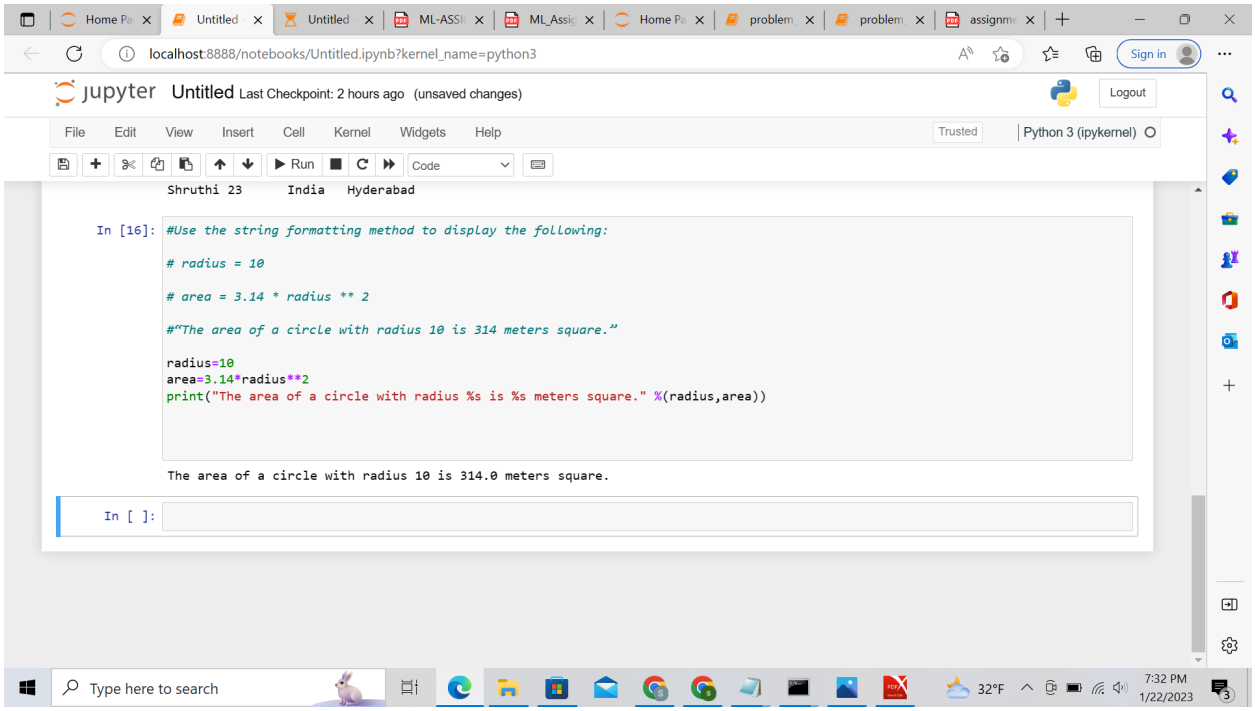
Use the string formatting method to display the following:

radius = 10

area = 3.14 * radius ** 2

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

Ans



1) ** is a power operator

2) The % operator in python for strings is used for something called string substitution

Question 9

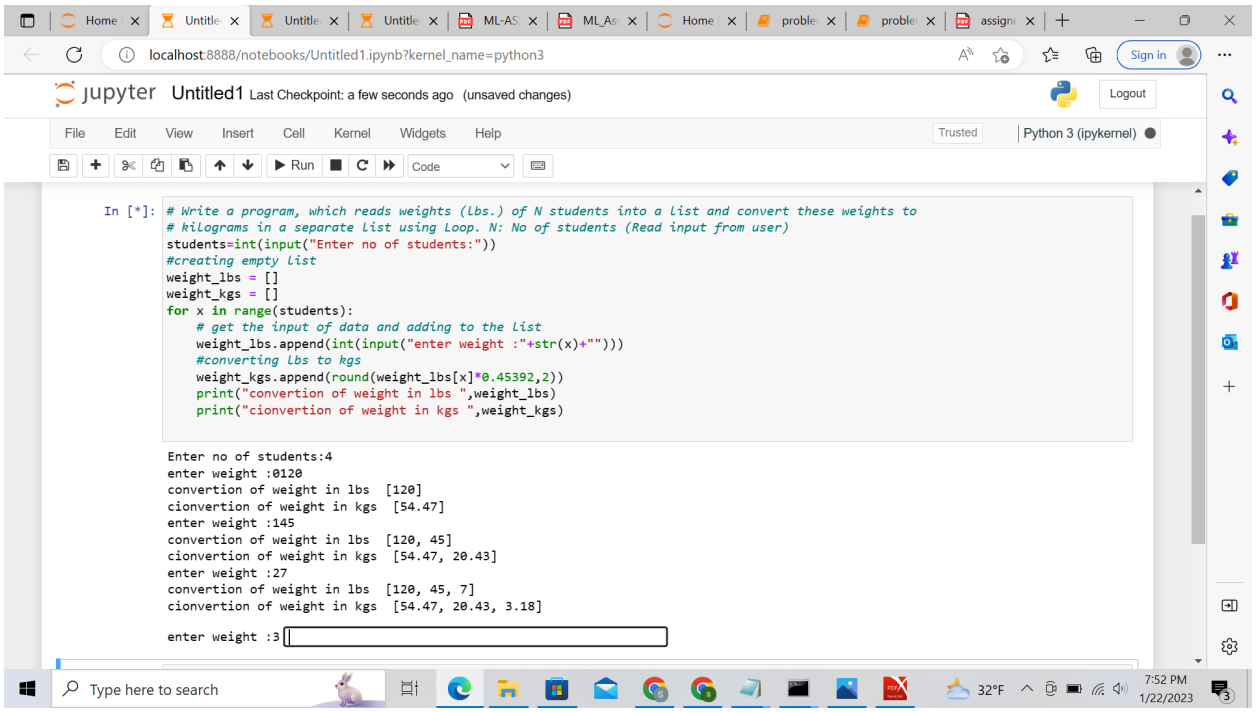
Write a program, which reads weights (lbs.) of N students into a list and convert these weights to kilograms in a separate list using Loop.

N: No of students (Read input from user)

Ex: L1: [150, 155, 145, 148]

Output: [68.03, 70.3, 65.77, 67.13]

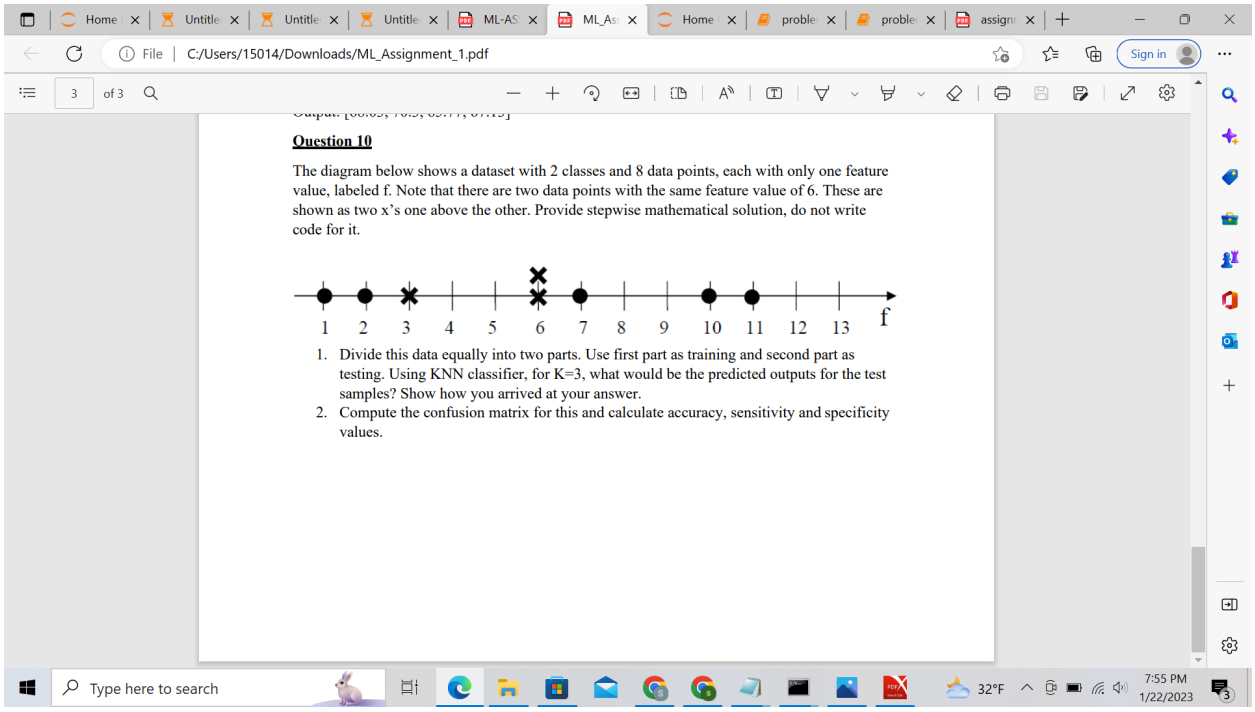
Ans



1)Using the input() function allows user input

2) Using the for loop we will iterate the N no.of time and collect the students weights in lbs. and store it in the list after that performing the weight conversion calculations from lbs. to kgs the student weights in kgs is stored in another list

Question 10



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.

Ans

1) Divided the data equally into two parts i.e training set and test set
2) For K=3 calculated the distance and predicted the output
3) Computed the confusion matrix for this.
4) And calculated the accuracy , sensitivity and specificity values

Tp=2
Tn =0
Fp = 2
Fn = 0

Accuracy = (Tp+Tn)/(Tn+Fp+Fn+Tp)

Sensitivity = Tp/(Tp+Fn)

Specificity = Tn/(Fp+Tn)

Accuracy = 0.5

Sensitivity = 1

Specificity = 0

10) Divide data equally into two parts

1, 2, 3, 7 as training and

6, 6, 10, 11 as testing

KNN classifier :- for K=3

Euclidean distance $d = \sqrt{(w-w_1)^2 + (h-h_1)^2}$

→ distance from 6 to 1, 2, 3, 7 is

$d_1 = \sqrt{(6-1)^2} = 5$

$d_2 = \sqrt{(6-2)^3} = 4$

$d_3 = \sqrt{(6-3)^2} = 3$ } $\dot{x}$

$d_4 = \sqrt{(6-7)^2} = 1$

As there are maximum no of (.). 6 is changed from X to .

→ distance from 10 to 1, 2, 3, 7 is

$d_1 = \sqrt{(10-1)^2} = 9$

$d_2 = \sqrt{(10-2)^2} = 8$

$d_3 = \sqrt{(10-3)^2} = 7$ } $\dot{X}$

$d_4 = \sqrt{(10-7)^2} = 3$

As there are maximum no of point (.) 10 is not changed it is .10.

⇒ distance from 11 to 1, 2, 3, 7 is

$d_1 = \sqrt{(11-1)^2} = 10$

$d_2 = \sqrt{(11-2)^2} = 9$

$d_3 = \sqrt{(11-3)^2} = 8$

$d_4 = \sqrt{(11-7)^2} = 4$ } x

As these are maximum no of (.), there is no change, x is same as .

2) Confusion matrix

	0	1
0	$T_N^{(0)}$	FP(2)
1	F_N (0)	Tp(2)

Accuracy :- $(Tp+T_N)/(T_N+FP+F_N+T_P)$

$= 2/2+2 = 2/4 = 0.5$

Sensitivity $= Tp/(Tp+F_N) = \frac{2}{2+0} = 1$

Specificity $= T_N/(FP+T_N) = 0/0+2 = 0$