

File Edit Selection View Go Run Terminal Help

EXPLORER

LAB 9

kmeans\_step\_by\_step.py

WELCOME

Figure 1

K-Means Clustering (K=3, After 2 Iterations)

The scatter plot displays 10 data points (P1-P10) and their assignment to 3 clusters (C1-C3) after 2 iterations of K-Means clustering. The x-axis ranges from 2 to 10, and the y-axis ranges from 2 to 9. The data points are represented by blue circles, and the cluster centroids are represented by orange crosses.

Point	Cluster
P1	C1
P2	C1
P3	C2
P4	C3
P5	C2
P6	C3
P7	C1
P8	C3
P9	C2
P10	C1

OUTPUT

PS C:\Users\zumer\OneDrive\Desktop> python kmeans\_step\_by\_step.py

New Centroids:

C1: mean of [P1, P2, P7]  
C2: mean of [P3, P5, P9]  
C3: mean of [P4, P6, P8]

FINAL CLUSTERS:

C1 : ['P1', 'P2', 'P7']  
C2 : ['P3', 'P5', 'P9']  
C3 : ['P4', 'P6', 'P8']

FINAL CENTROIDS:

C1 : (2.0, 2.6666666666666665)  
C2 : (3.6666666666666665, 8.0)  
C3 : (9.0, 5.333333333333333)

Ln 121, Col 1 Spaces: 4 UTF-8 CRLF { Python 3.13.2 Go Live

PROBLEMS

Filter (e.g. text, "/ts, !"/node\_modules..)

No problems have been detected in the workspace.

OUTLINE

TIMELINE

Search

4 42°F Mostly cloudy

OUTPUT DEBUG CONSOLE TERMINAL PORTS

Python Debug Console + □ × ⋮ | ☰ ×

```
PS C:\Users\zumer\OneDrive\Desktop\lab working\lab 9> & 'c:\Users\zumer\AppData\Local\Programs\Python\Python313\python.exe' 'c:\Users\zumer\.vscode\extensions\ms-python.debugpy-2025.18.0-win32-x64\bundled\libs\debugpy\launcher' '54506' '--' 'c:\Users\zumer\OneDrive\Desktop\lab working\lab 9\kmeans_step_by_step.py'
→ P4 assigned to C3
P5 distances -> C1:6.41, C2:1.20, C3:7.03
→ P5 assigned to C2
P6 distances -> C1:9.10, C2:6.41, C3:1.94
→ P6 assigned to C3
P7 distances -> C1:1.05, C2:5.04, C3:6.44
→ P7 assigned to C1
P8 distances -> C1:7.13, C2:6.67, C3:1.33
→ P8 assigned to C3
P9 distances -> C1:4.45, C2:1.20, C3:6.23
→ P9 assigned to C2

New Centroid Calculation:
C1: mean of ['P1', 'P2', 'P7'] = (2.00, 2.67)
C2: mean of ['P3', 'P5', 'P9'] = (3.67, 8.00)
C3: mean of ['P4', 'P6', 'P8'] = (9.00, 5.33)

=====
FINAL CLUSTERS AFTER 2 ITERATIONS
=====
C1 : ['P1', 'P2', 'P7']
C2 : ['P3', 'P5', 'P9']
C3 : ['P4', 'P6', 'P8']

FINAL CENTROIDS:
C1 : (2.0, 2.6666666666666665)
C2 : (3.6666666666666665, 8.0)
C3 : (9.0, 5.333333333333333)
```

PS C:\Users\zumer\OneDrive\Desktop\lab working\lab 9>

EXPLORER

LAB 9

.venv

kmeans\_sklearn\_stepwise.py

kmeans\_step\_by\_step.py

CHAT

Welcome kmeans\_step\_by\_step.py 1

78 #

79 plt.figure()

80 plt.scatter(X[:, 0], X[:, 1])

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85 K-Means using scikit-learn (K = 2)

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Figure 1

X

Y

K-Means using scikit-learn (K = 2)

P5

P9

P3

P6

P1

P7

P2

C1

P4

P8

C0

Build with Agent

All responses may be inaccurate.

Generate Agent Instructions to onboard AI onto your codebase.

OUTPUT

PS C:\Users\zumer\OneDrive\Desktop\lab working\lab 9\kmeans\_sklearn\_stepwise.py

Cluster 0: 3 points

Cluster 1: 6 points

Final Centroid Locations:

Cluster 0 centroid = (9.00, 5.33)

Cluster 1 centroid = (2.83, 5.33)

Python Debug Console

powershell

Describe what to build next

The following environment is selected: ~\OneDrive\Desktop\lab work...

42°F Mostly cloudy

123 AM

1/17/2023

The screenshot shows a Jupyter Notebook interface with several tabs open. The active tab is titled 'kmeans\_step\_by\_stepwise.py'.

The code in the cell is:

```
# ...
plt.figure()
plt.scatter(X[:,0], X[:,1])
```

The resulting plot is titled 'K-Means using scikit-learn (K = 3)'. It displays 10 data points (P1-P9, P6) and their assigned centroids (C0-C2). The x-axis ranges from 2 to 10, and the y-axis ranges from 2 to 9. The data points are blue circles, and the centroids are orange crosses.

The bottom right corner of the plot area shows the following text:

```
marker='x')
```

The 'PROBLEMS' panel shows three Pylance errors related to missing imports:

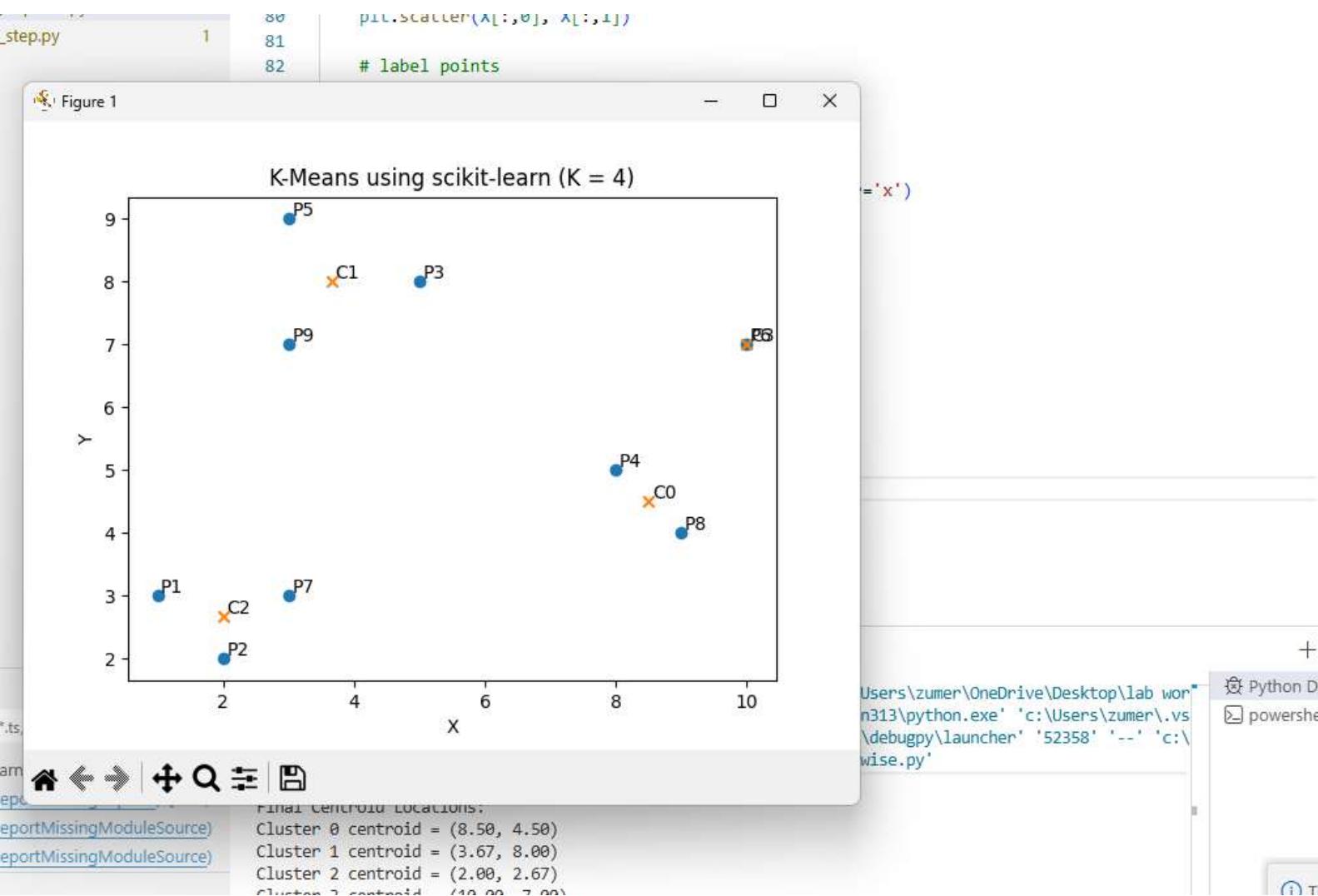
- Pylance(reportMissingImports) [Ln 6]
- Pylance(reportMissingModuleSource)
- Pylance(reportMissingModuleSource)

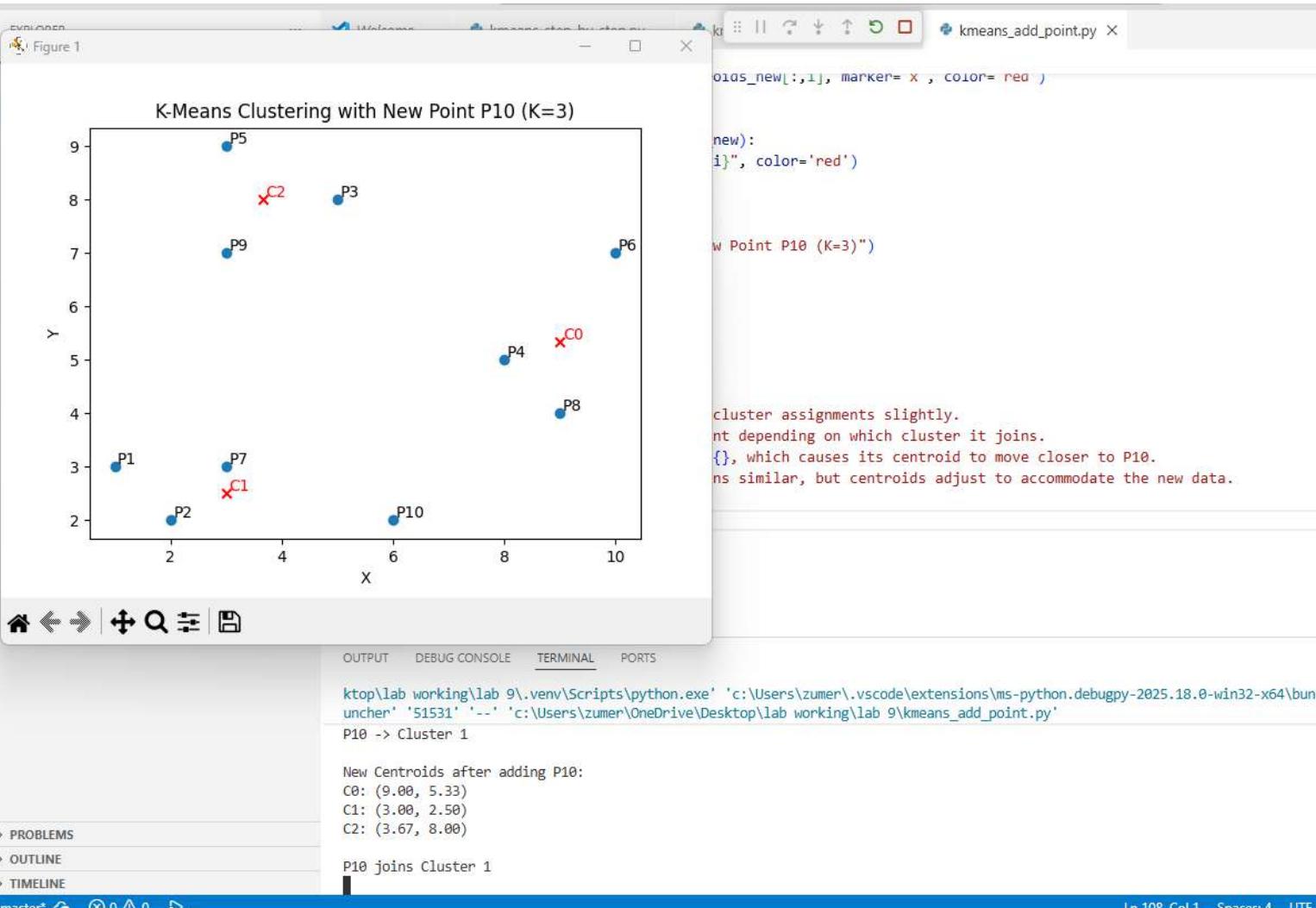
The 'OUTLINE' and 'TIMELINE' panels are also visible at the bottom.

The 'Python Debug Console' panel shows the command used to run the script:

```
C:\Users\zumer\OneDrive\Desktop\lab work\python313\python.exe 'c:\Users\zumer\vs11bs\debug\y\launcher' '52358' '--' 'c:\lab\kmeans_step_by_stepwise.py'
```

The status bar at the bottom indicates the current file is 'master', with 0 changes, and the code editor has 4 spaces, is in UTF-8 encoding, and is using Python 3.13.2.





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OUTPUT DEBUG CONSOLE TERMINAL PORTS

```
ktop\lab working\lab 9\.venv\Scripts\python.exe 'c:\Users\zumer\.vscode\extensions\ms-python.debugpy-2025.18.0-win32-x64\bundle' uncher' '51531' --- 'c:\Users\zumer\OneDrive\Desktop\lab working\lab 9\kmeans_add_point.py'
```

```
P3 -> Cluster 1
P4 -> Cluster 0
P5 -> Cluster 1
P6 -> Cluster 0
P7 -> Cluster 2
P8 -> Cluster 0
P9 -> Cluster 1
Centroids: [[9.0, 5.333333333], [3.66666667, 8.0], [2.66666667]]]
```

STEP 3: Added new point P10 [6,2]

STEP 4: New K-Means Clustering with P10

```
P1 -> Cluster 1
P2 -> Cluster 1
P3 -> Cluster 2
P4 -> Cluster 0
P5 -> Cluster 2
P6 -> Cluster 0
P7 -> Cluster 1
P8 -> Cluster 0
P9 -> Cluster 2
P10 -> Cluster 1
```

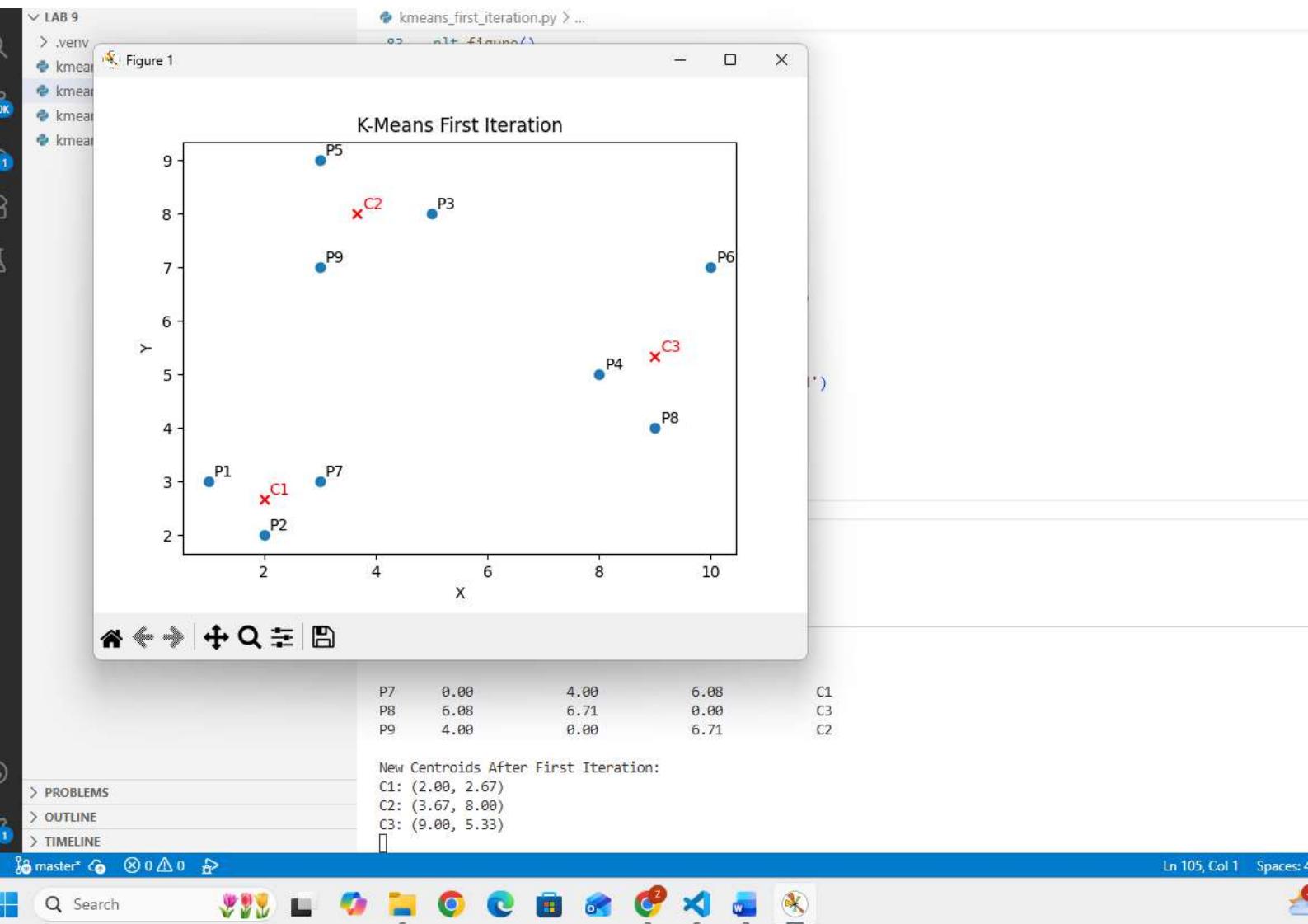
New Centroids after adding P10:

```
C0: (9.00, 5.33)
C1: (3.00, 2.50)
C2: (3.67, 8.00)
```

P10 joins Cluster 1

STEP 7: Explanation:

- Adding a new data point can change cluster assignments slightly.
- Centroids shift towards the new point depending on which cluster it joins.
- In this example, P10 joins Cluster 1, which causes its centroid to move closer to P10.
- The overall cluster structure remains similar, but centroids adjust to accommodate the new data.



```
PS C:\Users\zumer\OneDrive\Desktop\lab working\lab 9>
PS C:\Users\zumer\OneDrive\Desktop\lab working\lab 9> ^C
PS C:\Users\zumer\OneDrive\Desktop\lab working\lab 9> cd 'c:\Users\zumer\OneDrive\Desktop\lab working\lab 9'; & 'c:\Users\zumer\OneDrive\Desktop\lab working\lab 9\venv\Scripts\python.exe' 'c:\Users\zumer\.vscode\extensions\ms-python.debugpy-2025.18.0-win32-x64\bundled\libs\debugpy\launcher' '57657' '--' 'c:\Users\zumer\OneDrive\Desktop\lab working\lab 9\kmeans_first_iteration.py'
Distance Table (First Iteration):
Point  Dist to C1    Dist to C2    Dist to C3    Assigned Cluster
P1     2.00          4.47          8.06          C1
P2     1.41          5.10          7.28          C1
P3     5.39          2.24          5.66          C2
P4     5.39          5.39          1.41          C3
P5     6.00          2.00          7.81          C2
P6     8.06          7.00          3.16          C3
P7     0.00          4.00          6.08          C1
P8     6.08          6.71          0.00          C3
P9     4.00          0.00          6.71          C2

New Centroids After First Iteration:
C1: (2.00, 2.67)
C2: (3.67, 8.00)
C3: (9.00, 5.33)
PS C:\Users\zumer\OneDrive\Desktop\lab working\lab 9> []
```