```
In [3]:   #Import numpy
          import numpy as np

          #Seasons
          Seasons = ["2015","2016","2017","2018","2019","2020","2021","2022","2023","2024"
          Sdict = {"2015":0,"2016":1,"2017":2,"2018":3,"2019":4,"2020":5,"2021":6,"2022":7

          #Players
          Players = ["Sachin","Rahul","Smith","Sami","Pollard","Morris","Samson","Dhoni","
          Pdict = {"Sachin":0,"Rahul":1,"Smith":2,"Sami":3,"Pollard":4,"Morris":5,"Samson"

          #Salaries
          Sachin_Salary = [15946875,17718750,19490625,21262500,23034375,24806250,25244493,
          Rahul_Salary = [12000000,12744189,13488377,14232567,14976754,16324500,18038573,1
          Smith_Salary = [4621800,5828090,13041250,14410581,15779912,14500000,16022500,175
          Sami_Salary = [3713640,4694041,13041250,14410581,15779912,17149243,18518574,1945
          Pollard_Salary = [4493160,4806720,6061274,13758000,15202590,16647180,18091770,19
          Morris_Salary = [3348000,4235220,12455000,14410581,15779912,14500000,16022500,17
          Samson_Salary = [3144240,3380160,3615960,4574189,13520500,14940153,16359805,1777
          Dhoni_Salary = [0,0,4171200,4484040,4796880,6053663,15506632,16669630,17832627,1
          Kohli_Salary = [0,0,0,4822800,5184480,5546160,6993708,16402500,17632688,18862875
          Sky_Salary = [3031920,3841443,13041250,14410581,15779912,14200000,15691000,17182
          #Matrix
          Salary = np.array([Sachin_Salary, Rahul_Salary, Smith_Salary, Sami_Salary, Polla

          #Games
          Sachin_G = [80,77,82,82,73,82,58,78,6,35]
          Rahul_G = [82,57,82,79,76,72,60,72,79,80]
          Smith_G = [79,78,75,81,76,79,62,76,77,69]
          Sami_G = [80,65,77,66,69,77,55,67,77,40]
          Pollard_G = [82,82,82,79,82,78,54,76,71,41]
          Morris_G = [70,69,67,77,70,77,57,74,79,44]
          Samson_G = [78,64,80,78,45,80,60,70,62,82]
          Dhoni_G = [35,35,80,74,82,78,66,81,81,27]
          Kohli_G = [40,40,40,81,78,81,39,0,10,51]
          Sky_G = [75,51,51,79,77,76,49,69,54,62]
          #Matrix
          Games = np.array([Sachin_G, Rahul_G, Smith_G, Sami_G, Pollard_G, Morris_G, Samso

          #Points
          Sachin_PTS = [2832,2430,2323,2201,1970,2078,1616,2133,83,782]
          Rahul_PTS = [1653,1426,1779,1688,1619,1312,1129,1170,1245,1154]
          Smith_PTS = [2478,2132,2250,2304,2258,2111,1683,2036,2089,1743]
          Sami_PTS = [2122,1881,1978,1504,1943,1970,1245,1920,2112,966]
          Pollard_PTS = [1292,1443,1695,1624,1503,1784,1113,1296,1297,646]
          Morris_PTS = [1572,1561,1496,1746,1678,1438,1025,1232,1281,928]
          Samson_PTS = [1258,1104,1684,1781,841,1268,1189,1186,1185,1564]
          Dhoni_PTS = [903,903,1624,1871,2472,2161,1850,2280,2593,686]
          Kohli_PTS = [597,597,597,1361,1619,2026,852,0,159,904]
          Sky_PTS = [2040,1397,1254,2386,2045,1941,1082,1463,1028,1331]
          #Matrix
          Points = np.array([Sachin_PTS, Rahul_PTS, Smith_PTS, Sami_PTS, Pollard_PTS, Morr

In [4]:   Salary
```

```
Out[4]: array([[15946875, 17718750, 19490625, 21262500, 23034375, 24806250,
                25244493, 27849149, 30453805, 23500000],
               [12000000, 12744189, 13488377, 14232567, 14976754, 16324500,
                18038573, 19752645, 21466718, 23180790],
               [ 4621800,  5828090, 13041250, 14410581, 15779912, 14500000,
                16022500, 17545000, 19067500, 20644400],
               [ 3713640,  4694041, 13041250, 14410581, 15779912, 17149243,
                18518574, 19450000, 22407474, 22458000],
               [ 4493160,  4806720,  6061274, 13758000, 15202590, 16647180,
                18091770, 19536360, 20513178, 21436271],
               [ 3348000,  4235220, 12455000, 14410581, 15779912, 14500000,
                16022500, 17545000, 19067500, 20644400],
               [ 3144240,  3380160,  3615960,  4574189, 13520500, 14940153,
                16359805, 17779458, 18668431, 20068563],
               [       0,        0,  4171200,  4484040,  4796880,  6053663,
                15506632, 16669630, 17832627, 18995624],
               [       0,        0,        0,  4822800,  5184480,  5546160,
                 6993708, 16402500, 17632688, 18862875],
               [ 3031920,  3841443, 13041250, 14410581, 15779912, 14200000,
                15691000, 17182000, 18673000, 15000000]])
```

In [5]: `Games`

```
Out[5]: array([[80, 77, 82, 82, 73, 82, 58, 78,  6, 35],
               [82, 57, 82, 79, 76, 72, 60, 72, 79, 80],
               [79, 78, 75, 81, 76, 79, 62, 76, 77, 69],
               [80, 65, 77, 66, 69, 77, 55, 67, 77, 40],
               [82, 82, 82, 79, 82, 78, 54, 76, 71, 41],
               [70, 69, 67, 77, 70, 77, 57, 74, 79, 44],
               [78, 64, 80, 78, 45, 80, 60, 70, 62, 82],
               [35, 35, 80, 74, 82, 78, 66, 81, 81, 27],
               [40, 40, 40, 81, 78, 81, 39,  0, 10, 51],
               [75, 51, 51, 79, 77, 76, 49, 69, 54, 62]])
```

In [6]: `Points`

```
Out[6]: array([[2832, 2430, 2323, 2201, 1970, 2078, 1616, 2133,   83,  782],
               [1653, 1426, 1779, 1688, 1619, 1312, 1129, 1170, 1245, 1154],
               [2478, 2132, 2250, 2304, 2258, 2111, 1683, 2036, 2089, 1743],
               [2122, 1881, 1978, 1504, 1943, 1970, 1245, 1920, 2112,  966],
               [1292, 1443, 1695, 1624, 1503, 1784, 1113, 1296, 1297,  646],
               [1572, 1561, 1496, 1746, 1678, 1438, 1025, 1232, 1281,  928],
               [1258, 1104, 1684, 1781,  841, 1268, 1189, 1186, 1185, 1564],
               [ 903,  903, 1624, 1871, 2472, 2161, 1850, 2280, 2593,  686],
               [ 597,  597,  597, 1361, 1619, 2026,  852,    0,  159,  904],
               [2040, 1397, 1254, 2386, 2045, 1941, 1082, 1463, 1028, 1331]])
```

In [7]: `Games[0]`

```
Out[7]: array([80, 77, 82, 82, 73, 82, 58, 78,  6, 35])
```

In [8]:
```
print(Games.shape)
print(Salary.shape)
```

```
(10, 10)
(10, 10)
```

In [9]: `Games[0:5]`

Out[9]: array([[80, 77, 82, 82, 73, 82, 58, 78, 6, 35],
                [82, 57, 82, 79, 76, 72, 60, 72, 79, 80],
                [79, 78, 75, 81, 76, 79, 62, 76, 77, 69],
                [80, 65, 77, 66, 69, 77, 55, 67, 77, 40],
                [82, 82, 82, 79, 82, 78, 54, 76, 71, 41]])

In [10]: Games[0,5]

Out[10]: 82

In [11]: Games[::3]

Out[11]: array([[80, 77, 82, 82, 73, 82, 58, 78, 6, 35],
                [80, 65, 77, 66, 69, 77, 55, 67, 77, 40],
                [78, 64, 80, 78, 45, 80, 60, 70, 62, 82],
                [75, 51, 51, 79, 77, 76, 49, 69, 54, 62]])

In [12]: Games[-3,-1]

Out[12]: 27

In [13]: Games

Out[13]: array([[80, 77, 82, 82, 73, 82, 58, 78, 6, 35],
                [82, 57, 82, 79, 76, 72, 60, 72, 79, 80],
                [79, 78, 75, 81, 76, 79, 62, 76, 77, 69],
                [80, 65, 77, 66, 69, 77, 55, 67, 77, 40],
                [82, 82, 82, 79, 82, 78, 54, 76, 71, 41],
                [70, 69, 67, 77, 70, 77, 57, 74, 79, 44],
                [78, 64, 80, 78, 45, 80, 60, 70, 62, 82],
                [35, 35, 80, 74, 82, 78, 66, 81, 81, 27],
                [40, 40, 40, 81, 78, 81, 39, 0, 10, 51],
                [75, 51, 51, 79, 77, 76, 49, 69, 54, 62]])

In [14]: Salary/Games

```
C:\Users\KonaSowjanya\AppData\Local\Temp\ipykernel_12456\3709746658.py:1: Runtime
Warning: divide by zero encountered in divide
  Salary/Games
```

```
Out[14]:  array([[ 199335.9375    ,  230113.63636364,  237690.54878049,
                   259298.7804878 ,  315539.38356164,  302515.24390244,
                   435249.87931034,  357040.37179487, 5075634.16666667,
                   671428.57142857],
                 [ 146341.46341463,  223582.26315789,  164492.40243902,
                   180159.07594937,  197062.55263158,  226729.16666667,
                   300642.88333333,  274342.29166667,  271730.60759494,
                   289759.875     ],
                 [  58503.79746835,   74719.1025641 ,  173883.33333333,
                   177908.40740741,  207630.42105263,  183544.30379747,
                   258427.41935484,  230855.26315789,  247629.87012987,
                   299194.20289855],
                 [  46420.5       ,   72216.01538462,  169366.88311688,
                   218342.13636364,  228694.37681159,  222717.44155844,
                   336701.34545455,  290298.50746269,  291006.15584416,
                   561450.        ],
                 [  54794.63414634,   58618.53658537,   73917.97560976,
                   174151.89873418,  185397.43902439,  213425.38461538,
                   335032.77777778,  257057.36842105,  288918.        ,
                   522835.87804878],
                 [  47828.57142857,   61380.        ,  185895.52238806,
                   187150.4025974 ,  225427.31428571,  188311.68831169,
                   281096.49122807,  237094.59459459,  241360.75949367,
                   469190.90909091],
                 [  40310.76923077,   52815.        ,   45199.5       ,
                    58643.44871795,  300455.55555556,  186751.9125    ,
                   272663.41666667,  253992.25714286,  301103.72580645,
                   244738.57317073],
                 [      0.        ,       0.        ,   52140.        ,
                    60595.13513514,   58498.53658537,   77611.06410256,
                   234948.96969697,  205797.90123457,  220155.88888889,
                   703541.62962963],
                 [      0.        ,       0.        ,       0.        ,
                    59540.74074074,   66467.69230769,   68471.11111111,
                   179325.84615385,             inf, 1763268.8       ,
                   369860.29411765],
                 [  40425.6       ,   75322.41176471,  255710.78431373,
                   182412.41772152,  204933.92207792,  186842.10526316,
                   320224.48979592,  249014.49275362,  345796.2962963 ,
                   241935.48387097]])
```

In [15]: Salary//Games

Out[15]:
```
array([[ 199335,   230113,   237690,   259298,   315539,   302515,   435249,
         357040,  5075634,   671428],
       [ 146341,   223582,   164492,   180159,   197062,   226729,   300642,
         274342,   271730,   289759],
       [  58503,    74719,   173883,   177908,   207630,   183544,   258427,
         230855,   247629,   299194],
       [  46420,    72216,   169366,   218342,   228694,   222717,   336701,
         290298,   291006,   561450],
       [  54794,    58618,    73917,   174151,   185397,   213425,   335032,
         257057,   288918,   522835],
       [  47828,    61380,   185895,   187150,   225427,   188311,   281096,
         237094,   241360,   469190],
       [  40310,    52815,    45199,    58643,   300455,   186751,   272663,
         253992,   301103,   244738],
       [      0,        0,    52140,    60595,    58498,    77611,   234948,
         205797,   220155,   703541],
       [      0,        0,        0,    59540,    66467,    68471,   179325,
              0,  1763268,   369860],
       [  40425,    75322,   255710,   182412,   204933,   186842,   320224,
         249014,   345796,   241935]])
```

In [16]:
```python
np.round(Salary//Games)
```

C:\Users\KonaSowjanya\AppData\Local\Temp\ipykernel_12456\3663165759.py:1: Runtime Warning: divide by zero encountered in floor_divide
  np.round(Salary//Games)

Out[16]:
```
array([[ 199335,   230113,   237690,   259298,   315539,   302515,   435249,
         357040,  5075634,   671428],
       [ 146341,   223582,   164492,   180159,   197062,   226729,   300642,
         274342,   271730,   289759],
       [  58503,    74719,   173883,   177908,   207630,   183544,   258427,
         230855,   247629,   299194],
       [  46420,    72216,   169366,   218342,   228694,   222717,   336701,
         290298,   291006,   561450],
       [  54794,    58618,    73917,   174151,   185397,   213425,   335032,
         257057,   288918,   522835],
       [  47828,    61380,   185895,   187150,   225427,   188311,   281096,
         237094,   241360,   469190],
       [  40310,    52815,    45199,    58643,   300455,   186751,   272663,
         253992,   301103,   244738],
       [      0,        0,    52140,    60595,    58498,    77611,   234948,
         205797,   220155,   703541],
       [      0,        0,        0,    59540,    66467,    68471,   179325,
              0,  1763268,   369860],
       [  40425,    75322,   255710,   182412,   204933,   186842,   320224,
         249014,   345796,   241935]])
```

In [17]:
```python
import warnings
warnings.filterwarnings('ignore')
```
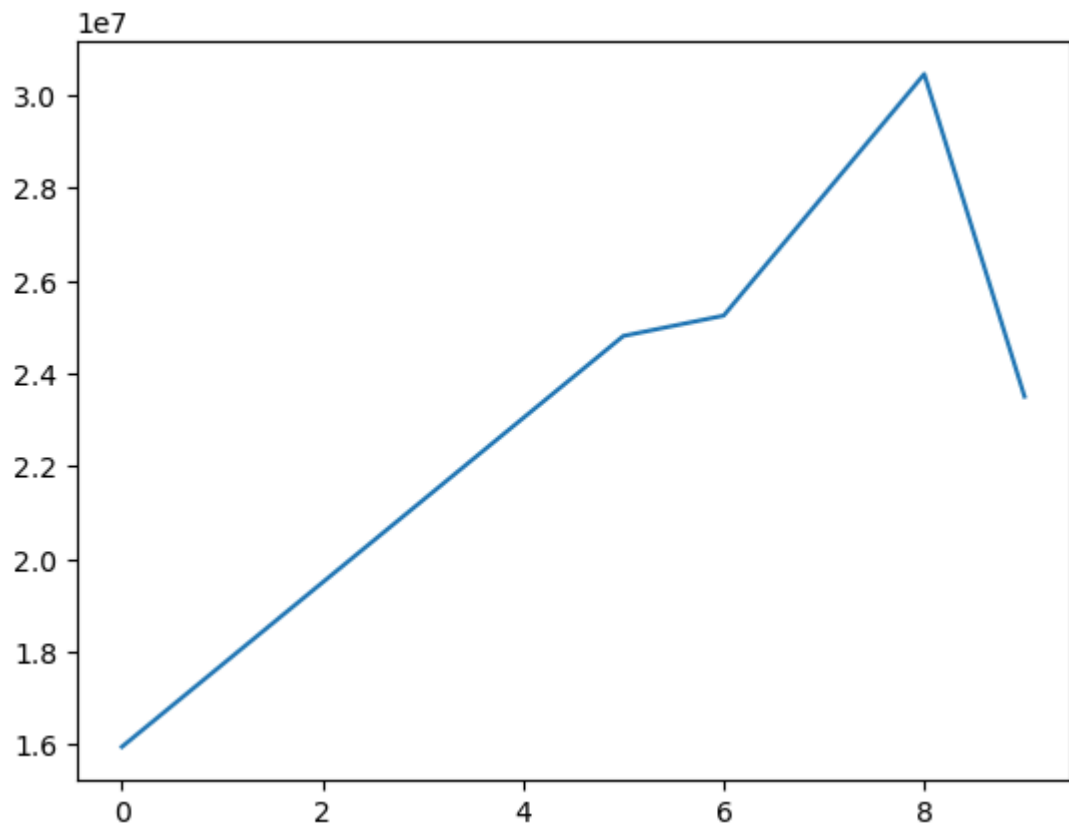
In [18]:
```python
import matplotlib.pyplot as plt
```

In [19]:
```python
Salary[0]
```

Out[19]:
```
array([15946875, 17718750, 19490625, 21262500, 23034375, 24806250,
       25244493, 27849149, 30453805, 23500000])
```

In [20]:
```python
plt.plot(Salary[0])
```
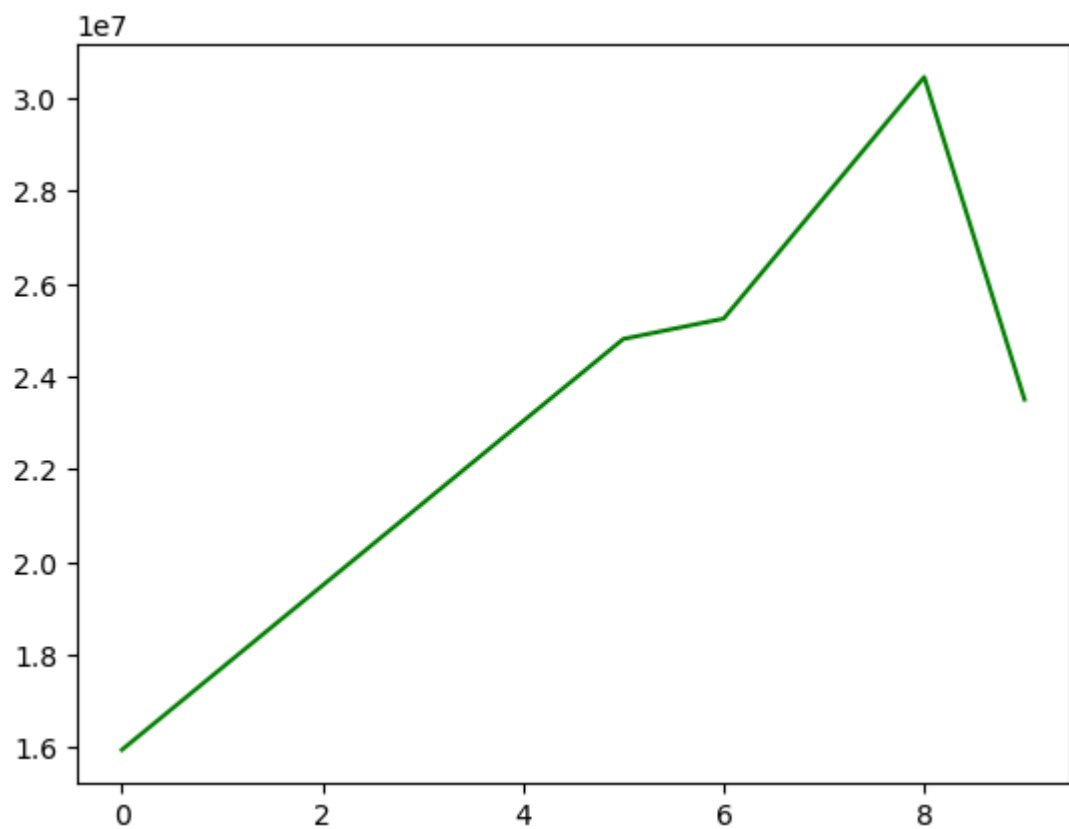
Out[20]: [<matplotlib.lines.Line2D at 0x221e178f620>]

In [21]: plt.plot(Salary[0],color='g')
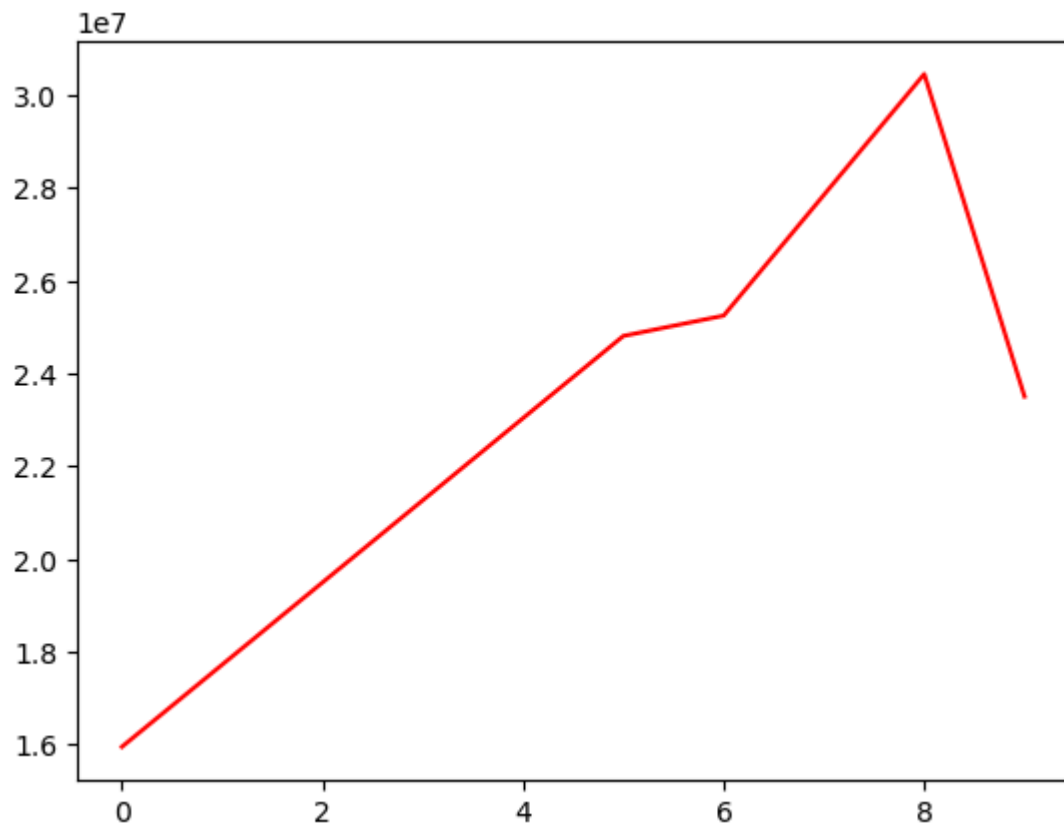
Out[21]: [<matplotlib.lines.Line2D at 0x221e2fe9b20>]

In [22]: plt.plot(Salary[0],color='r')

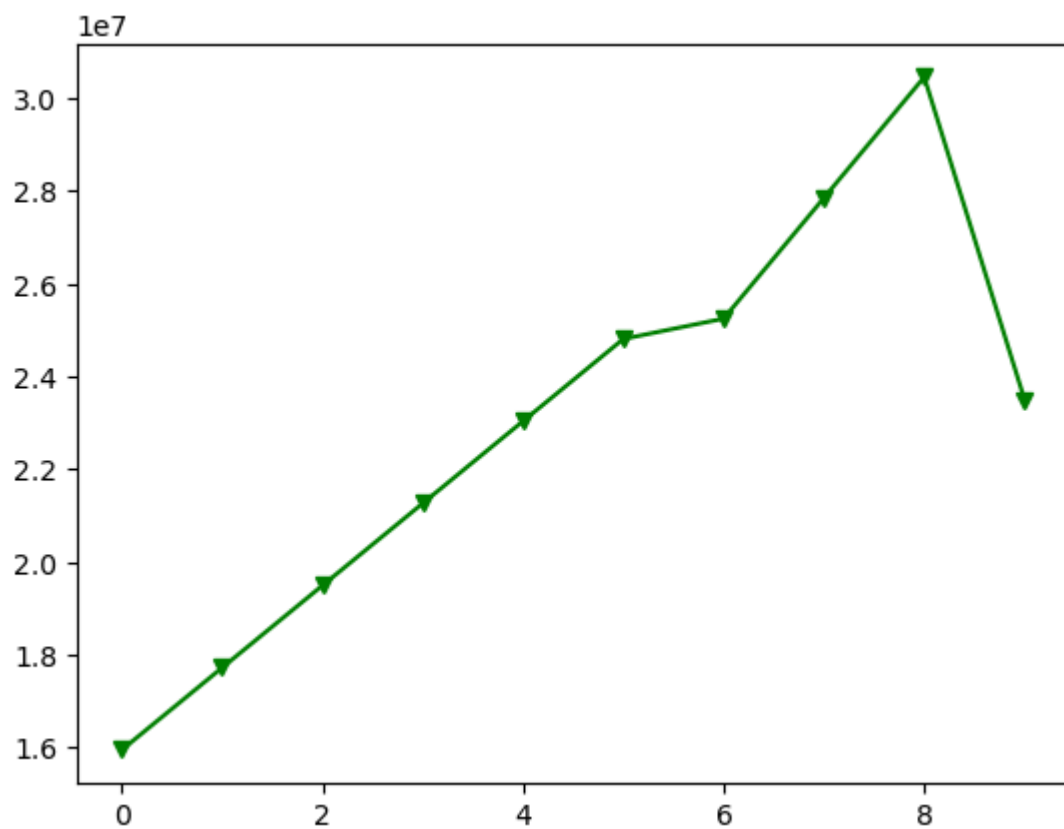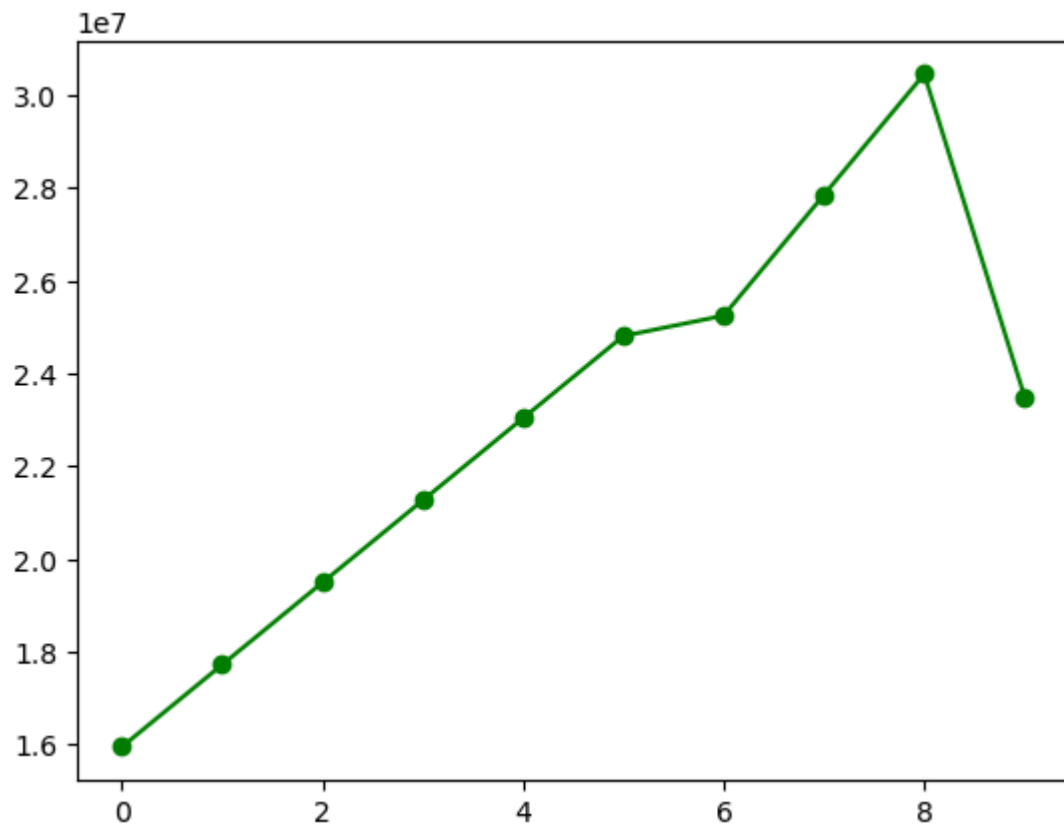Out[22]:   [<matplotlib.lines.Line2D at 0x221df66df70>]
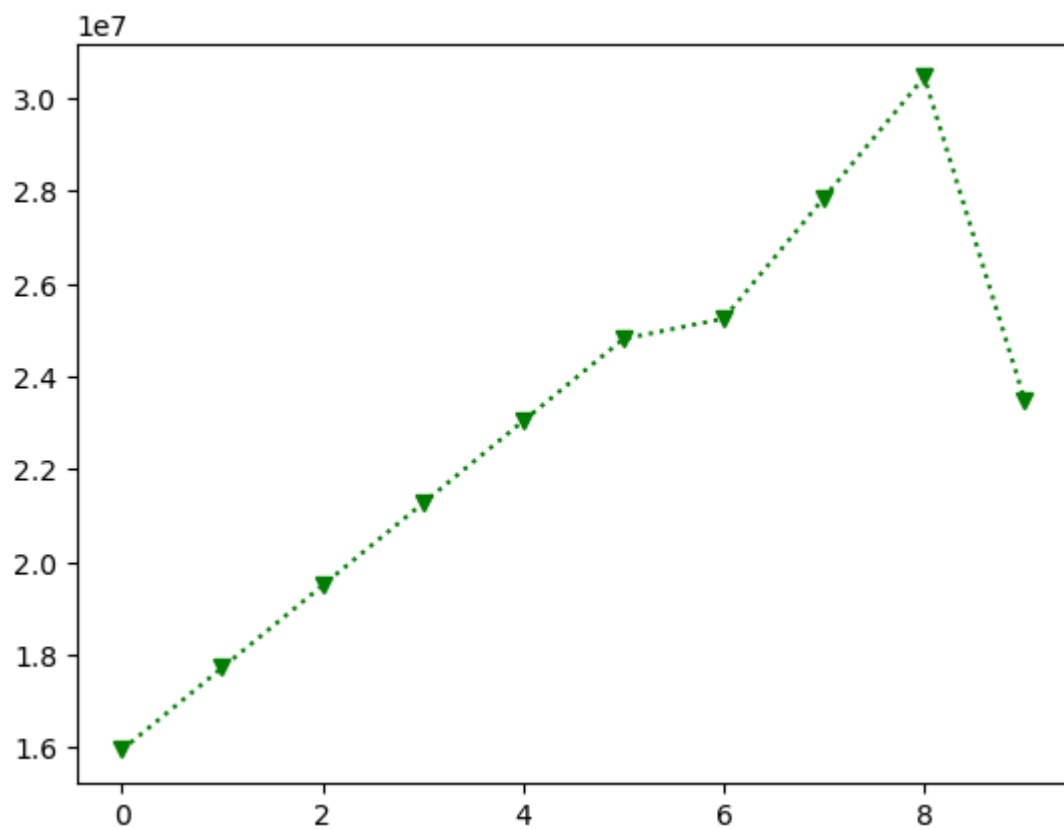

In [23]:   `plt.plot(Salary[0],color='g',marker='v')`

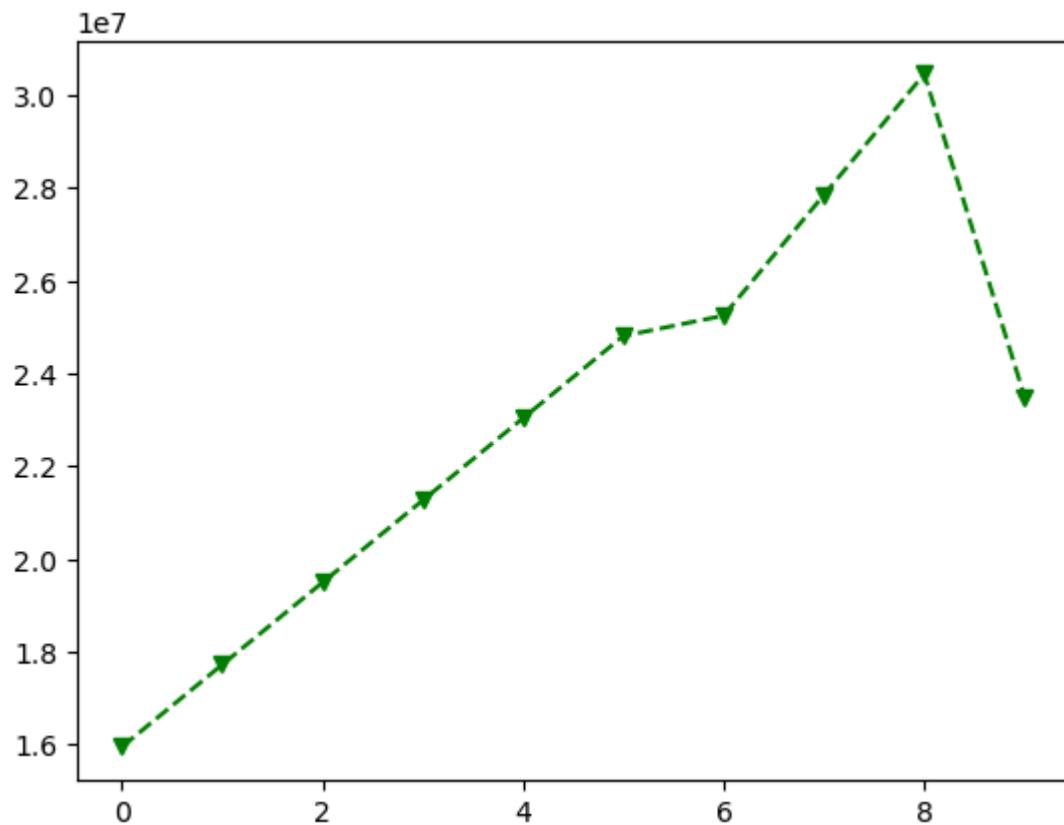Out[23]:   [<matplotlib.lines.Line2D at 0x221e1830b90>]
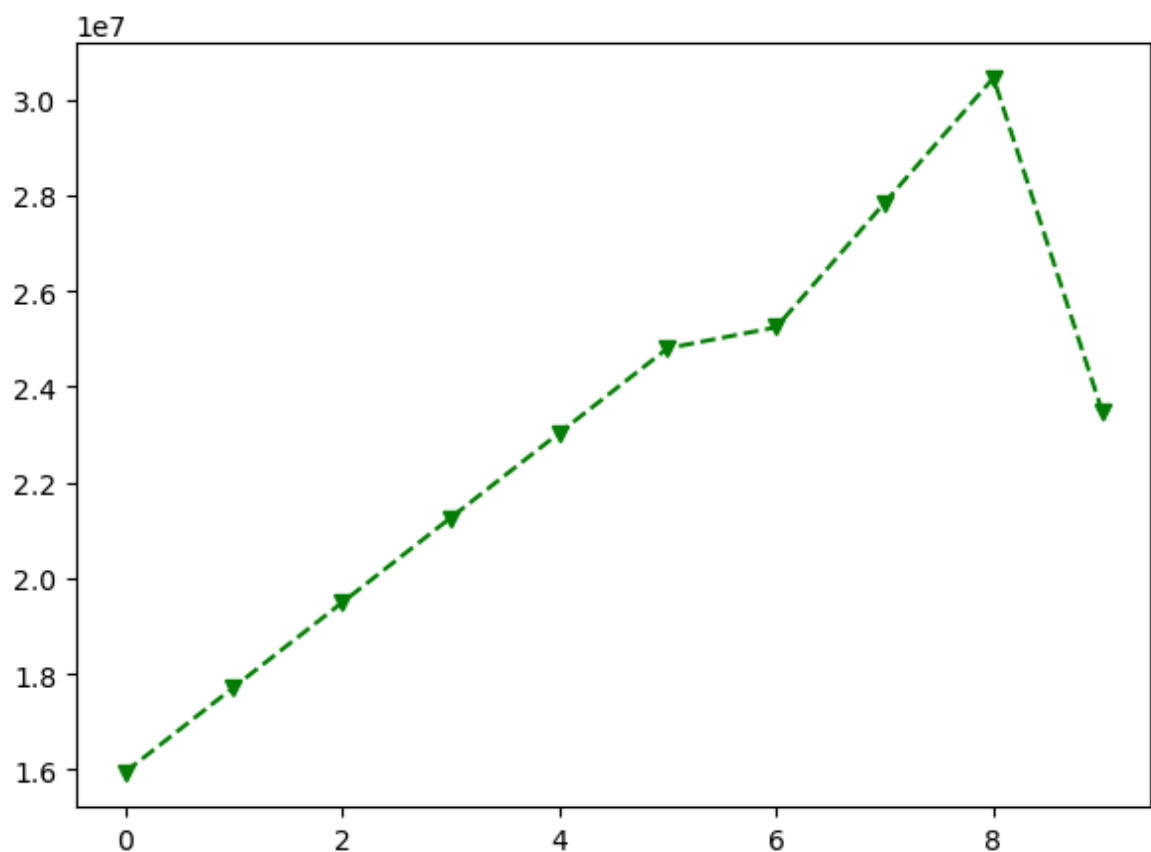

In [24]:   `plt.plot(Salary[0],color='g',marker='o')`

Out[24]:   [<matplotlib.lines.Line2D at 0x221e1898110>]

In [25]:   ```python
plt.plot(Salary[0],color='g',marker='v',ls='dotted')
```

Out[25]:   [<matplotlib.lines.Line2D at 0x221e18fd310>]



In [26]:   ```python
plt.plot(Salary[0],color='g',marker='v',ls='--')
```

Out[26]: [<matplotlib.lines.Line2D at 0x221e323acc0>]

In [38]:
```python
%matplotlib inline
plt.rcParams['figure.figsize']=7,5 # Runtime parameters for graph with 3cm width
```

In [39]:
```python
plt.plot(Salary[0],color='g',marker='v',ls='--')
plt.show()
```

In [40]:
```python
plt.plot(Salary[0],color='g',marker='v',ls='--',ms=10)
```

Out[40]:
```
[<matplotlib.lines.Line2D at 0x221e31ba0f0>]
```

In [41]:
```python
plt.show()
```
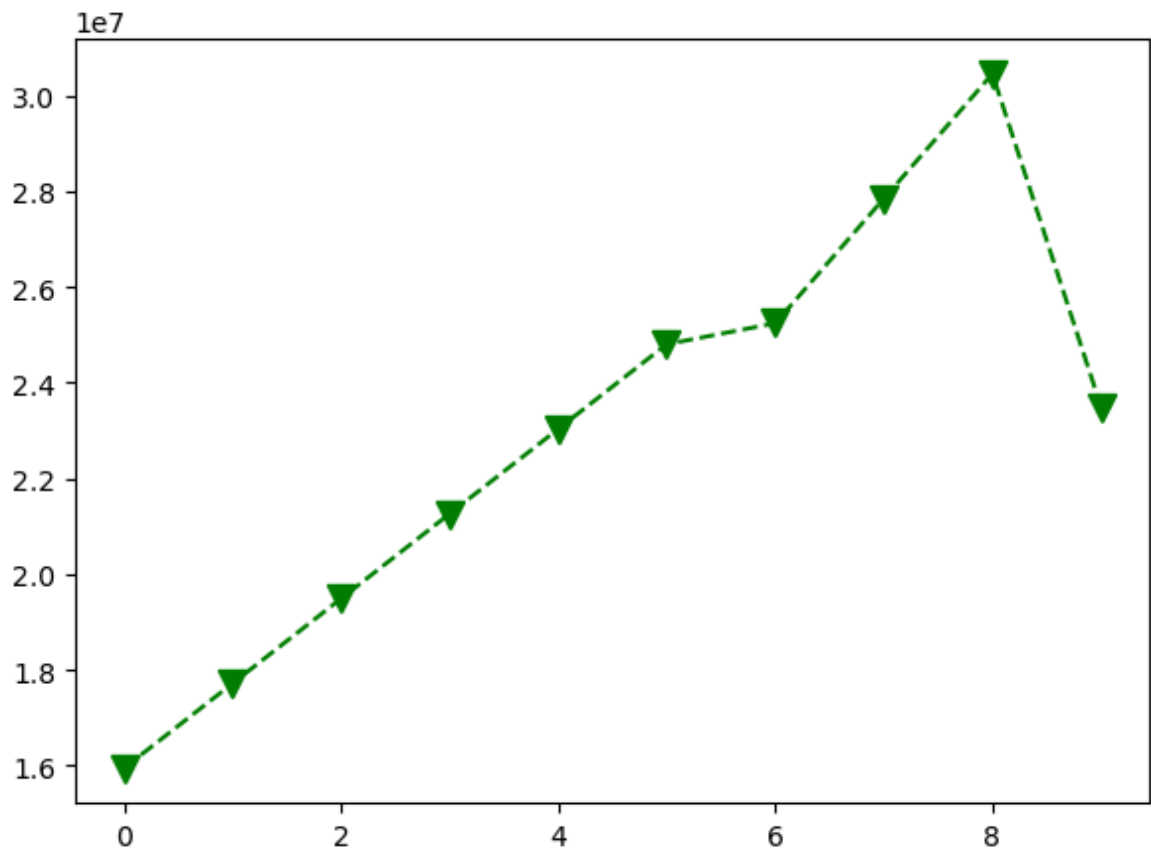

In [31]:
```python
list(range(0,10))
```

Out[31]:
```
[0, 1, 2, 3, 4, 5, 6, 7, 8, 9]
```

In [33]:
```python
Sdict # season wise matches for every year in Dict format
```

Out[33]:
```
{'2015': 0,
 '2016': 1,
 '2017': 2,
 '2018': 3,
 '2019': 4,
 '2020': 5,
 '2021': 6,
 '2022': 7,
 '2023': 8,
 '2024': 9}
```

In [34]:
```python
Pdict # Players dictionary
```

Out[34]: {'Sachin': 0,
           'Rahul': 1,
           'Smith': 2,
           'Sami': 3,
           'Pollard': 4,
           'Morris': 5,
           'Samson': 6,
           'Dhoni': 7,
           'Kohli': 8,
           'Sky': 9}

In [44]:
```python
plt.plot(Salary[0],c='Green',ls='--',marker='s',ms=7)
plt.xticks(list(range(0,10)),Seasons)
plt.show()

# ls - line separation
# ms - thickness of marker
# marker = s menas square shaped marker
```
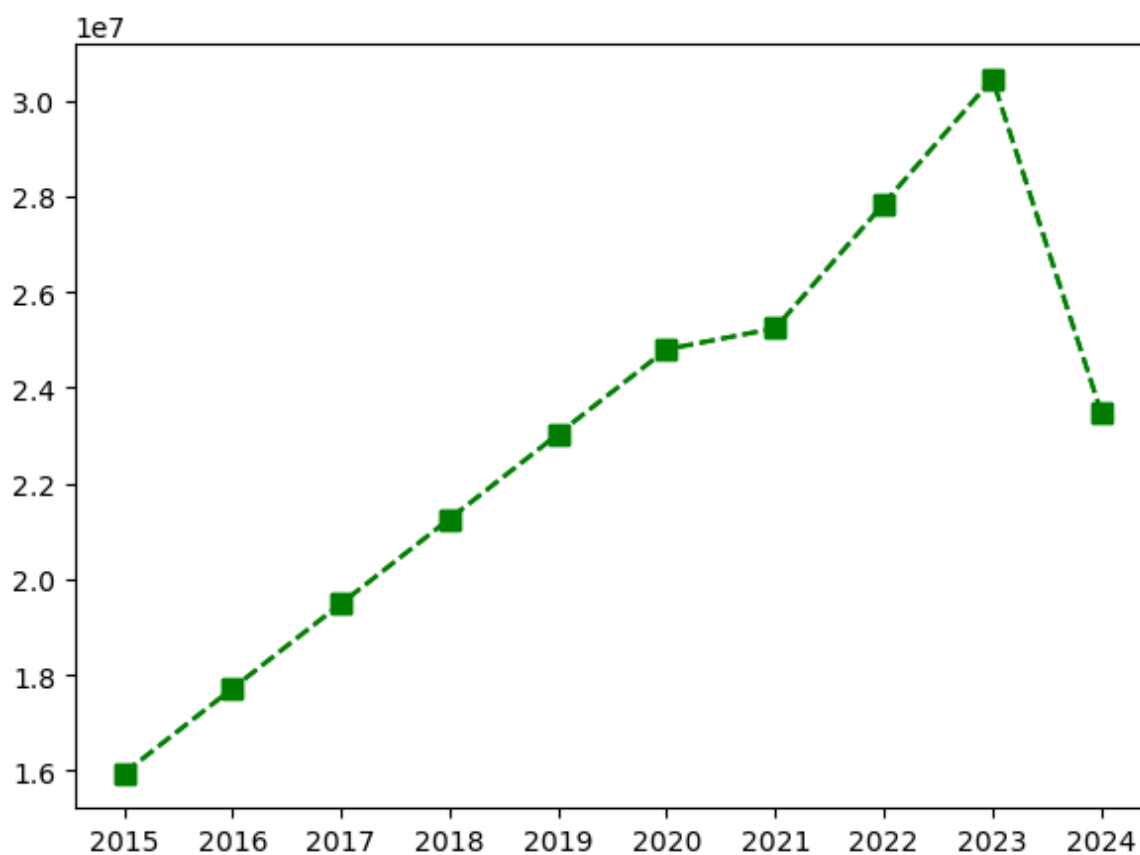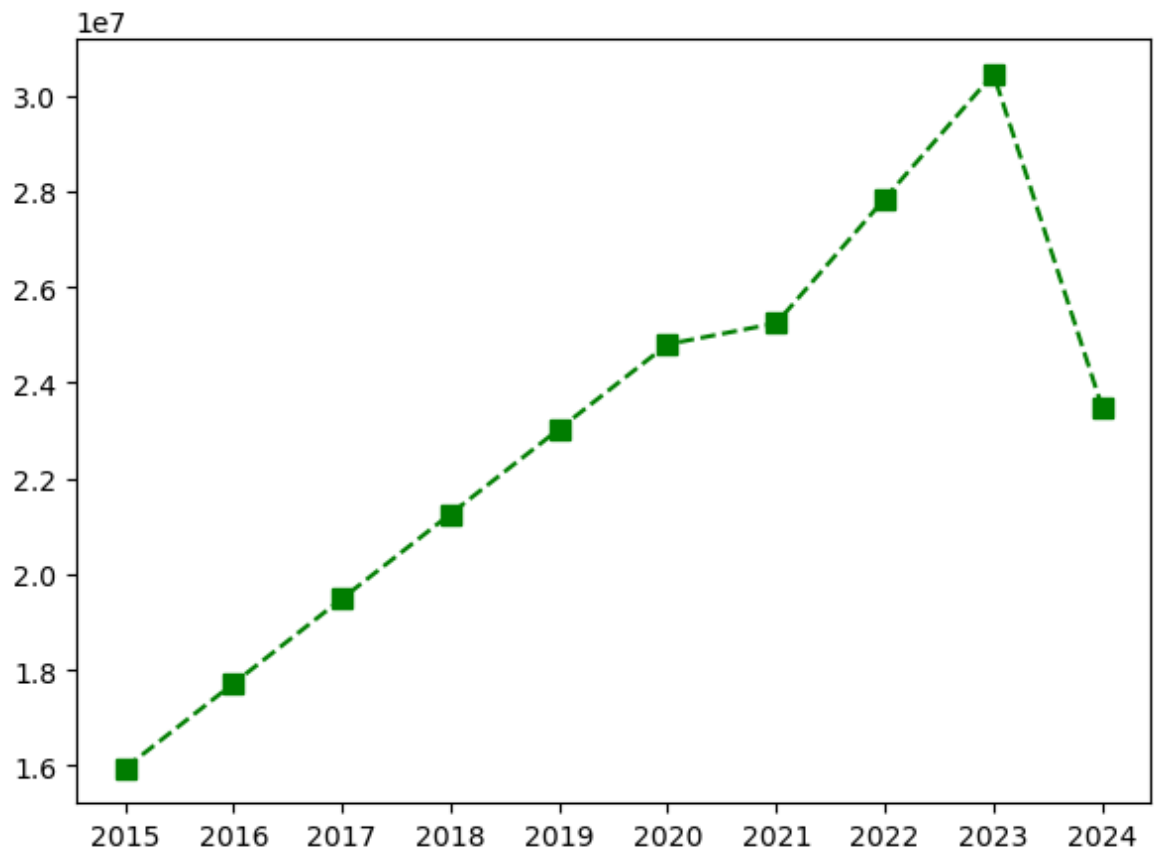

In [47]:
```python
plt.plot(Salary[0], c='Green', ls = ':', marker = 's', ms = 7, label = Players[0
plt.xticks(list(range(0,10)), Seasons,rotation='vertical')
plt.show()
```
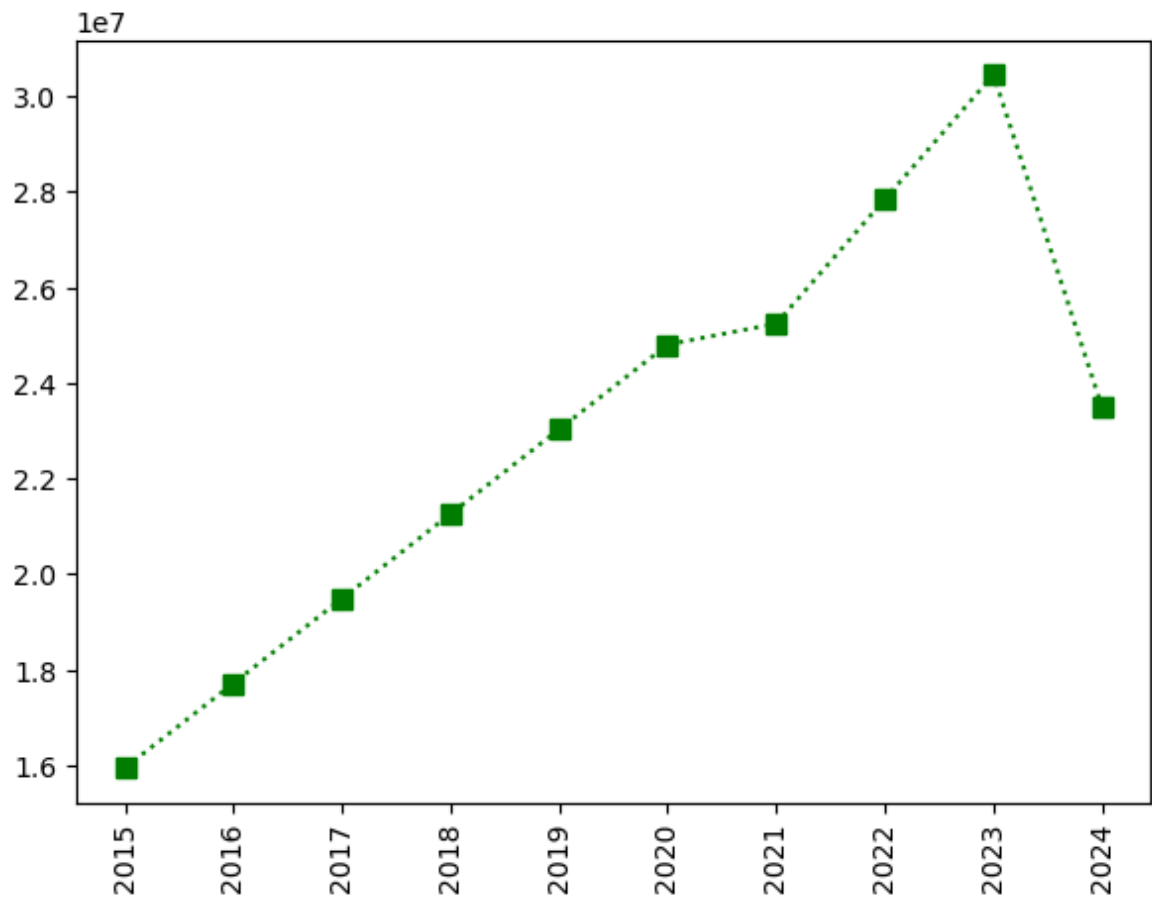
In [49]: `Players`

Out[49]:
```
['Sachin',
 'Rahul',
 'Smith',
 'Sami',
 'Pollard',
 'Morris',
 'Samson',
 'Dhoni',
 'Kohli',
 'Sky']
```

In [48]:
```python
plt.plot(Salary[0], c='Green', ls = '--', marker = 's', ms = 7, label = Players[
plt.xticks(list(range(0,10)), Seasons,rotation='horizontal')
plt.show()
```

```
In [51]: plt.plot(Salary[1], c='Blue', ls = ':', marker = 'o', ms = 10, label = Players[1
         plt.show()
```
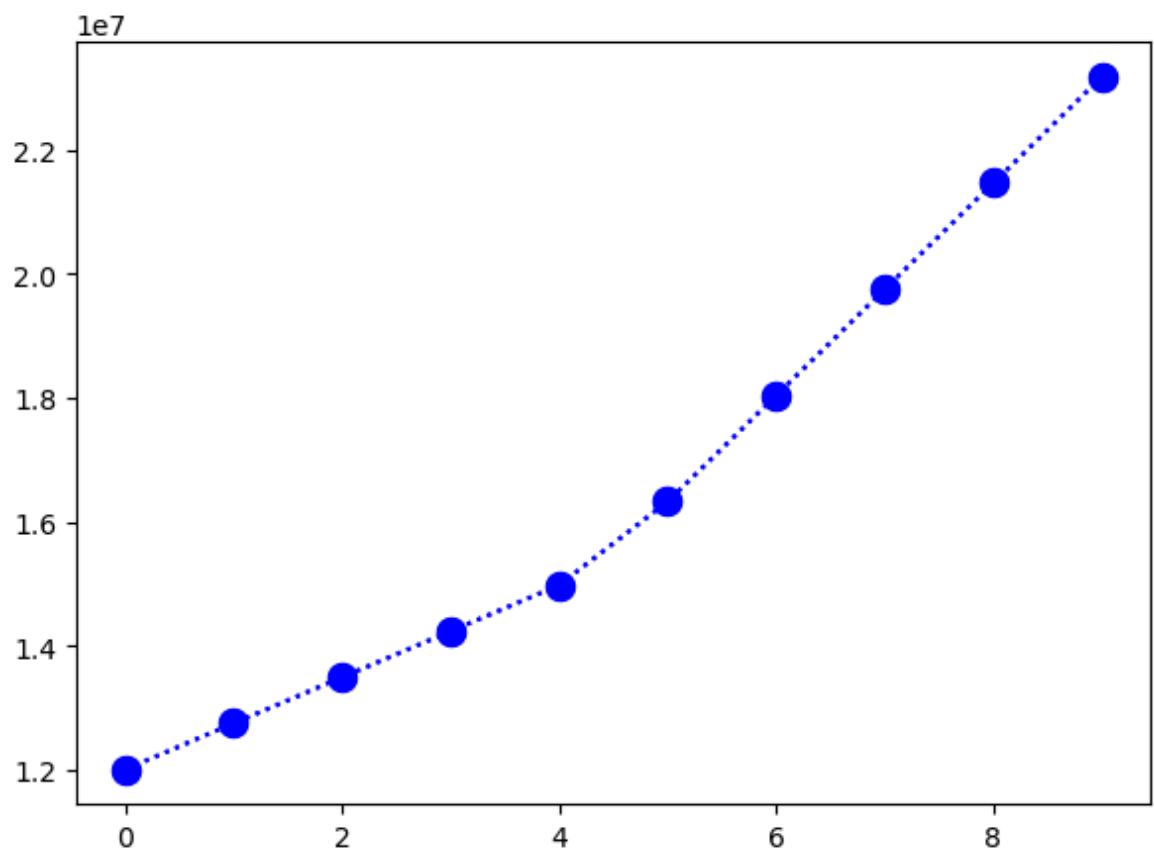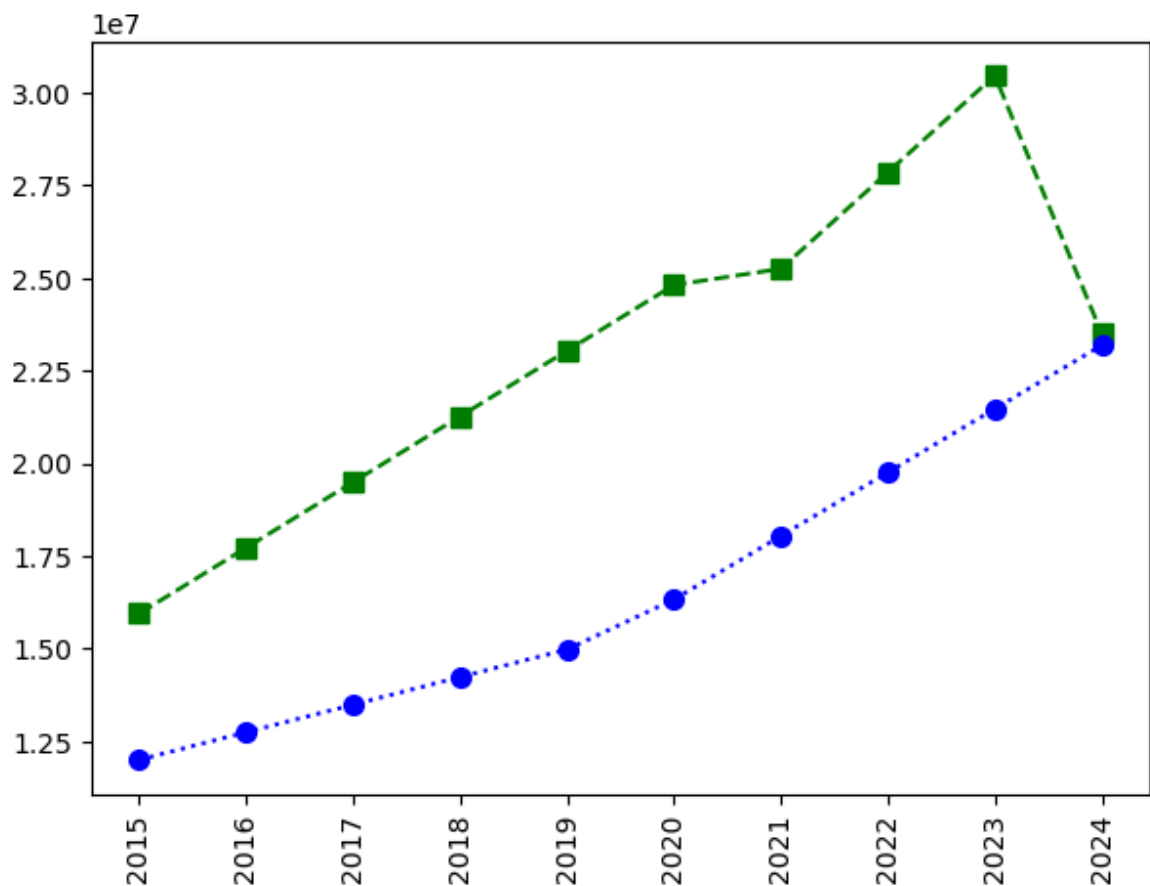
More Visualization, combining all 3 players maps into a single graph for better visualization and comparision

In [54]:
```python
plt.plot(Salary[0], c='Green', ls = '--', marker = 's', ms = 7, label = Players[
plt.plot(Salary[1], c='Blue', ls = ':', marker = 'o', ms = 7, label = Players[1]

plt.xticks(list(range(0,10)), Seasons,rotation='vertical')

plt.show()
```
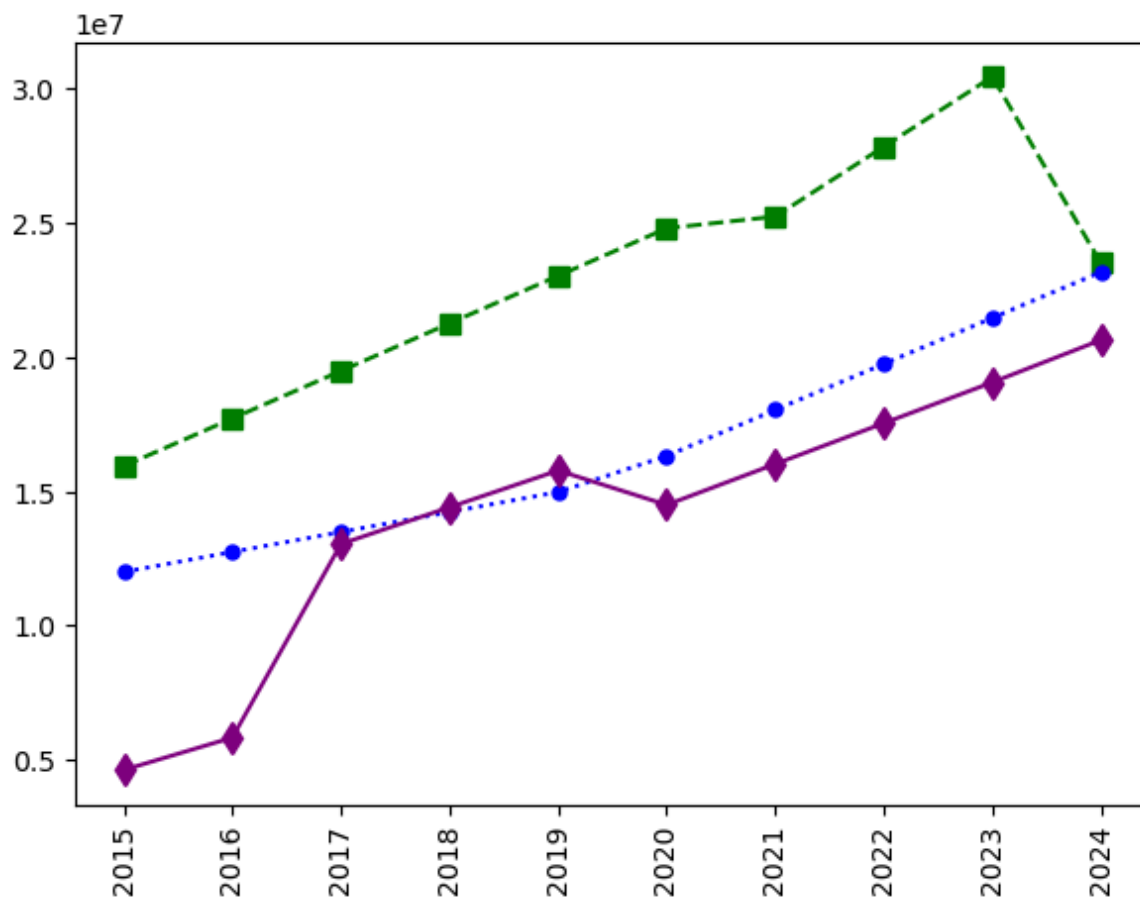

In [61]:
```python
plt.plot(Salary[0], c='Green', ls = '--', marker = 's', ms = 7, label = Players[
plt.plot(Salary[1], c='Blue', ls = ':', marker = 'o', ms = 5, label = Players[1]
plt.plot(Salary[2], c='purple', ls = '-', marker = 'd', ms = 8, label = Players[

plt.xticks(list(range(0,10)), Seasons,rotation='vertical')

plt.show()
```
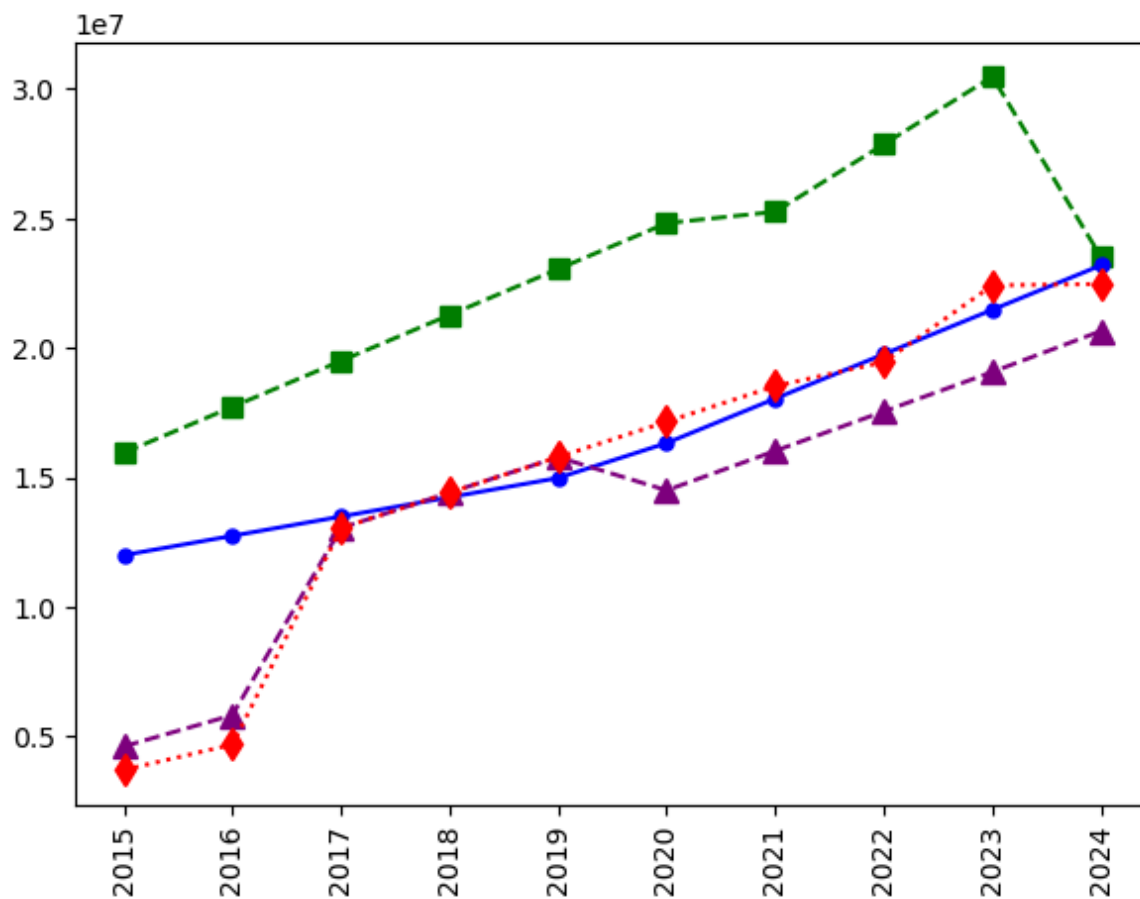
In [62]:
```python
plt.plot(Salary[0], c='Green', ls = '--', marker = 's', ms = 7, label = Players[
plt.plot(Salary[1], c='Blue', ls = '-', marker = 'o', ms = 5, label = Players[1]
plt.plot(Salary[2], c='purple', ls = '--', marker = '^', ms = 8, label = Players
plt.plot(Salary[3], c='Red', ls = ':', marker = 'd', ms = 8, label = Players[3])

plt.xticks(list(range(0,10)), Seasons,rotation='vertical')

plt.show()
```
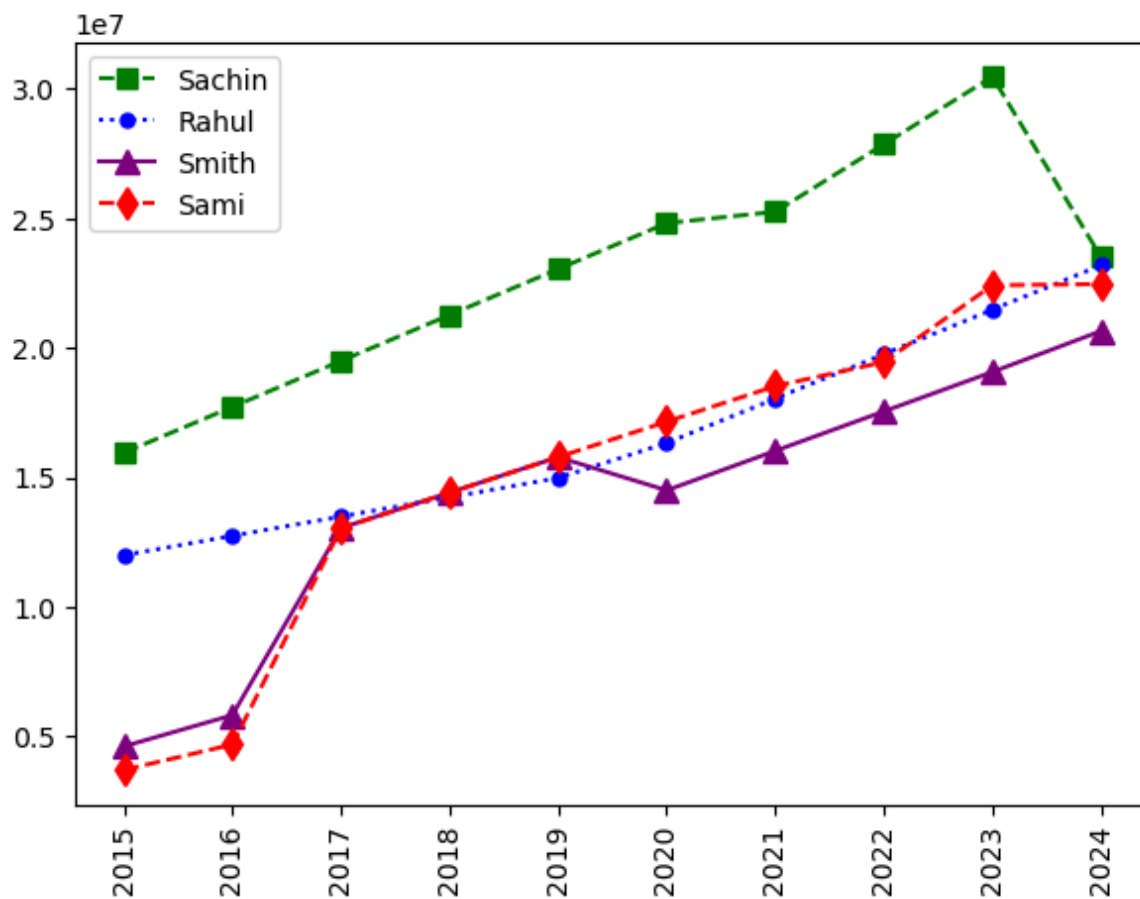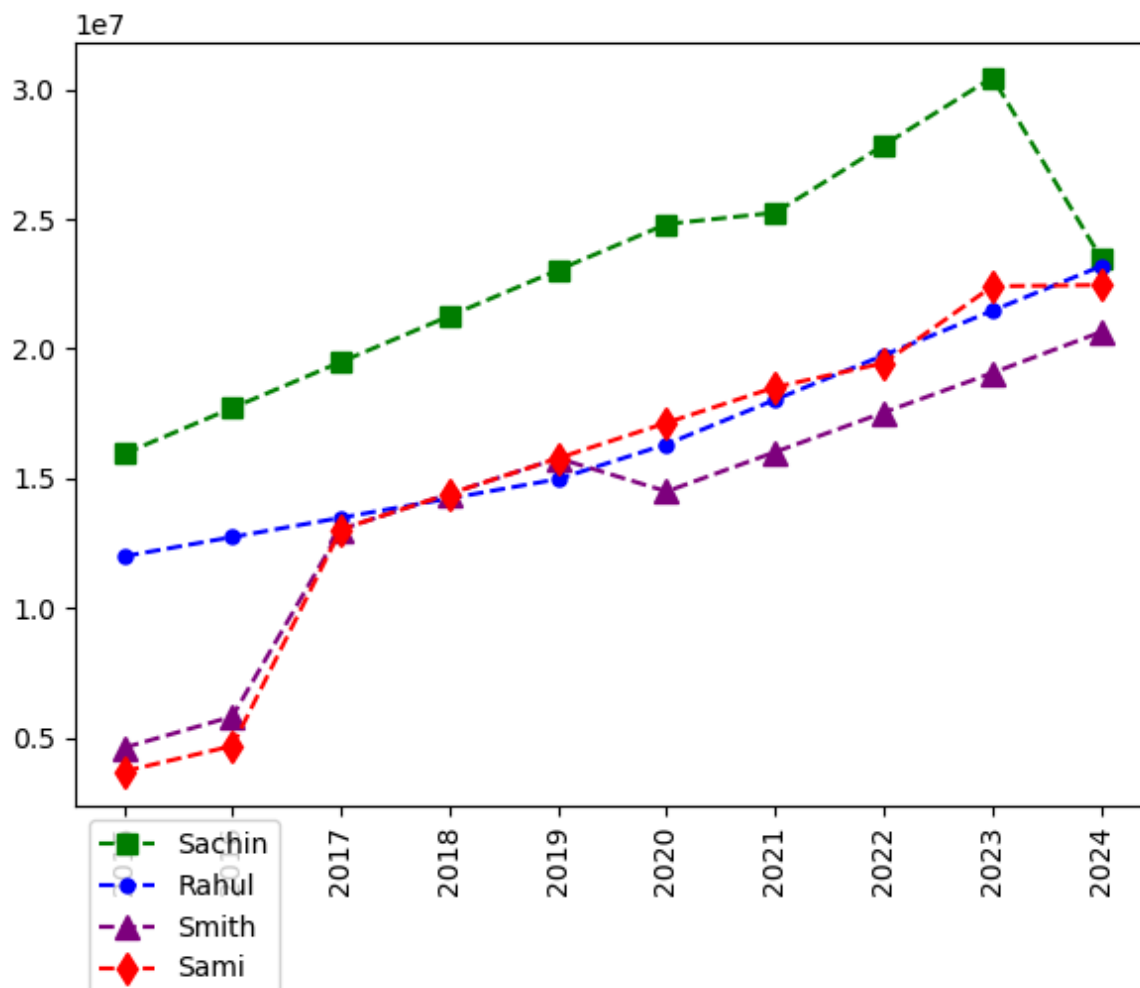
In [63]:
```python
# how to add legned in visualisation

plt.plot(Salary[0], c='Green', ls = '--', marker = 's', ms = 7, label = Players[
plt.plot(Salary[1], c='Blue', ls = ':', marker = 'o', ms = 5, label = Players[1]
plt.plot(Salary[2], c='purple', ls = '-', marker = '^', ms = 8, label = Players[
plt.plot(Salary[3], c='Red', ls = '--', marker = 'd', ms = 8, label = Players[3]
plt.legend()
plt.xticks(list(range(0,10)), Seasons,rotation='vertical')

plt.show()
```
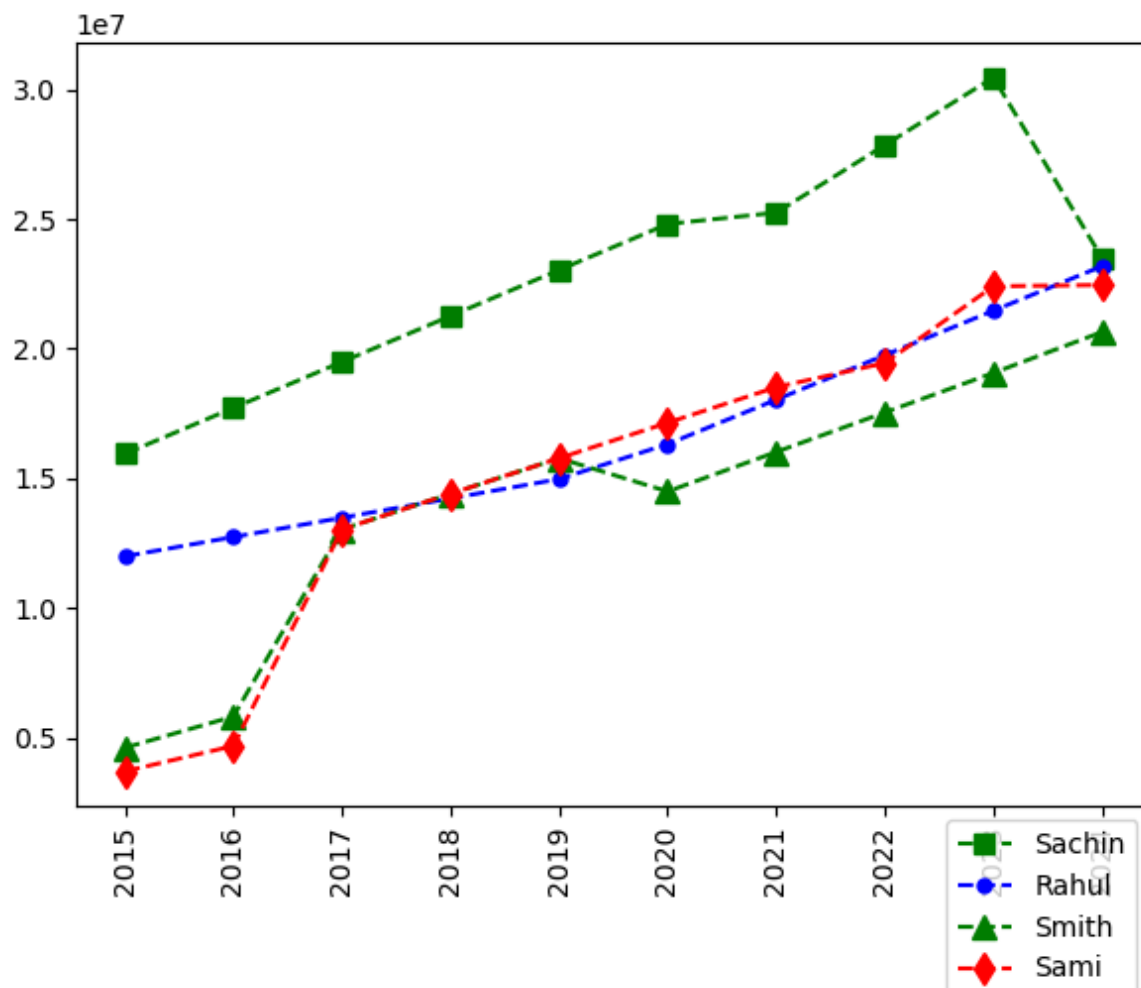
```
In [64]: plt.plot(Salary[0], c='Green', ls = '--', marker = 's', ms = 7, label = Players[
         plt.plot(Salary[1], c='Blue', ls = '--', marker = 'o', ms = 5, label = Players[1
         plt.plot(Salary[2], c='purple', ls = '--', marker = '^', ms = 8, label = Players
         plt.plot(Salary[3], c='Red', ls = '--', marker = 'd', ms = 8, label = Players[3]
         plt.legend(loc = 'upper left',bbox_to_anchor=(0,0) )
         plt.xticks(list(range(0,10)), Seasons,rotation='vertical')

         plt.show()
```
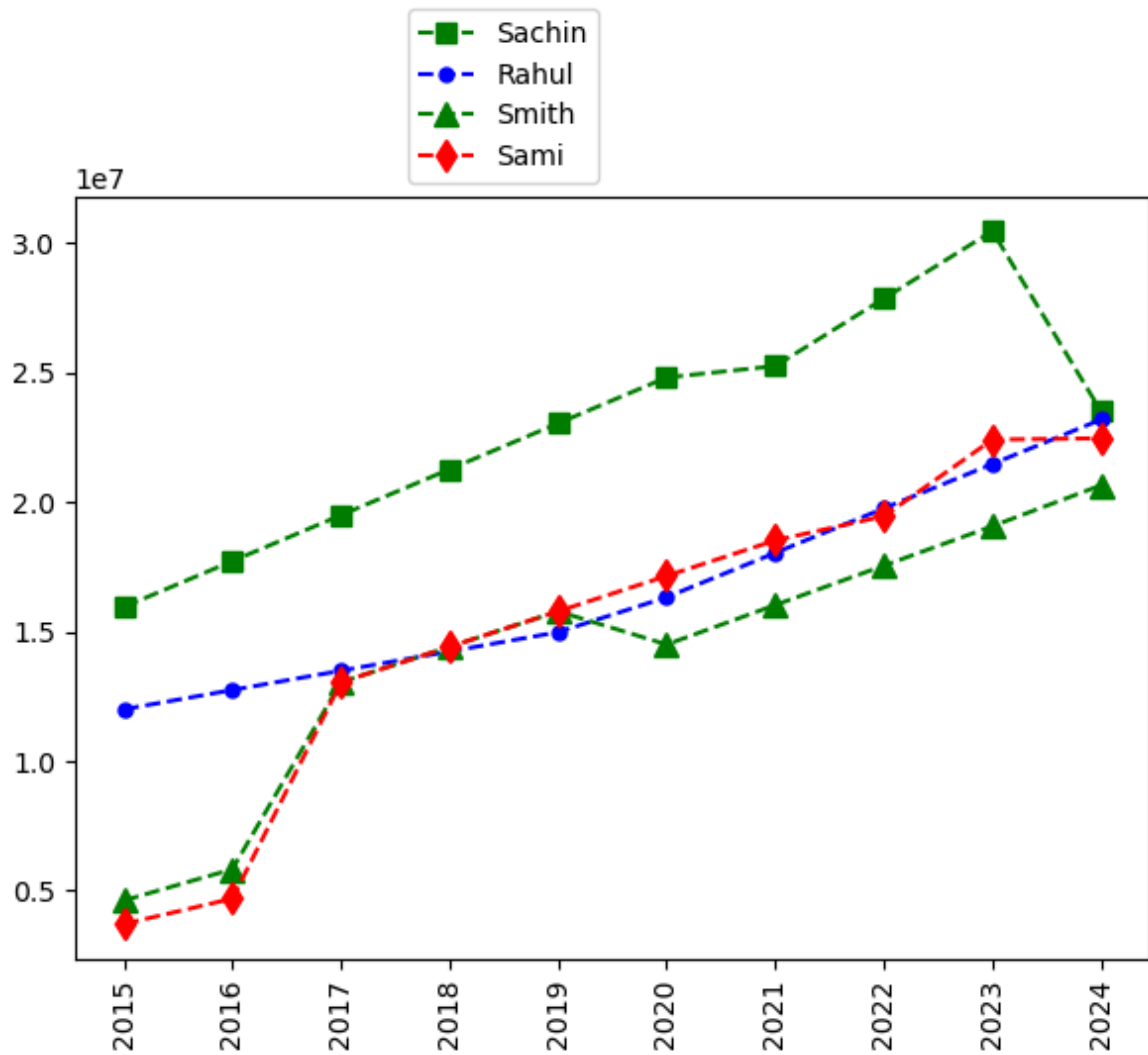
```
In [65]: plt.plot(Salary[0], c='Green', ls = '--', marker = 's', ms = 7, label = Players[
         plt.plot(Salary[1], c='Blue', ls = '--', marker = 'o', ms = 5, label = Players[1
         plt.plot(Salary[2], c='Green', ls = '--', marker = '^', ms = 8, label = Players[
         plt.plot(Salary[3], c='Red', ls = '--', marker = 'd', ms = 8, label = Players[3]
         plt.legend(loc = 'upper right',bbox_to_anchor=(1,0) )
         plt.xticks(list(range(0,10)), Seasons,rotation='vertical')

         plt.show()
```

```
In [66]: plt.plot(Salary[0], c='Green', ls = '--', marker = 's', ms = 7, label = Players[
         plt.plot(Salary[1], c='Blue', ls = '--', marker = 'o', ms = 5, label = Players[1
         plt.plot(Salary[2], c='Green', ls = '--', marker = '^', ms = 8, label = Players[
         plt.plot(Salary[3], c='Red', ls = '--', marker = 'd', ms = 8, label = Players[3]
         plt.legend(loc = 'lower right',bbox_to_anchor=(0.5,1) )
         plt.xticks(list(range(0,10)), Seasons,rotation='vertical')

         plt.show()
```
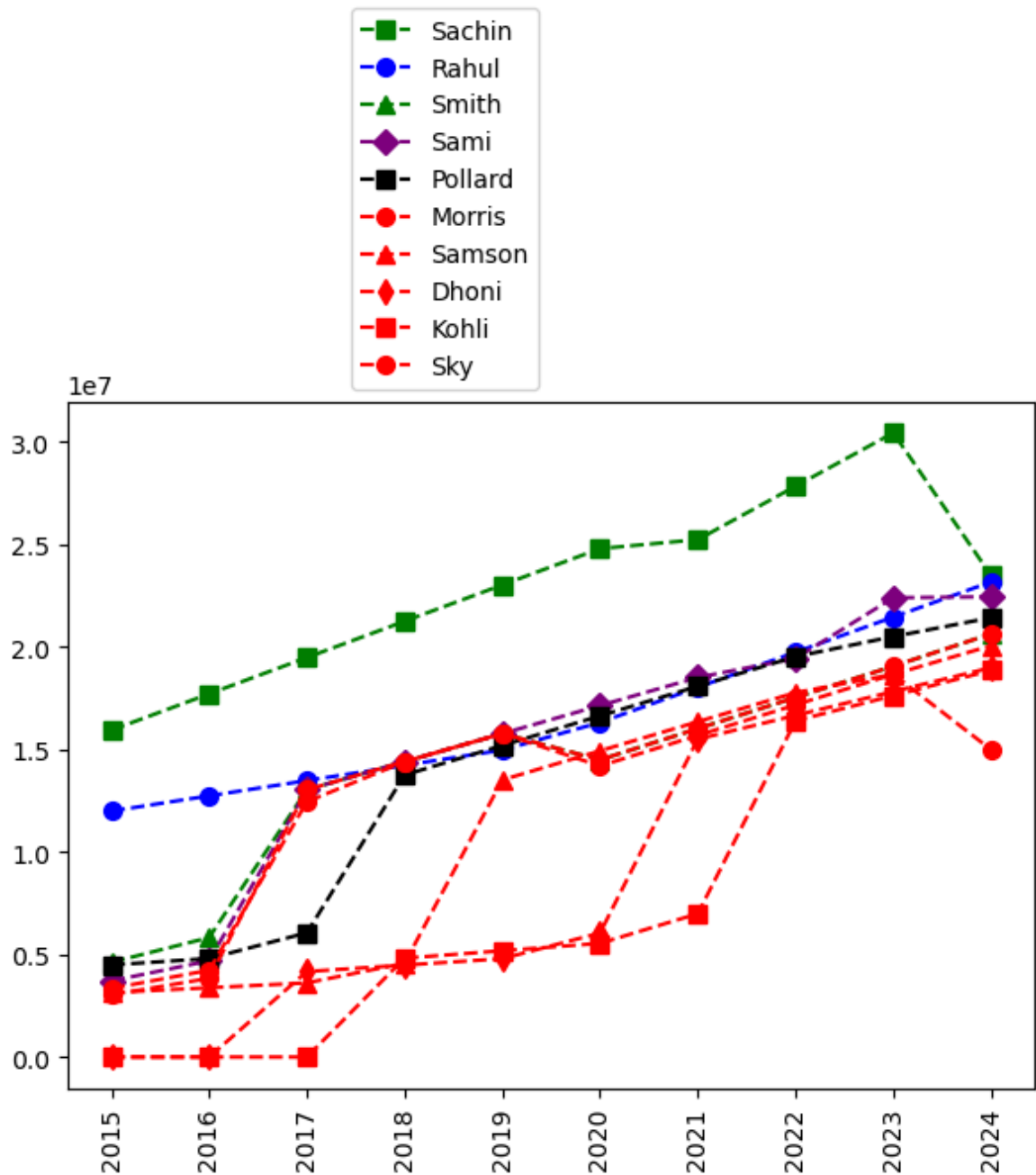
In [67]:
```python
plt.plot(Salary[0], c='Green', ls = '--', marker = 's', ms = 7, label = Players[
plt.plot(Salary[1], c='Blue', ls = '--', marker = 'o', ms = 7, label = Players[1
plt.plot(Salary[2], c='Green', ls = '--', marker = '^', ms = 7, label = Players[
plt.plot(Salary[3], c='Purple', ls = '--', marker = 'D', ms = 7, label = Players
plt.plot(Salary[4], c='Black', ls = '--', marker = 's', ms = 7, label = Players[
plt.plot(Salary[5], c='Red', ls = '--', marker = 'o', ms = 7, label = Players[5]
plt.plot(Salary[6], c='Red', ls = '--', marker = '^', ms = 7, label = Players[6]
plt.plot(Salary[7], c='Red', ls = '--', marker = 'd', ms = 7, label = Players[7]
plt.plot(Salary[8], c='Red', ls = '--', marker = 's', ms = 7, label = Players[8]
plt.plot(Salary[9], c='Red', ls = '--', marker = 'o', ms = 7, label = Players[9]

plt.legend(loc = 'lower right',bbox_to_anchor=(0.5,1) )
plt.xticks(list(range(0,10)), Seasons,rotation='vertical')

plt.show()
```

```
In [68]:   # we can visualize the how many games played by a player

           plt.plot(Games[0], c='Green', ls = '--', marker = 's', ms = 7, label = Players[0
           plt.plot(Games[1], c='Blue', ls = '--', marker = 'o', ms = 7, label = Players[1]
           plt.plot(Games[2], c='Green', ls = '--', marker = '^', ms = 7, label = Players[2
           plt.plot(Games[3], c='Red', ls = '--', marker = 'D', ms = 7, label = Players[3])
           plt.plot(Games[4], c='Black', ls = '--', marker = 's', ms = 7, label = Players[4
           plt.plot(Games[5], c='Blue', ls = '--', marker = 'o', ms = 7, label = Players[5]
           plt.plot(Games[6], c='red', ls = '--', marker = '^', ms = 7, label = Players[6])
           plt.plot(Games[7], c='Green', ls = '--', marker = 'd', ms = 7, label = Players[7
           plt.plot(Games[8], c='Red', ls = '--', marker = 's', ms = 7, label = Players[8])
           plt.plot(Games[9], c='Blue', ls = '--', marker = 'o', ms = 7, label = Players[9]

           plt.legend(loc = 'lower right',bbox_to_anchor=(0.5,1) )
           plt.xticks(list(range(0,10)), Seasons,rotation='vertical')

           plt.show()
```
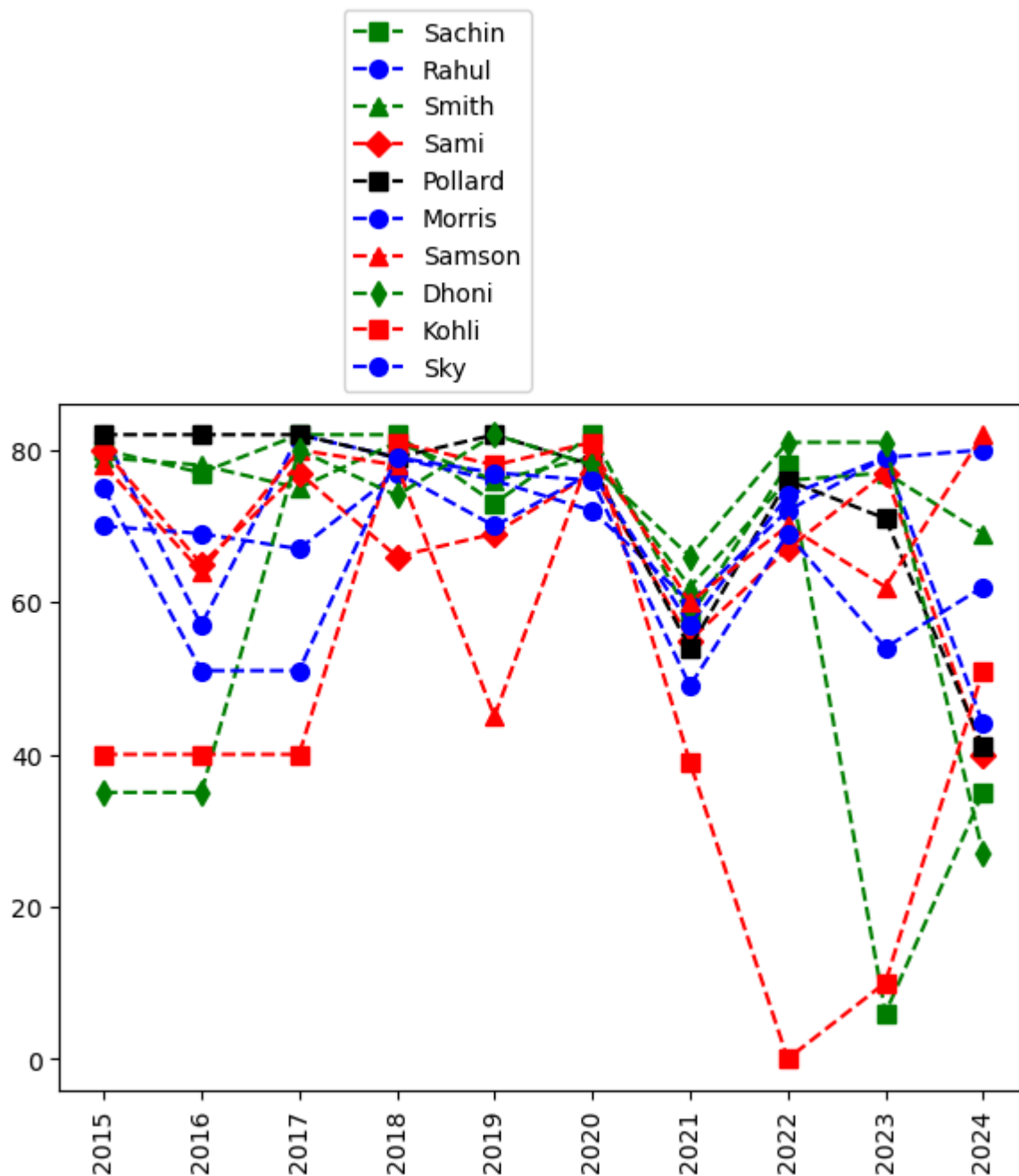
- In this section we learned -

1>Matrices 2>Building matrices - np.reshape 3>Dictionaried in python (order doesnot mater) (keys & values) 4>visualizaing using pyplot 5>Basket ball analysis

In [ ]: