In [1]:
```
#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, Samsc

#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 [2]:
```
Salary
```

```
Out[2]: 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 [3]: Points
```

```
Out[3]: 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 [4]: Sdict
```

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

```
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]: Games[5]
```

```
Out[6]: array([70, 69, 67, 77, 70, 77, 57, 74, 79, 44])
```

```
In [7]: Games[5,3]
```

```
Out[7]: np.int64(77)
```

```
In [8]: Salary
```

```
Out[8]: 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 [9]: Salary[0]
```

```
Out[9]: array([15946875, 17718750, 19490625, 21262500, 23034375, 24806250,
               25244493, 27849149, 30453805, 23500000])
```

```
In [10]: Pdict
```

```
Out[10]: {'Sachin': 0,
          'Rahul': 1,
          'Smith': 2,
          'Sami': 3,
          'Pollard': 4,
          'Morris': 5,
          'Samson': 6,
          'Dhoni': 7,
          'Kohli': 8,
          'Sky': 9}
```

```
In [11]: Games[0]
```

```
Out[11]: array([80, 77, 82, 82, 73, 82, 58, 78,  6, 35])
```

```
In [12]: Salary[0] / Games[0]
```

```
Out[12]: array([ 199335.9375    ,  230113.63636364,  237690.54878049,
                 259298.7804878 ,  315539.38356164,  302515.24390244,
                 435249.87931034,  357040.37179487, 5075634.16666667,
                 671428.57142857])
```

```
In [13]: np.round (Salary[0] / Games[0])
```

```
Out[13]: array([ 199336.,  230114.,  237691.,  259299.,  315539.,  302515.,
                 435250.,  357040., 5075634.,  671429.])
```

lets visulize the data

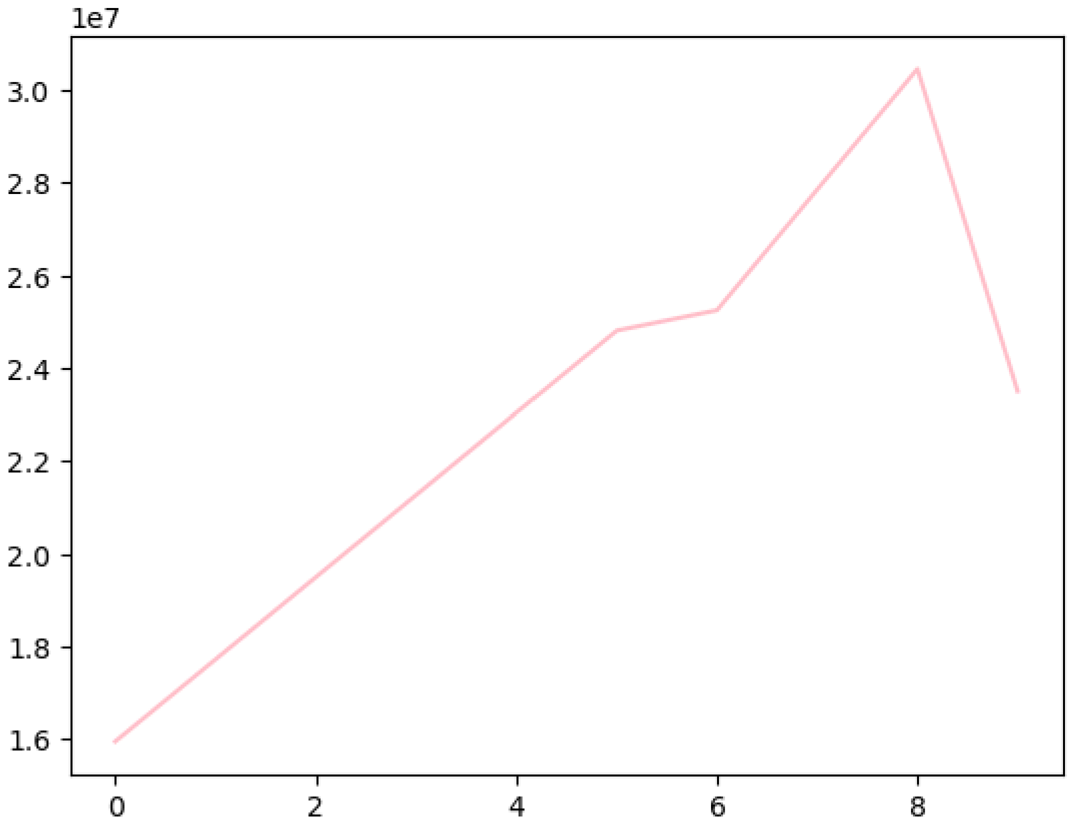
```
In [14]: import warnings
         warnings.filterwarnings('ignore')
         # to ignore as unwanted error write the code as ignore all
```

```
In [15]: import matplotlib.pyplot as plt
```

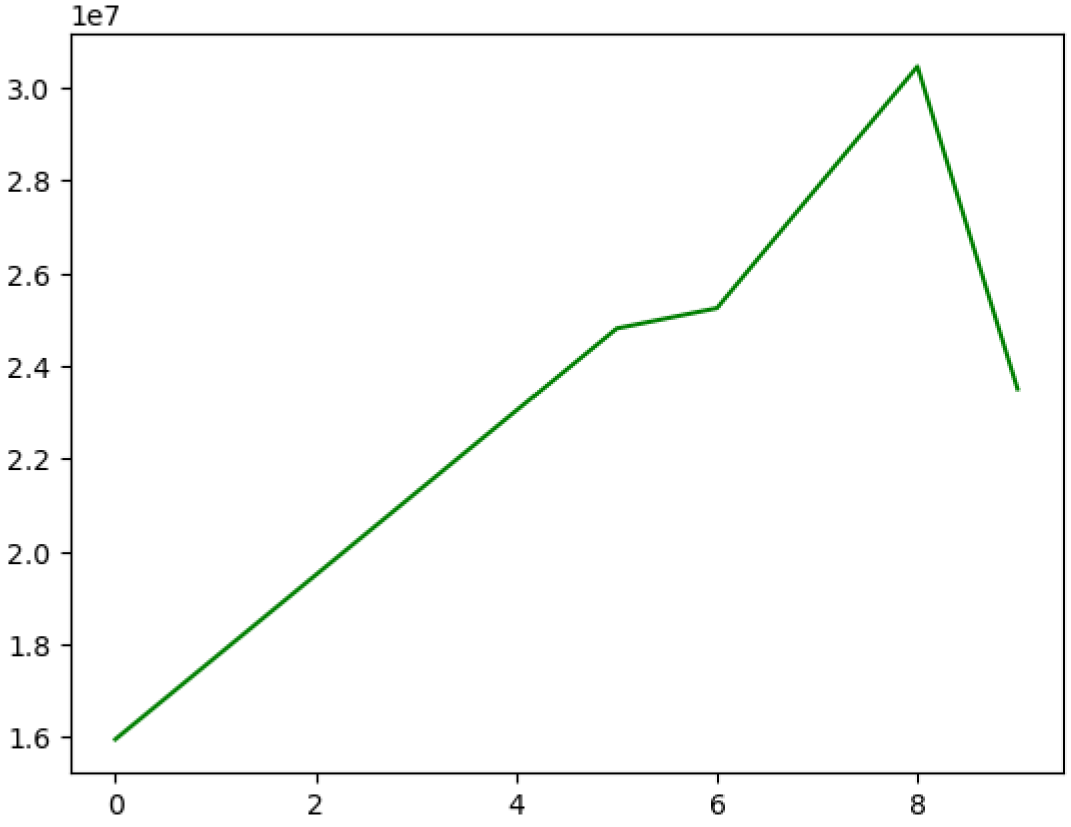
```
In [16]: Salary[0]
```

```
Out[16]: array([15946875, 17718750, 19490625, 21262500, 23034375, 24806250,
                25244493, 27849149, 30453805, 23500000])
```

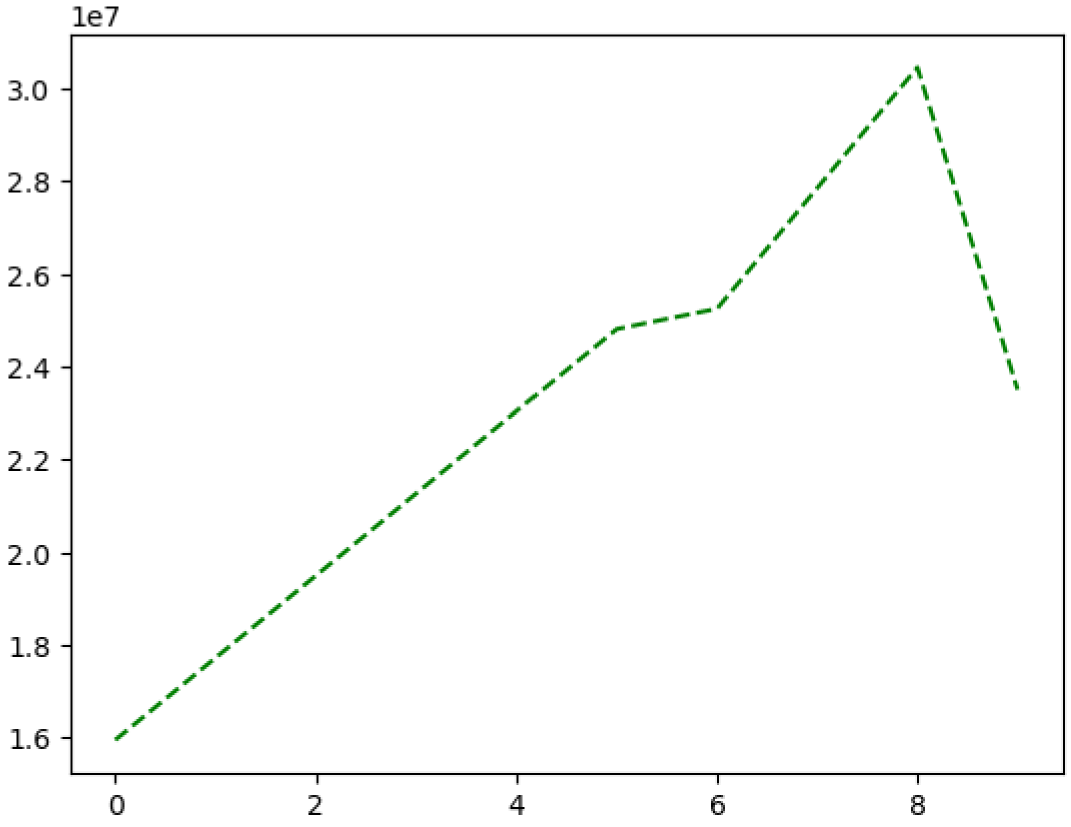
```
In [17]: plt.plot(Salary[0],color='pink')
         plt.show()
```



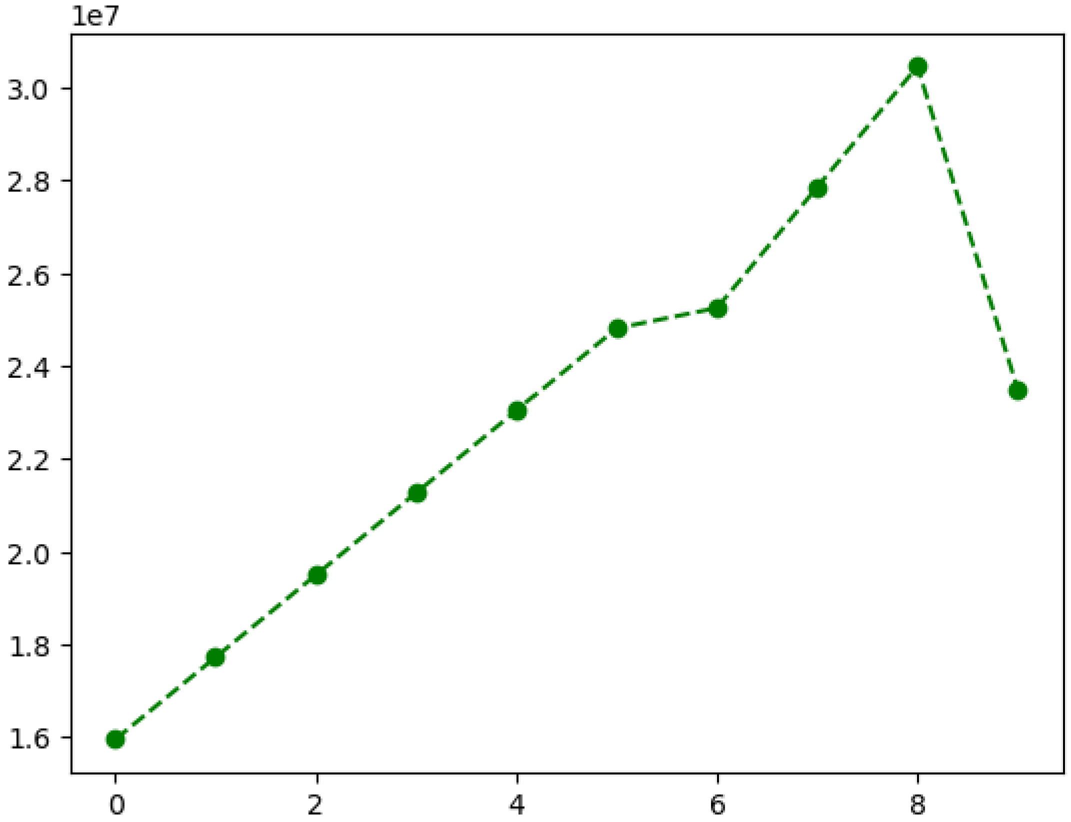
```
In [18]: plt.plot(Salary[0],c = 'g')
         plt.show()
```



```
In [19]: plt.plot(Salary[0], c = 'g', ls = '--')
         plt.show()
```



```
In [20]: plt.plot(Salary[0], c = 'g', ls = '--',marker ='o')
         plt.show()
```

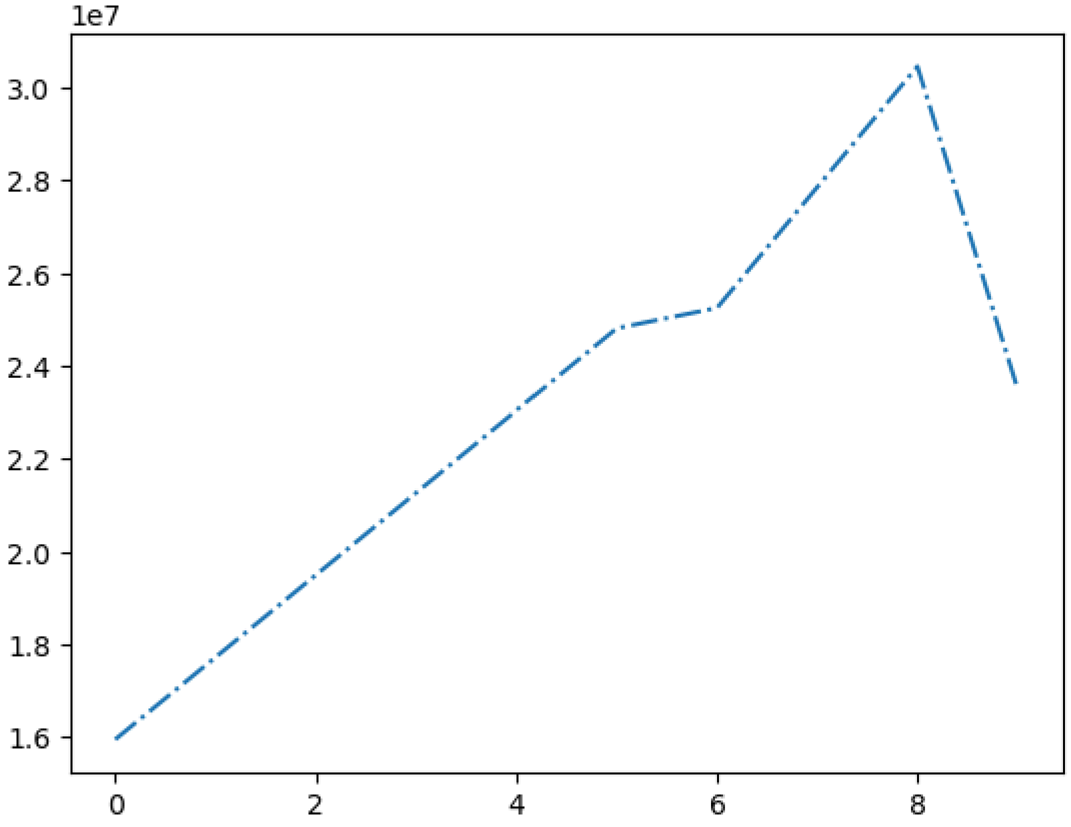


In [21]:
```
Games
```

Out[21]:
```
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]])
```

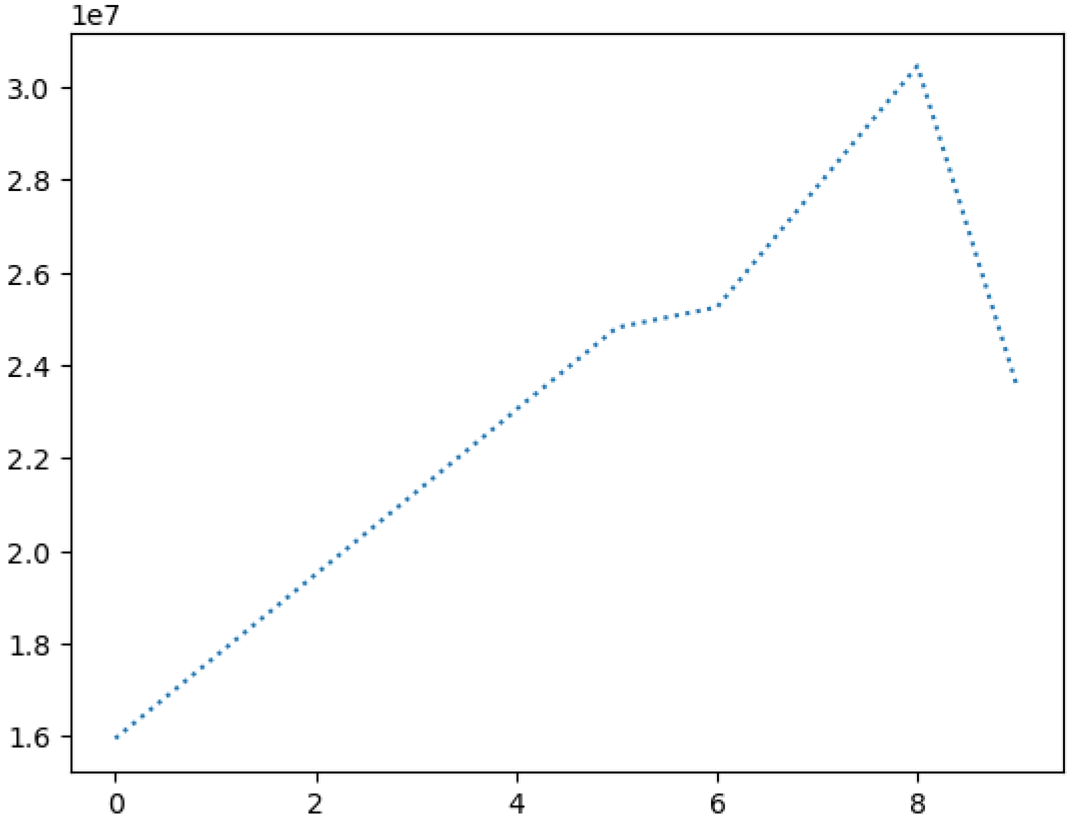
In [22]:
```
plt.plot(Salary[0],ls = '-.')
```

Out[22]:
```
[<matplotlib.lines.Line2D at 0x1d5c0f0ead0>]
```



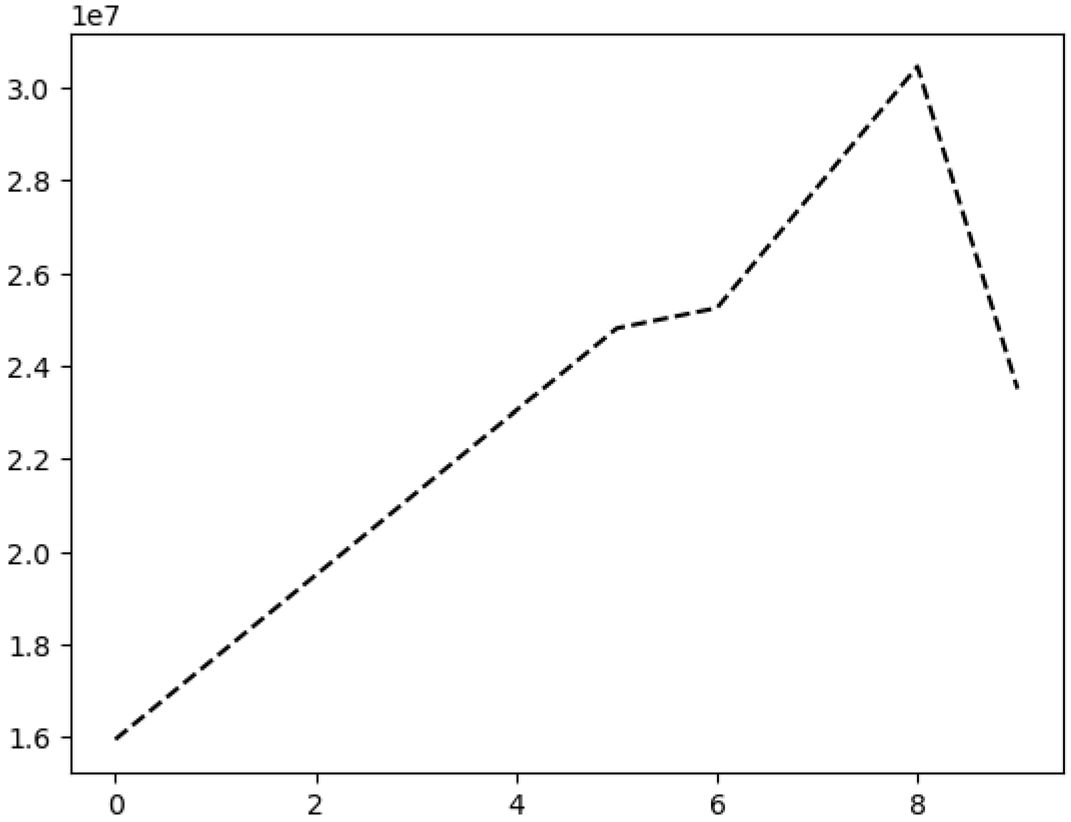
In [23]:
```
plt.plot(Salary[0], ls = ':')
```

Out[23]:
```
[<matplotlib.lines.Line2D at 0x1d5c0edc190>]
```



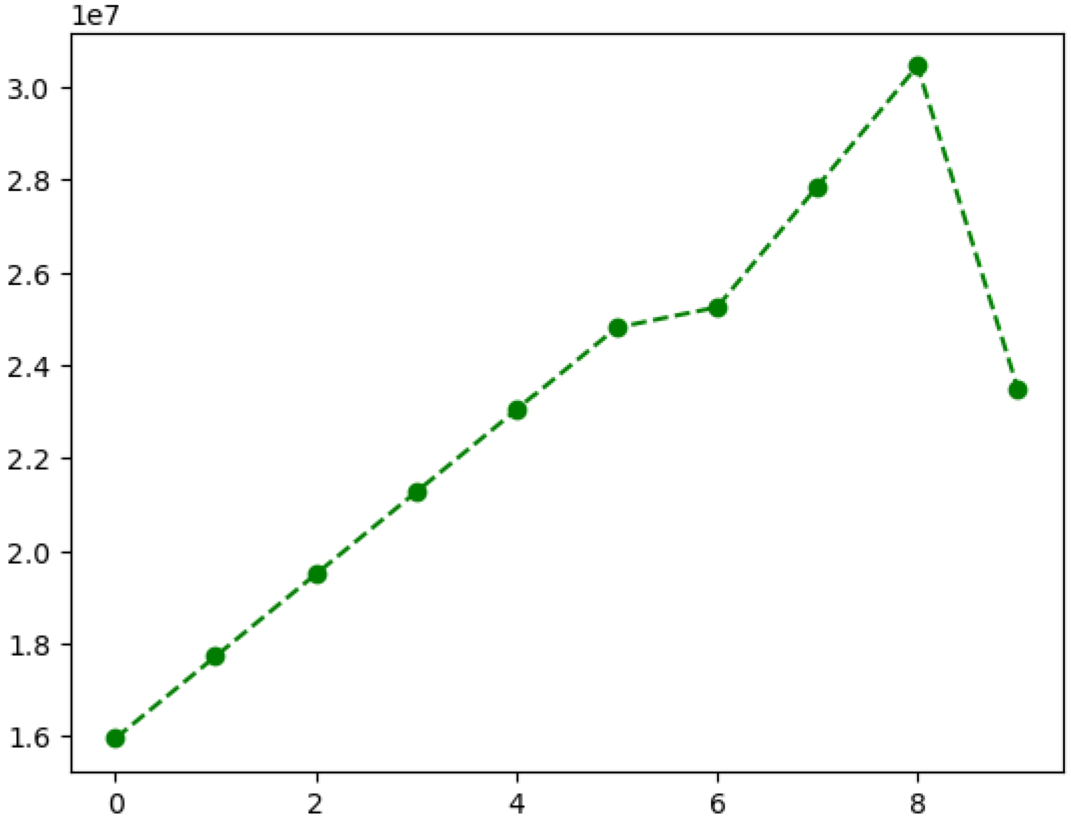
In [24]:
```
plt.plot(Salary[0],ls = '--', color = 'black')
```

Out[24]:
```
[<matplotlib.lines.Line2D at 0x1d5c0702710>]
```



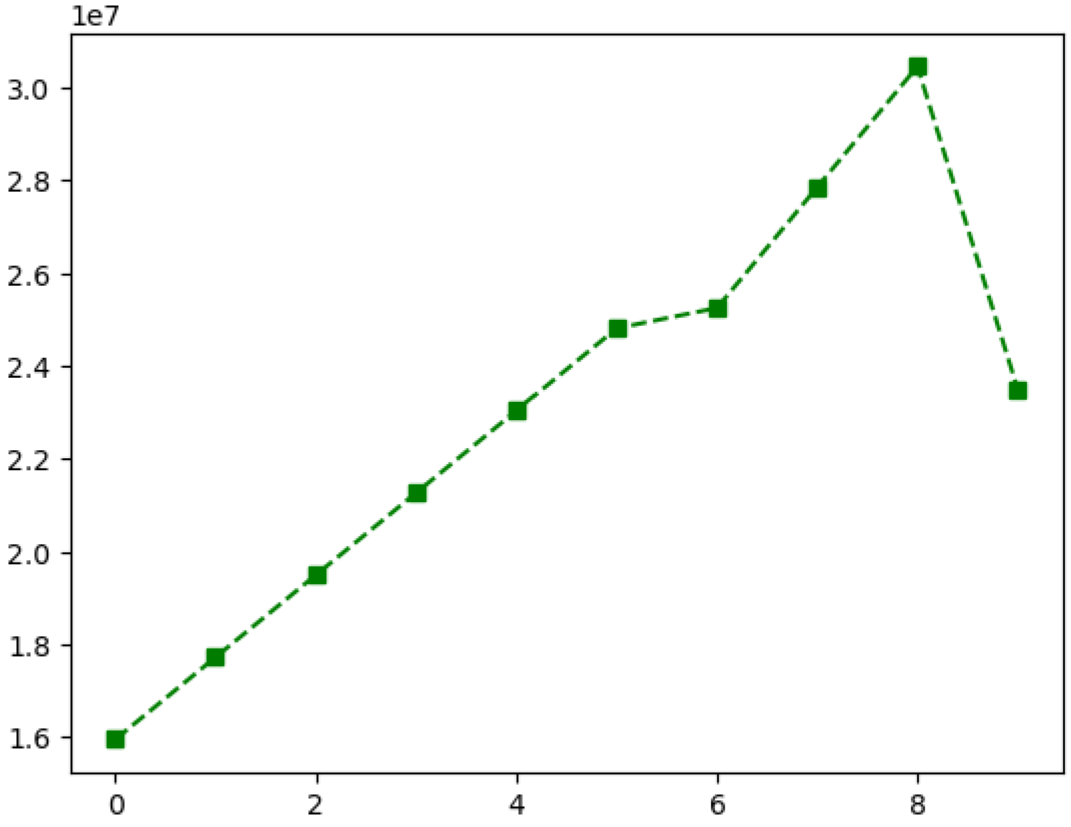
```
In [25]: plt.plot(Salary[0],ls = '--',color = 'green',marker = 'o')
```

```
Out[25]: [<matplotlib.lines.Line2D at 0x1d5c07cccd0>]
```



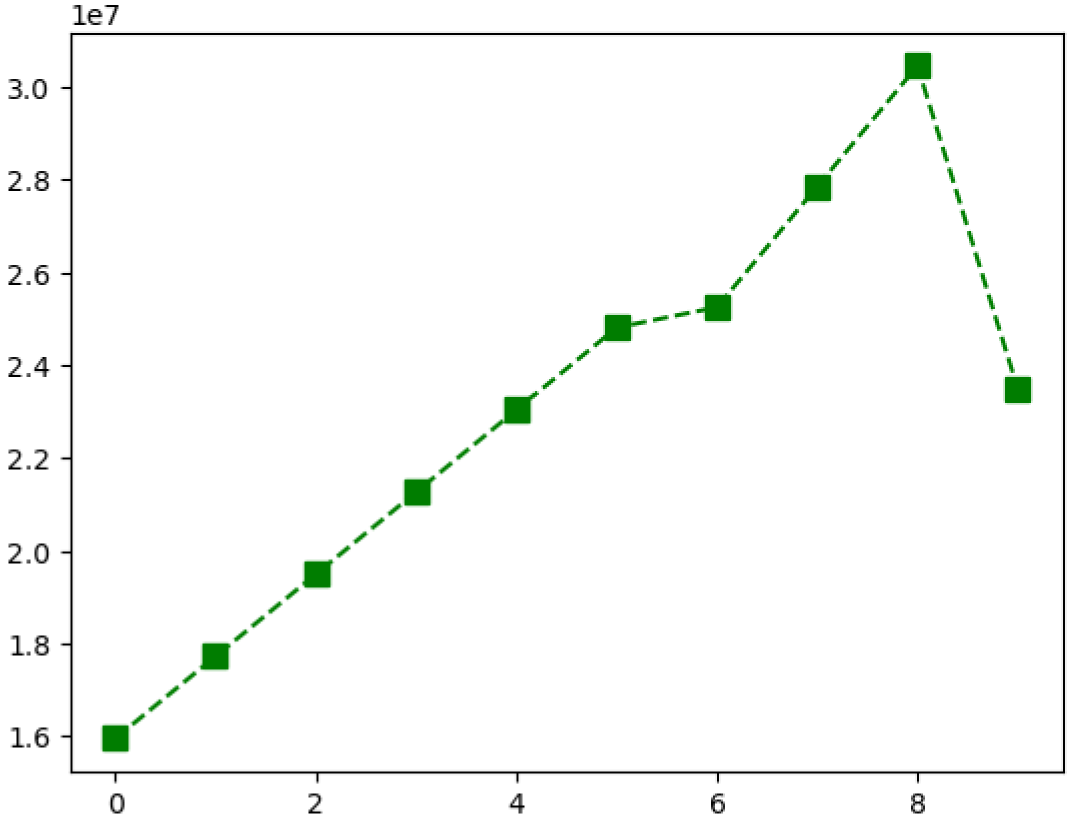
```
In [26]: plt.plot(Salary[0],ls = '--',color = 'green', marker = 's')
```

```
Out[26]: [<matplotlib.lines.Line2D at 0x1d5c0713250>]
```



```
In [27]: plt.plot(Salary[0],ls = '--',color = 'green', marker = 's', ms = 8)
```

```
Out[27]: [<matplotlib.lines.Line2D at 0x1d5c2035810>]
```



Project/task-3

Matrices/Numpy-----

In [28]:

```
#Import numpy
import numpy as np

#Seasons
Seasons = ["2010","2011","2012","2013","2014","2015","2016","2017","2018","2019"
Sdict = {"2010":0,"2011":1,"2012":2,"2013":3,"2014":4,"2015":5,"2016":6,"2017":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 [29]:

```
Salary # matrix format
```

```
Out[29]:  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 [30]:  # Buiding your first matrix -
          Games
```

```
Out[30]:  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 [31]:  Points
```

```
Out[31]:  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 [32]:  mydata = np.arange(0,20)
          print(mydata)
```

```
[ 0  1  2  3  4  5  6  7  8  9 10 11 12 13 14 15 16 17 18 19]
```

```
In [33]:  np.reshape(mydata,(4,5)) # 5 rows & 4 columns
```

```
Out[33]:  array([[ 0,  1,  2,  3,  4],
                 [ 5,  6,  7,  8,  9],
                 [10, 11, 12, 13, 14],
                 [15, 16, 17, 18, 19]])
```

In [34]:
```
mydata
```

Out[34]:
```
array([ 0,  1,  2,  3,  4,  5,  6,  7,  8,  9, 10, 11, 12, 13, 14, 15, 16,
       17, 18, 19])
```

In [35]:
```
# np.reshape(mydata,(5,4),order = 'c') # 'c' means to read / write the elements
MATR1 = np.reshape(mydata,(5,4),order = 'c')
MATR1
```

Out[35]:
```
array([[ 0,  1,  2,  3],
       [ 4,  5,  6,  7],
       [ 8,  9, 10, 11],
       [12, 13, 14, 15],
       [16, 17, 18, 19]])
```

In [36]:
```
MATR1
```

Out[36]:
```
array([[ 0,  1,  2,  3],
       [ 4,  5,  6,  7],
       [ 8,  9, 10, 11],
       [12, 13, 14, 15],
       [16, 17, 18, 19]])
```

In [37]:
```
# IF i want to get only no.3
MATR1[4,3]
```

Out[37]:
```
np.int64(19)
```

In [38]:
```
MATR1[3,3]
```

Out[38]:
```
np.int64(15)
```

In [39]:
```
MATR1
```

Out[39]:
```
array([[ 0,  1,  2,  3],
       [ 4,  5,  6,  7],
       [ 8,  9, 10, 11],
       [12, 13, 14, 15],
       [16, 17, 18, 19]])
```

In [40]:
```
MATR1[-3,-1]
```

Out[40]:
```
np.int64(11)
```

In [41]:
```
MATR1
```

Out[41]:
```
array([[ 0,  1,  2,  3],
       [ 4,  5,  6,  7],
       [ 8,  9, 10, 11],
       [12, 13, 14, 15],
       [16, 17, 18, 19]])
```

In [42]:
```
mydata
```

Out[42]:
```
array([ 0,  1,  2,  3,  4,  5,  6,  7,  8,  9, 10, 11, 12, 13, 14, 15, 16,
       17, 18, 19])
```

In [43]:
```
MATR2 = np.reshape(mydata,(5,4),order = 'F') # reshape behaviour are - 'c','F','
```

```
MATR2
```

```
Out[43]: array([[ 0,  5, 10, 15],
                [ 1,  6, 11, 16],
                [ 2,  7, 12, 17],
                [ 3,  8, 13, 18],
                [ 4,  9, 14, 19]])
```

```
In [44]: MATR2[4,3]
```

```
Out[44]: np.int64(19)
```

```
In [45]: MATR2[0,2]
```

```
Out[45]: np.int64(10)
```

```
In [46]: MATR2
```

```
Out[46]: array([[ 0,  5, 10, 15],
                [ 1,  6, 11, 16],
                [ 2,  7, 12, 17],
                [ 3,  8, 13, 18],
                [ 4,  9, 14, 19]])
```

```
In [47]:  MATR2[1:2]
```

```
Out[47]: array([[ 1,  6, 11, 16]])
```

```
In [48]: MATR2[1,2]
```

```
Out[48]: np.int64(11)
```

```
In [49]: MATR2
```

```
Out[49]: array([[ 0,  5, 10, 15],
                [ 1,  6, 11, 16],
                [ 2,  7, 12, 17],
                [ 3,  8, 13, 18],
                [ 4,  9, 14, 19]])
```

```
In [50]: MATR2[-2,-1]
```

```
Out[50]: np.int64(18)
```

```
In [51]: MATR2[-3,-3]
```

```
Out[51]: np.int64(7)
```

```
In [52]: MATR2[0:2]
```

```
Out[52]: array([[ 0,  5, 10, 15],
                [ 1,  6, 11, 16]])
```

```
In [53]: mydata
```

```
Out[53]: array([ 0,  1,  2,  3,  4,  5,  6,  7,  8,  9, 10, 11, 12, 13, 14, 15, 16,
                17, 18, 19])
```

In [54]:

```
MATR3 = np.reshape(mydata,(5,4), order = 'A')
MATR3
```

Out[54]:

```
array([[ 0,  1,  2,  3],
       [ 4,  5,  6,  7],
       [ 8,  9, 10, 11],
       [12, 13, 14, 15],
       [16, 17, 18, 19]])
```

In [55]:

```
MATR2 ## F shape
```

Out[55]:

```
array([[ 0,  5, 10, 15],
       [ 1,  6, 11, 16],
       [ 2,  7, 12, 17],
       [ 3,  8, 13, 18],
       [ 4,  9, 14, 19]])
```

In [56]:

```
MATR1 # C shape
```

Out[56]:

```
array([[ 0,  1,  2,  3],
       [ 4,  5,  6,  7],
       [ 8,  9, 10, 11],
       [12, 13, 14, 15],
       [16, 17, 18, 19]])
```

In [57]:

```
a1 = ['welcome','to','datascience']
a2 = ['required','hard','work']
a3 = [1,2,3]
```

In [58]:

```
[a1,a2,a3] # list same datatype
```

Out[58]:

```
[['welcome', 'to', 'datascience'], ['required', 'hard', 'work'], [1, 2, 3]]
```

In [59]:

```
np.array([a1,a2,a3]) # u11 - unicode 11 character : 3*3 matrix
```

Out[59]:

```
array([['welcome', 'to', 'datascience'],
       ['required', 'hard', 'work'],
       ['1', '2', '3']], dtype='<U21')
```

In [60]:

```
Games
```

Out[60]:

```
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 [61]:

```
Games[0]
```

Out[61]:

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

In [62]:

```
Games[5]
```

```
Out[62]:  array([70, 69, 67, 77, 70, 77, 57, 74, 79, 44])
```

```
In [63]: Games[0,5]
```

```
Out[63]:  np.int64(82)
```

```
In [64]: Games[0,2]
```

```
Out[64]:  np.int64(82)
```

```
In [65]: Games
```

```
Out[65]:  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 [66]: Games[0:2]
```

```
Out[66]:  array([[80, 77, 82, 82, 73, 82, 58, 78,  6, 35],
                 [82, 57, 82, 79, 76, 72, 60, 72, 79, 80]])
```

```
In [67]: Games
```

```
Out[67]:  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 [68]: Games[1:2]
```

```
Out[68]:  array([[82, 57, 82, 79, 76, 72, 60, 72, 79, 80]])
```

```
In [69]: Games[2]
```

```
Out[69]:  array([79, 78, 75, 81, 76, 79, 62, 76, 77, 69])
```

```
In [70]: Games[2]
```

```
Out[70]:  array([79, 78, 75, 81, 76, 79, 62, 76, 77, 69])
```

```
In [71]: Games
```

```
Out[71]: 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 [72]: Games[2,3]
```

```
Out[72]: np.int64(81)
```

```
In [73]: Games[2,8]
```

```
Out[73]: np.int64(77)
```

```
In [74]: Games
```

```
Out[74]: 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 [75]: Games[-3:-1]
```

```
Out[75]: array([[35, 35, 80, 74, 82, 78, 66, 81, 81, 27],
                [40, 40, 40, 81, 78, 81, 39,  0, 10, 51]])
```

```
In [76]: Games[-3,-1]
```

```
Out[76]: np.int64(27)
```

```
In [77]: Points
```

```
Out[77]: 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 [78]: Points[0]
```

```
Out[78]: array([2832, 2430, 2323, 2201, 1970, 2078, 1616, 2133,   83,  782])
```

In [79]:
```
Points
```

Out[79]:
```
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 [80]:
```
Points[6,1]
```

Out[80]:
```
np.int64(1104)
```

In [81]:
```
Points[3:6]
```

Out[81]:
```
array([[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]])
```

In [82]:
```
Points
```

Out[82]:
```
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 [83]:
```
Points[-6,-1]
```

Out[83]:
```
np.int64(646)
```

In [84]:
```
#====== DICTIONARY ======#

# dict does not maintain the order

dict1 = {'key1':'val1','key2':'val2','key3':'val3'}
```

In [85]:
```
dict1
```

Out[85]:
```
{'key1': 'val1', 'key2': 'val2', 'key3': 'val3'}
```

In [86]:
```
dict1['key2']
```

Out[86]:
```
'val2'
```

In [87]:
```
dict2 = {'bang':2,'hyd':'we are hear','pune': True}
```

In [88]:
```
dict2
```

```
Out[88]: {'bang': 2, 'hyd': 'we are hear', 'pune': True}
```

```
In [89]: dict3 = {'Germany':'I have been here','France':2,'Spain':True}
```

```
In [90]: dict3
```

```
Out[90]: {'Germany': 'I have been here', 'France': 2, 'Spain': True}
```

```
In [91]: dict3['Germany']
```

```
Out[91]: 'I have been here'
```

if you check theat dataset seasons & players are dictionary type of data

if you look at the pdict players names are are key part:nos are the values

dictionary can guide us which player at which level and which row

main advantage of the dictionary is we dont required to count which no row which plot

```
In [92]: Games
```

```
Out[92]: 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 [93]: Pdict
```

```
Out[93]: {'Sachin': 0,
          'Rahul': 1,
          'Smith': 2,
          'Sami': 3,
          'Pollard': 4,
          'Morris': 5,
          'Samson': 6,
          'Dhoni': 7,
          'Kohli': 8,
          'Sky': 9}
```

```
In [94]: # how do i know player kodebryant is at

         Pdict['Sachin']
```

```
Out[94]: 0
```

```
In [95]: Games[0]
```

```
Out[95]: array([80, 77, 82, 82, 73, 82, 58, 78,  6, 35])
```

```
In [96]: Games
```

```
Out[96]: 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 [97]: Pdict['Rahul']
```

```
Out[97]: 1
```

```
In [98]: Games[1]
```

```
Out[98]: array([82, 57, 82, 79, 76, 72, 60, 72, 79, 80])
```

GAMES

```
In [99]: Games[Pdict['Rahul']]
```

```
Out[99]: array([82, 57, 82, 79, 76, 72, 60, 72, 79, 80])
```

```
In [100…  Points
```

```
Out[100…  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 [101…  Salary
```

```
Out[101…  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 [102…  Salary[2,4]
```

```
Out[102…  np.int64(15779912)
```

```
In [103…  Salary
```

```
Out[103…  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 [104…  Salary[Pdict['Sky']][Sdict['2019']]
```

```
Out[104…  np.int64(15000000)
```

```
In [105…  Salary
```

```
Out[105…  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 [106…  Games
```

```
Out[106…  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 [107…  Salary/Games
```

```
Out[107…  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 [108…  np.round(Salary/Games)
```

Out[108…

```
array([[ 199336.,  230114.,  237691.,  259299.,  315539.,  302515.,
         435250.,  357040., 5075634.,  671429.],
       [ 146341.,  223582.,  164492.,  180159.,  197063.,  226729.,
         300643.,  274342.,  271731.,  289760.],
       [  58504.,   74719.,  173883.,  177908.,  207630.,  183544.,
         258427.,  230855.,  247630.,  299194.],
       [  46420.,   72216.,  169367.,  218342.,  228694.,  222717.,
         336701.,  290299.,  291006.,  561450.],
       [  54795.,   58619.,   73918.,  174152.,  185397.,  213425.,
         335033.,  257057.,  288918.,  522836.],
       [  47829.,   61380.,  185896.,  187150.,  225427.,  188312.,
         281096.,  237095.,  241361.,  469191.],
       [  40311.,   52815.,   45200.,   58643.,  300456.,  186752.,
         272663.,  253992.,  301104.,  244739.],
       [      0.,       0.,   52140.,   60595.,   58499.,   77611.,
         234949.,  205798.,  220156.,  703542.],
       [      0.,       0.,       0.,   59541.,   66468.,   68471.,
         179326.,      inf, 1763269.,  369860.],
       [  40426.,   75322.,  255711.,  182412.,  204934.,  186842.,
         320224.,  249014.,  345796.,  241935.]])
```

In [109…

```
import warnings
warnings.filterwarnings('ignore')
#np.round(Fieldgoals/Games)
#FieldGoals/Games # this matrix is lot of decimal points you can not round
#round()
```

In [110…

```
## --- First visualization ----##
```

In [111…

```
import numpy as np
import matplotlib.pyplot as plt
```

In [112…

```
Salary
```

Out[112…

```
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 [113…

```
Salary[0]
```

Out[113…

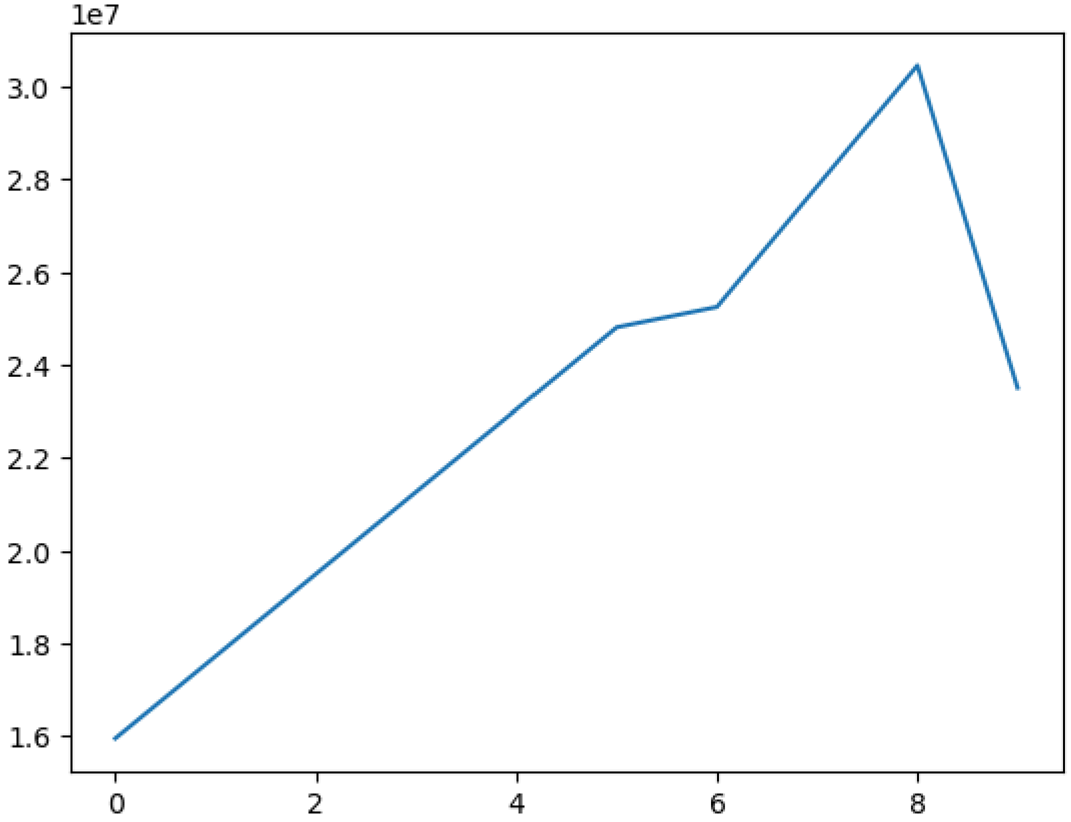
```
array([15946875, 17718750, 19490625, 21262500, 23034375, 24806250,
       25244493, 27849149, 30453805, 23500000])
```

In [114…

```
plt.plot(Salary[0])
```

Out[114…

```
[<matplotlib.lines.Line2D at 0x1d5c208bd90>]
```

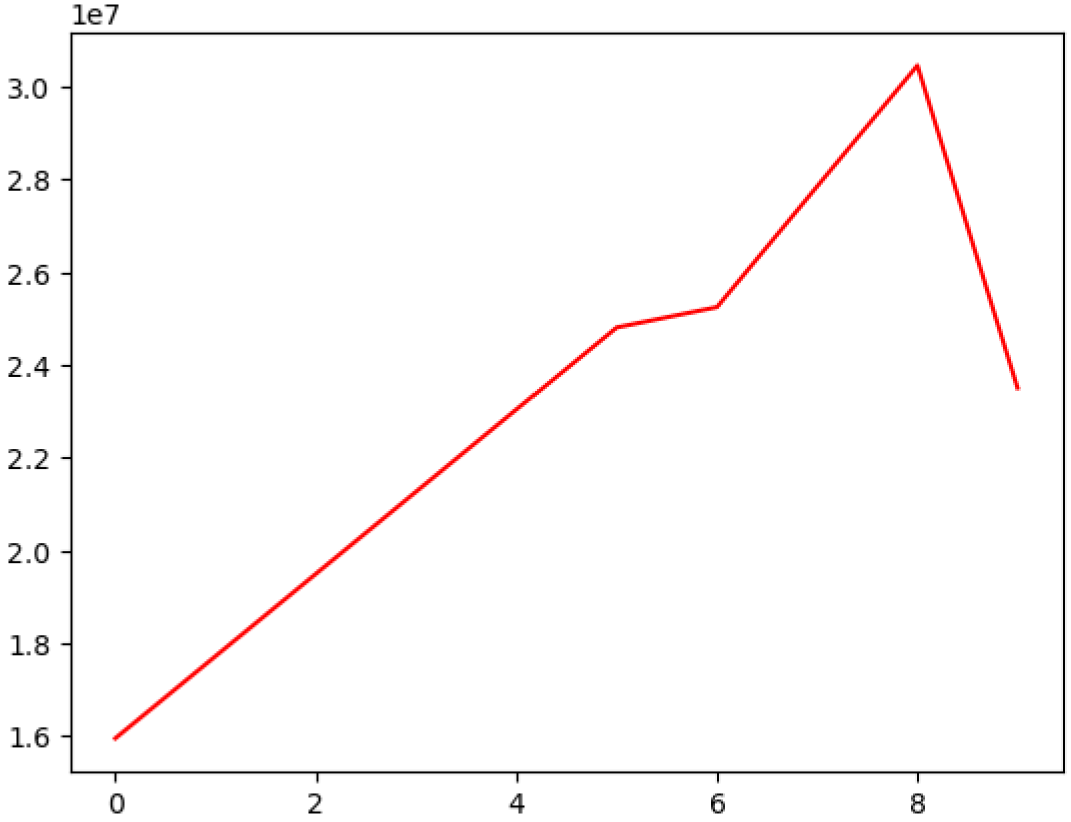


In [115…

```
plt.plot(Salary[0], c='red')
```

Out[115…

```
[<matplotlib.lines.Line2D at 0x1d5c2316350>]
```



In [116…

```
%matplotlib inline
plt.rcParams['figure.figsize'] = 10,6
```

In [117…

```
plt.plot(Salary[0], c='Blue', ls='dashed')
```

Out[117…

```
[<matplotlib.lines.Line2D at 0x1d5c2398910>]
```

In [118…

```
  plt.plot(Salary[0], c='Green', ls = '--', marker = 's') # s - Squares
```

Out[118…

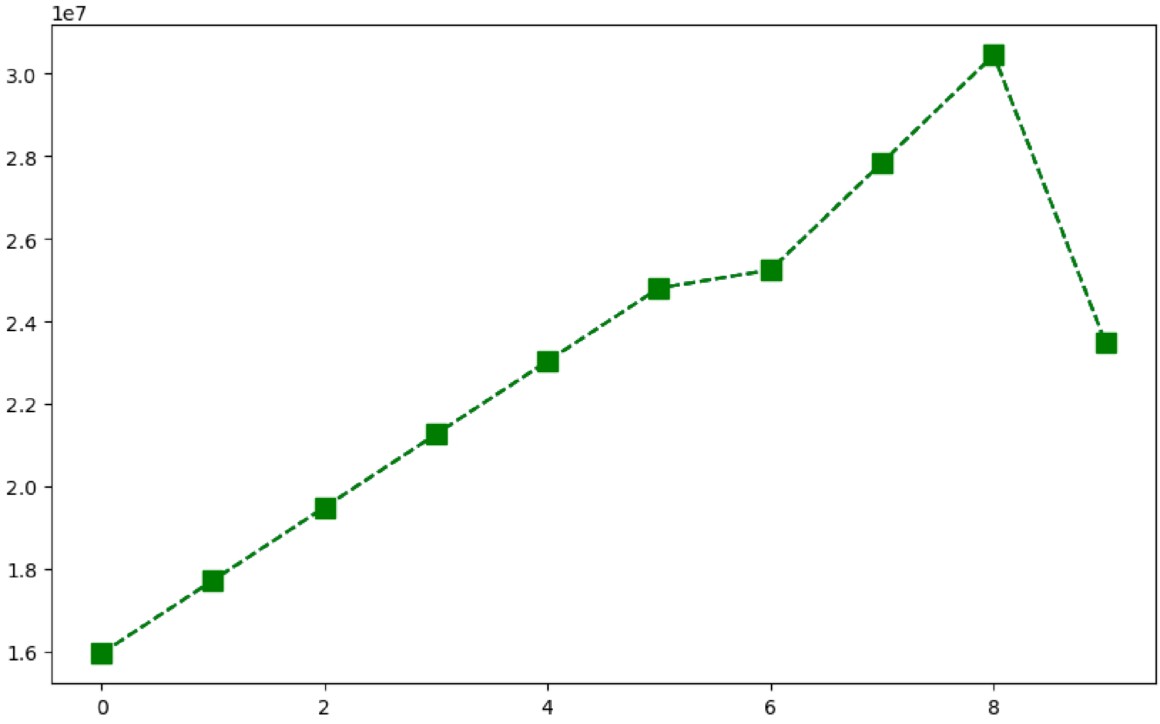
```
[<matplotlib.lines.Line2D at 0x1d5c23d3b10>]
```

In [119…

```
%matplotlib inline
plt.rcParams['figure.figsize'] = 10,8 #runtime configuration parameter
```

In [120…

```
plt.plot(Salary[0],c='Green',ls = '--', marker = 's', ms = 10)
plt.show()
```



In [121…

```
list(range(0,10))
```

Out[121…

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

In [122…

```
Sdict
```

Out[122…

```
{'2010': 0,
 '2011': 1,
 '2012': 2,
 '2013': 3,
 '2014': 4,
 '2015': 5,
 '2016': 6,
 '2017': 7,
 '2018': 8,
 '2019': 9}
```

In [123…

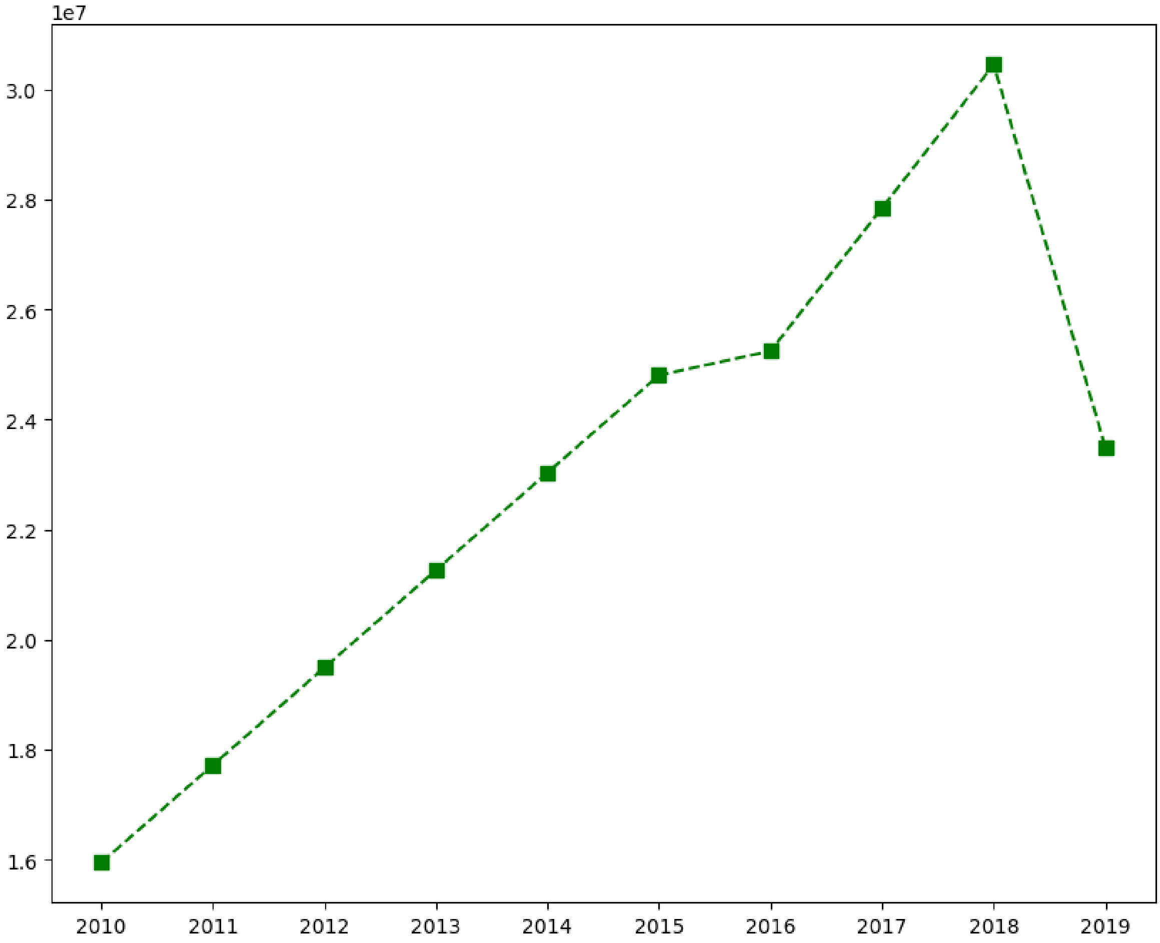
```
Pdict
```

Out[123…

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

In [124…

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



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 [125…

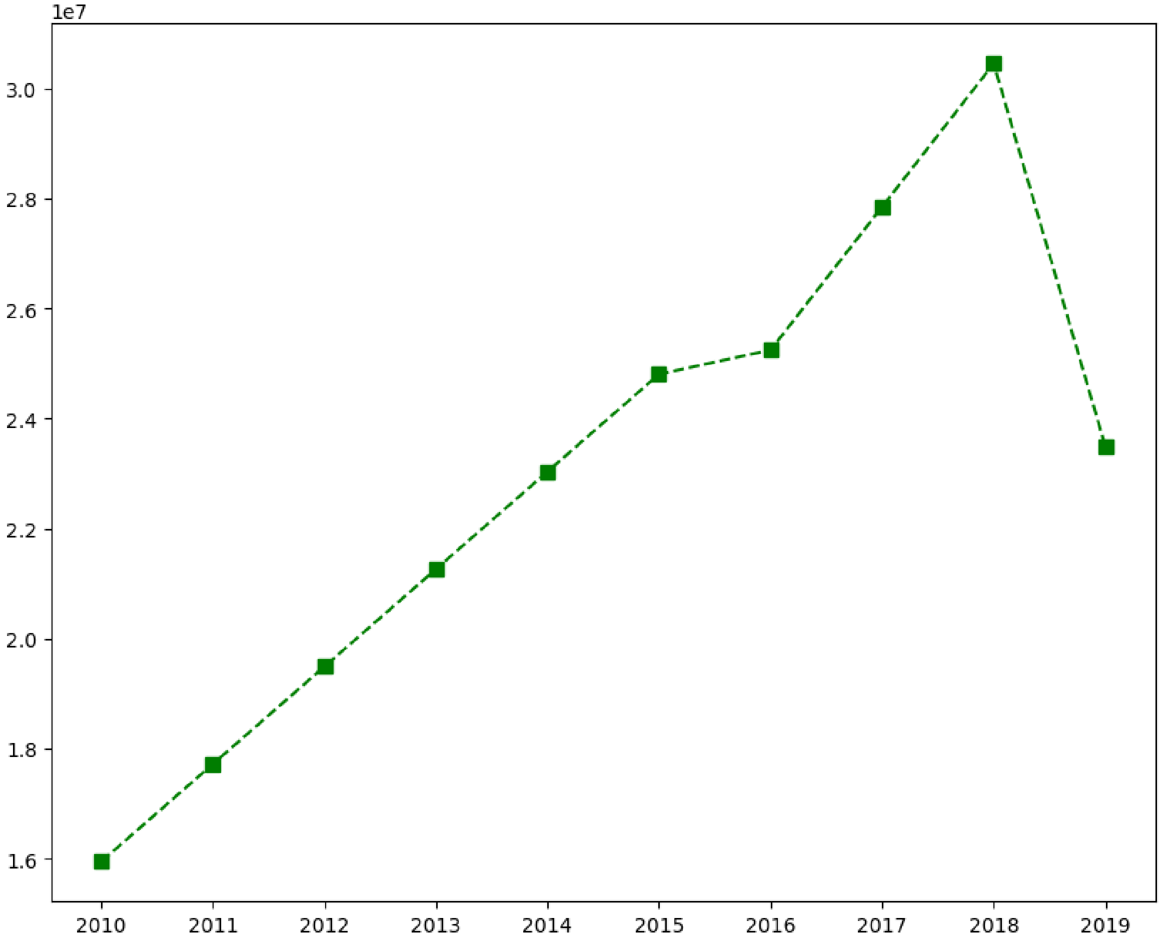
```
Games
```

Out[125…

```
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 [126…

```
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 [127…

```
Salary[0]
```

Out[127…

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

In [128…

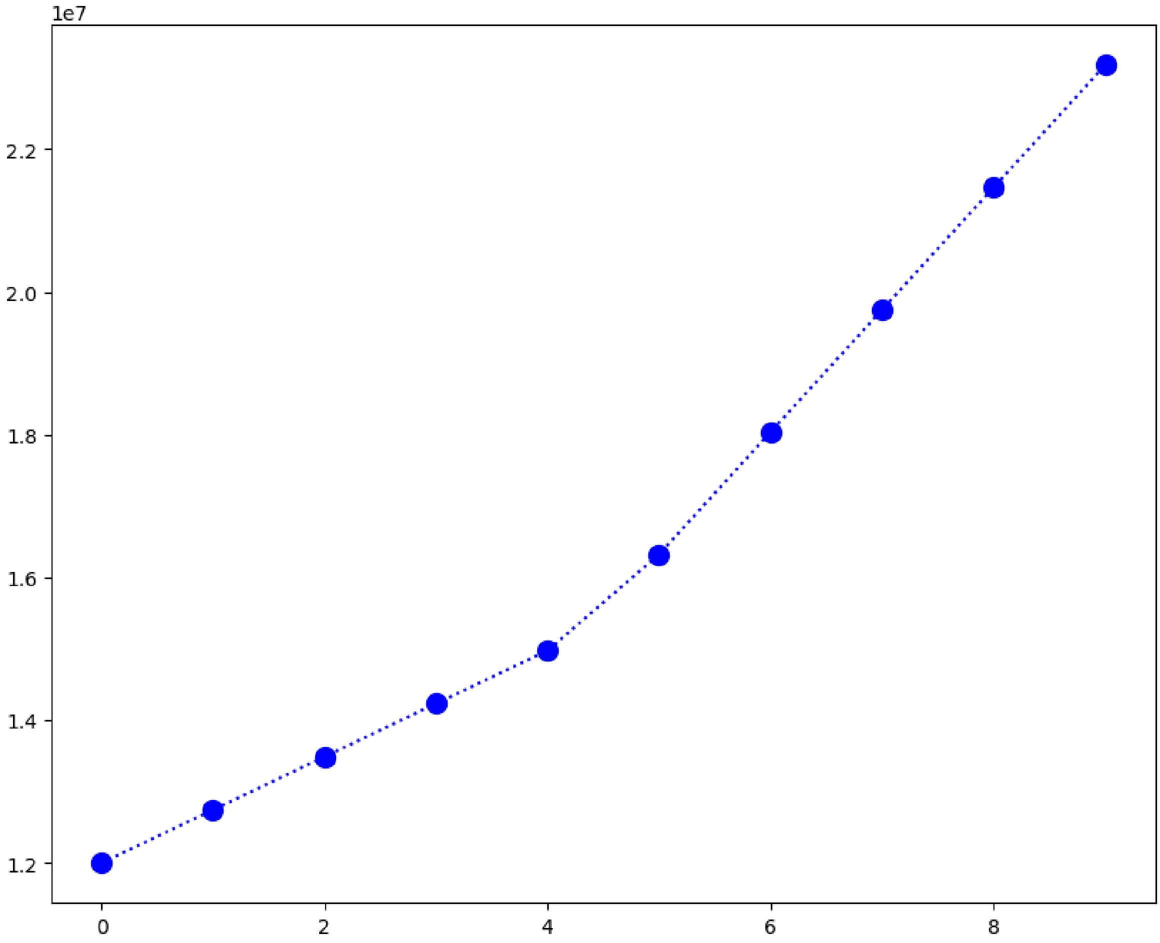
```
Salary[1]
```

Out[128…

```
array([12000000, 12744189, 13488377, 14232567, 14976754, 16324500,
       18038573, 19752645, 21466718, 23180790])
```

In [129…

```
plt.plot(Salary[1], c='Blue', ls=':', marker='o',ms=10, label=Players[1])
plt.show()
```

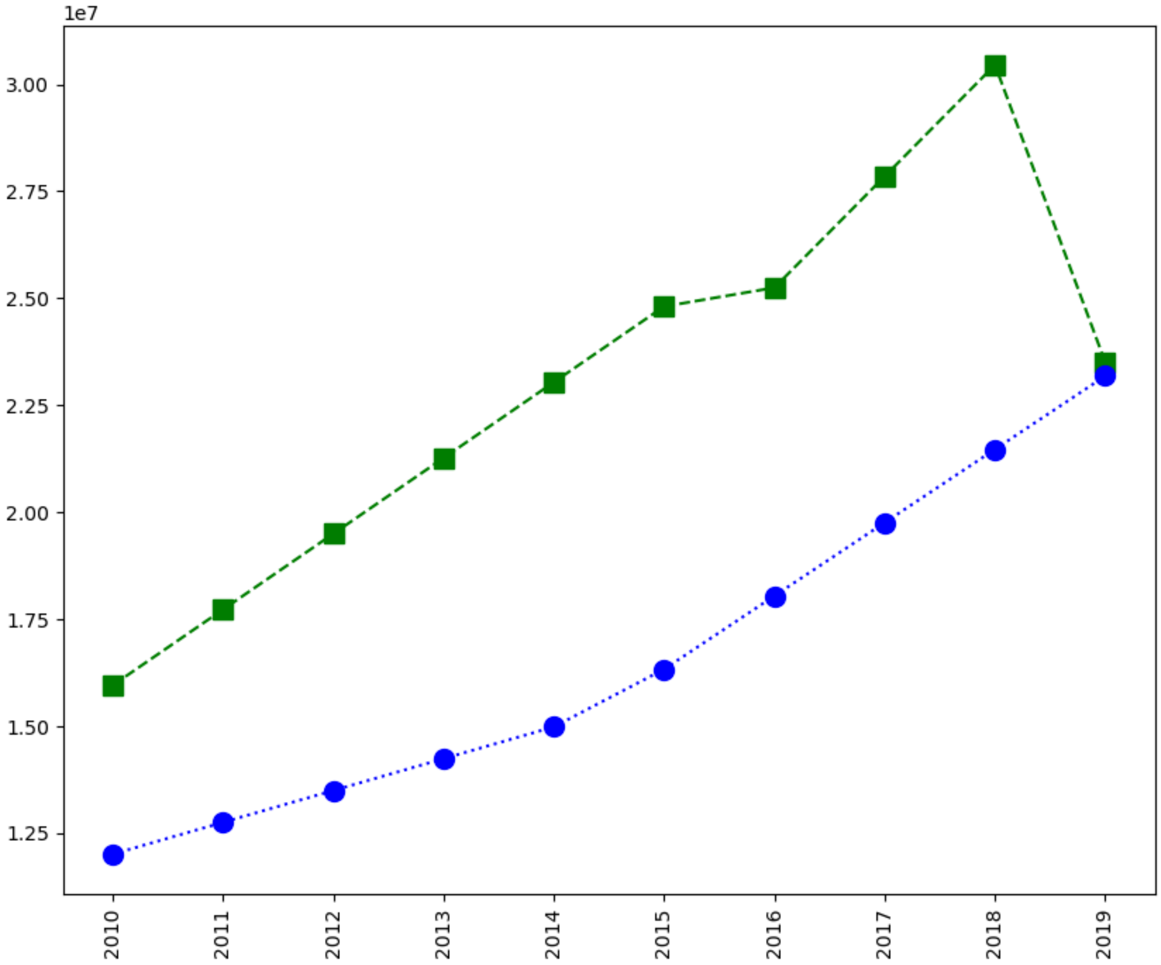


In [130…

```
# More visualization
```

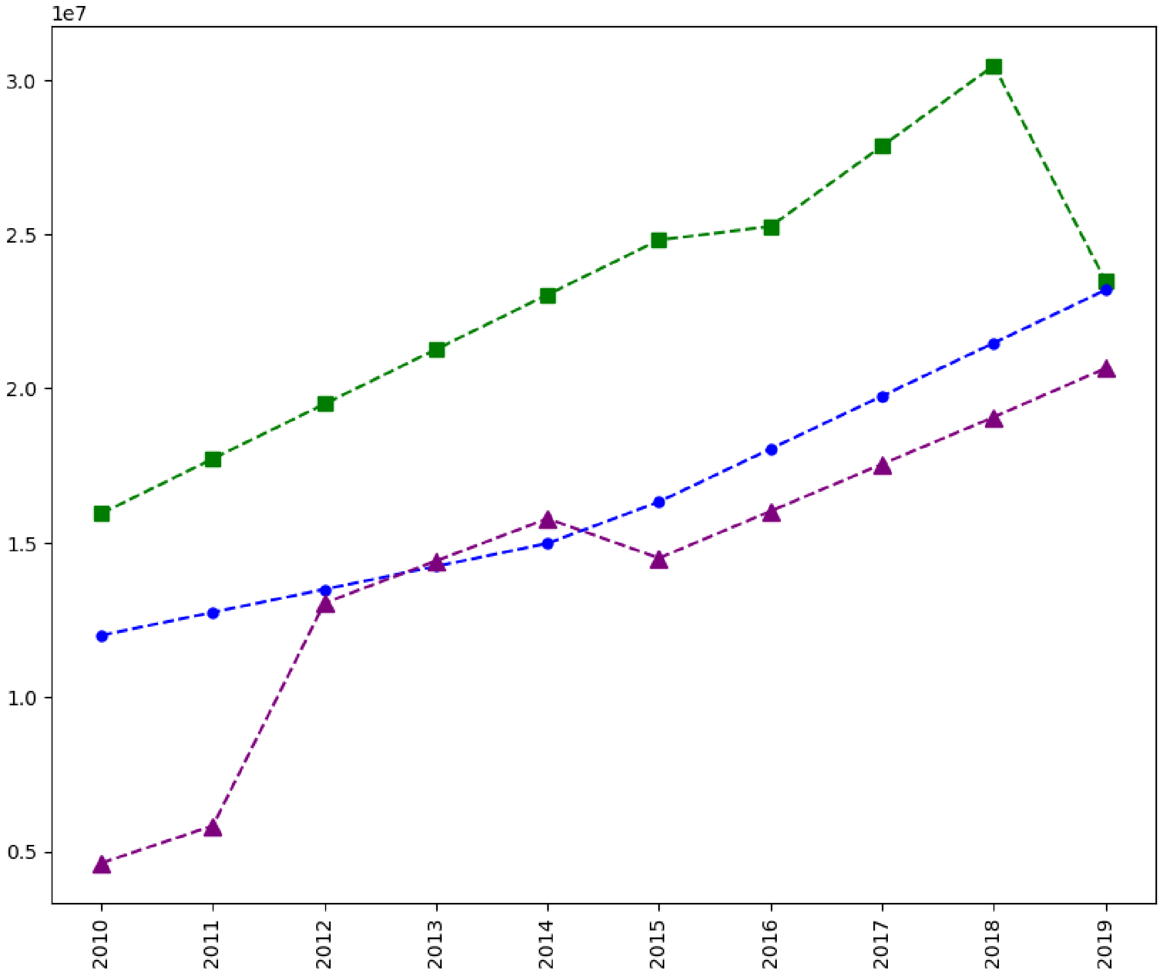
In [131…

```
plt.plot(Salary[0], c='Green', ls = '--', marker = 's', ms = 10, label = Players
plt.plot(Salary[1], c='Blue', ls = ':', marker = 'o', ms = 10, label = Players[1

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

plt.show()
```



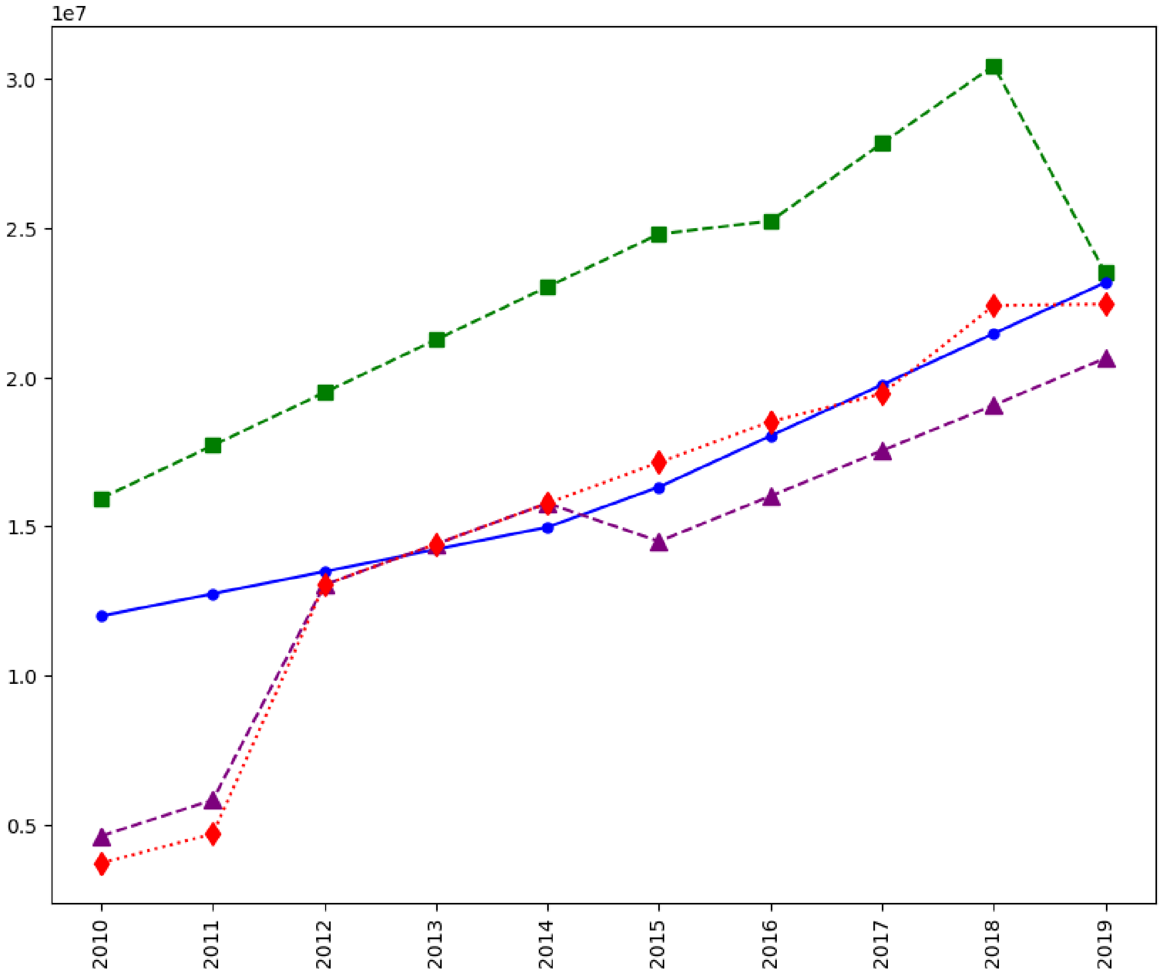
In [132…

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

plt.show()
```



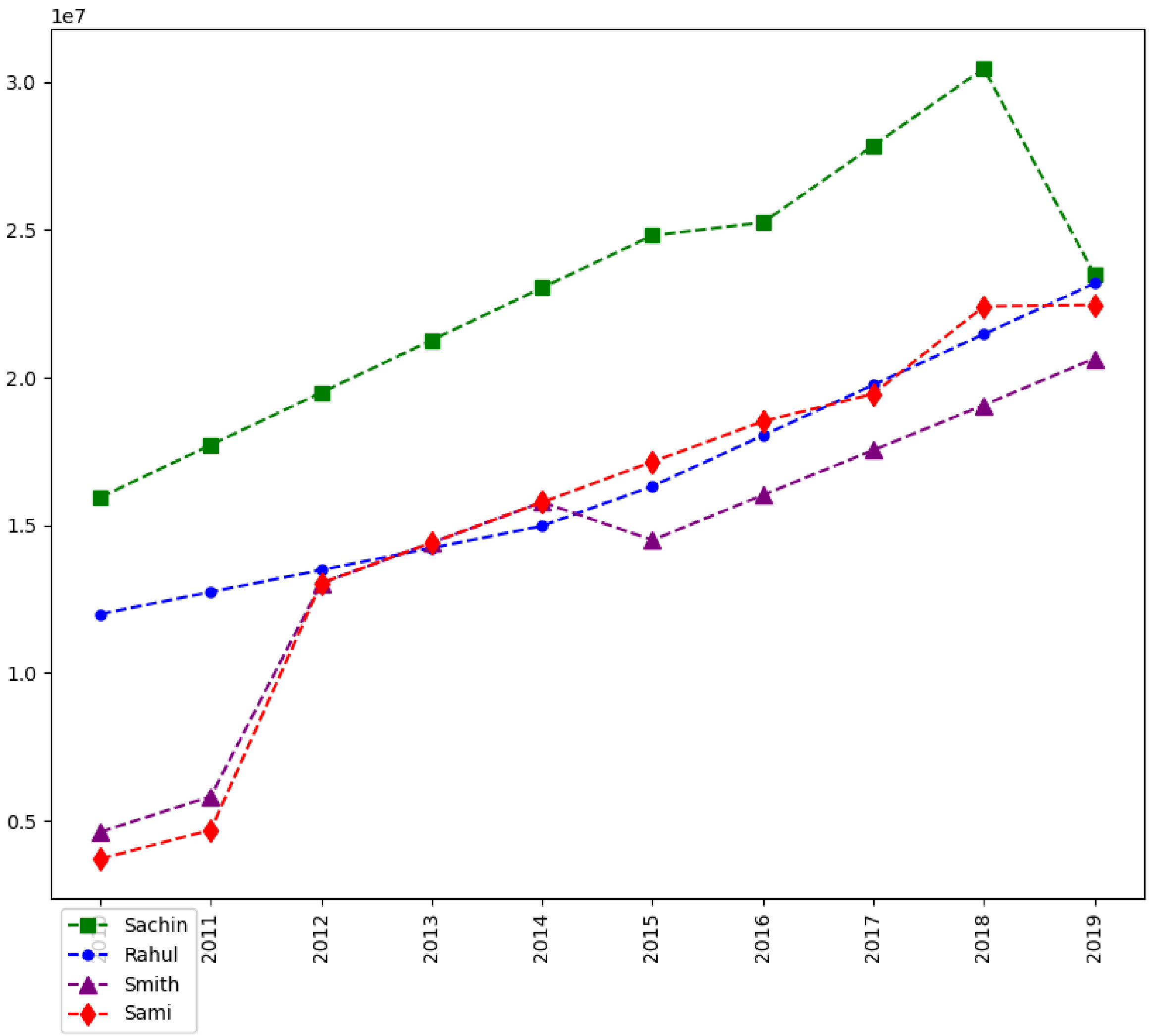
In [133…

```
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()
```



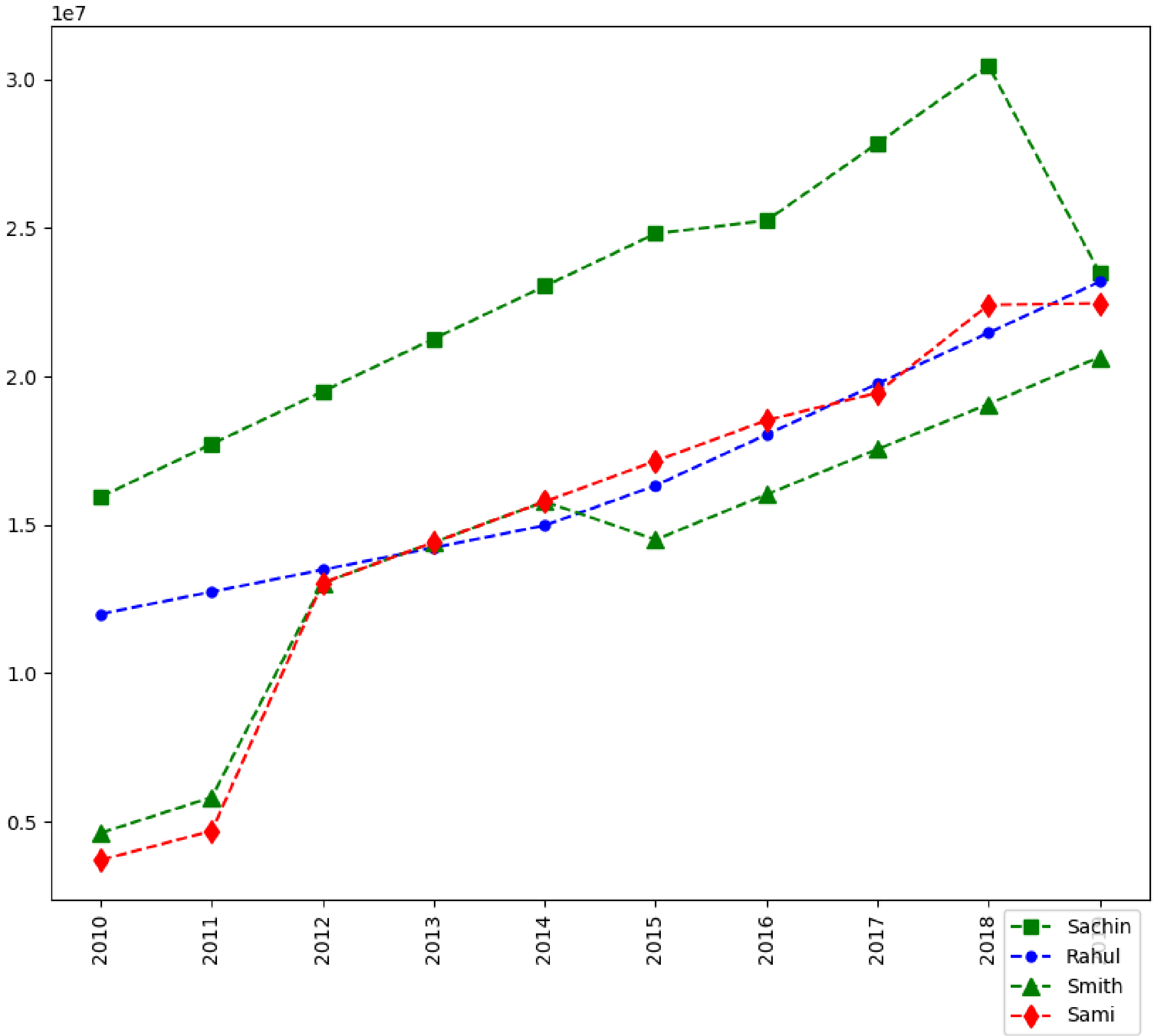
In [134…

```
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()
```



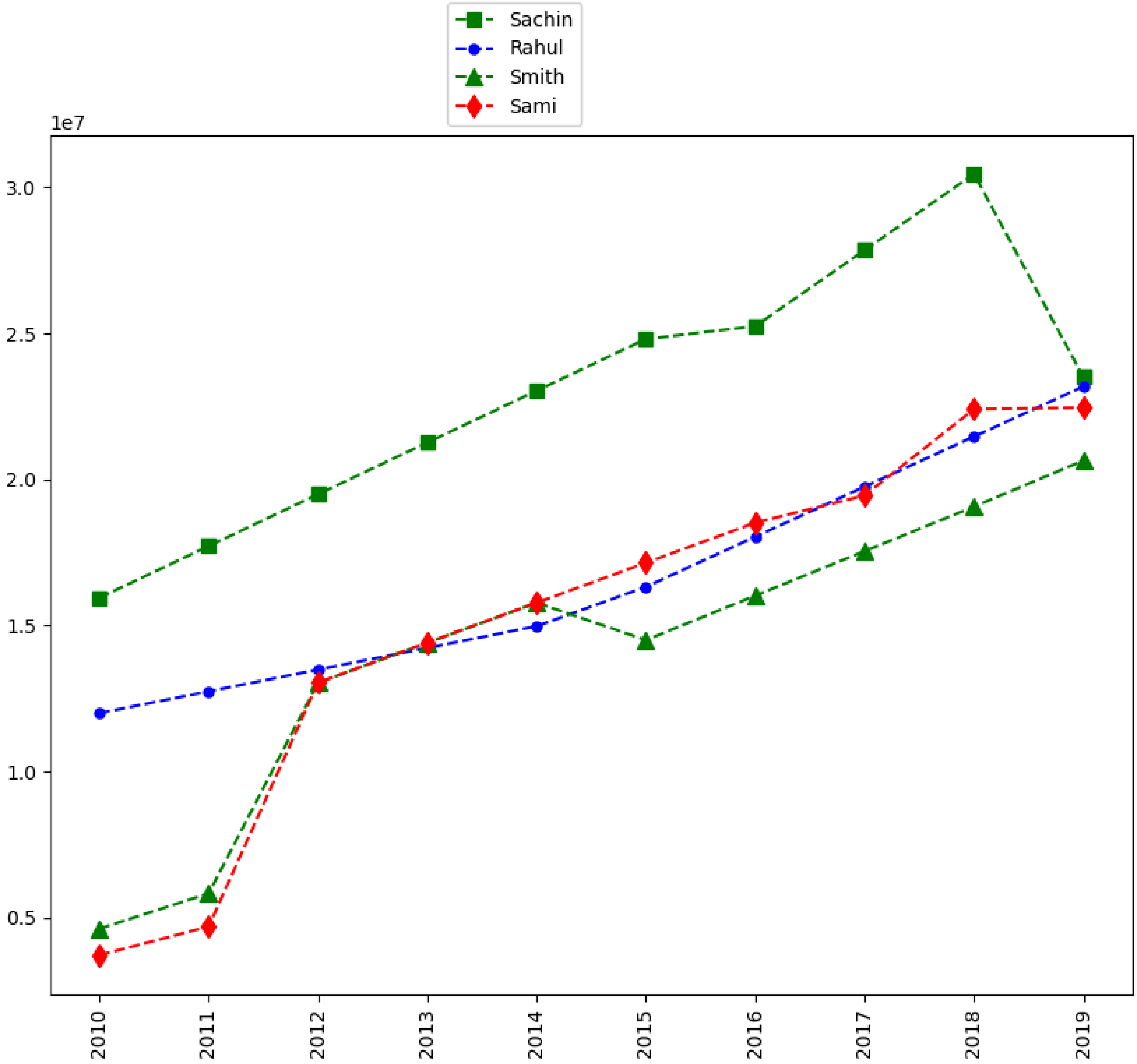
In [135…

```
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()
```



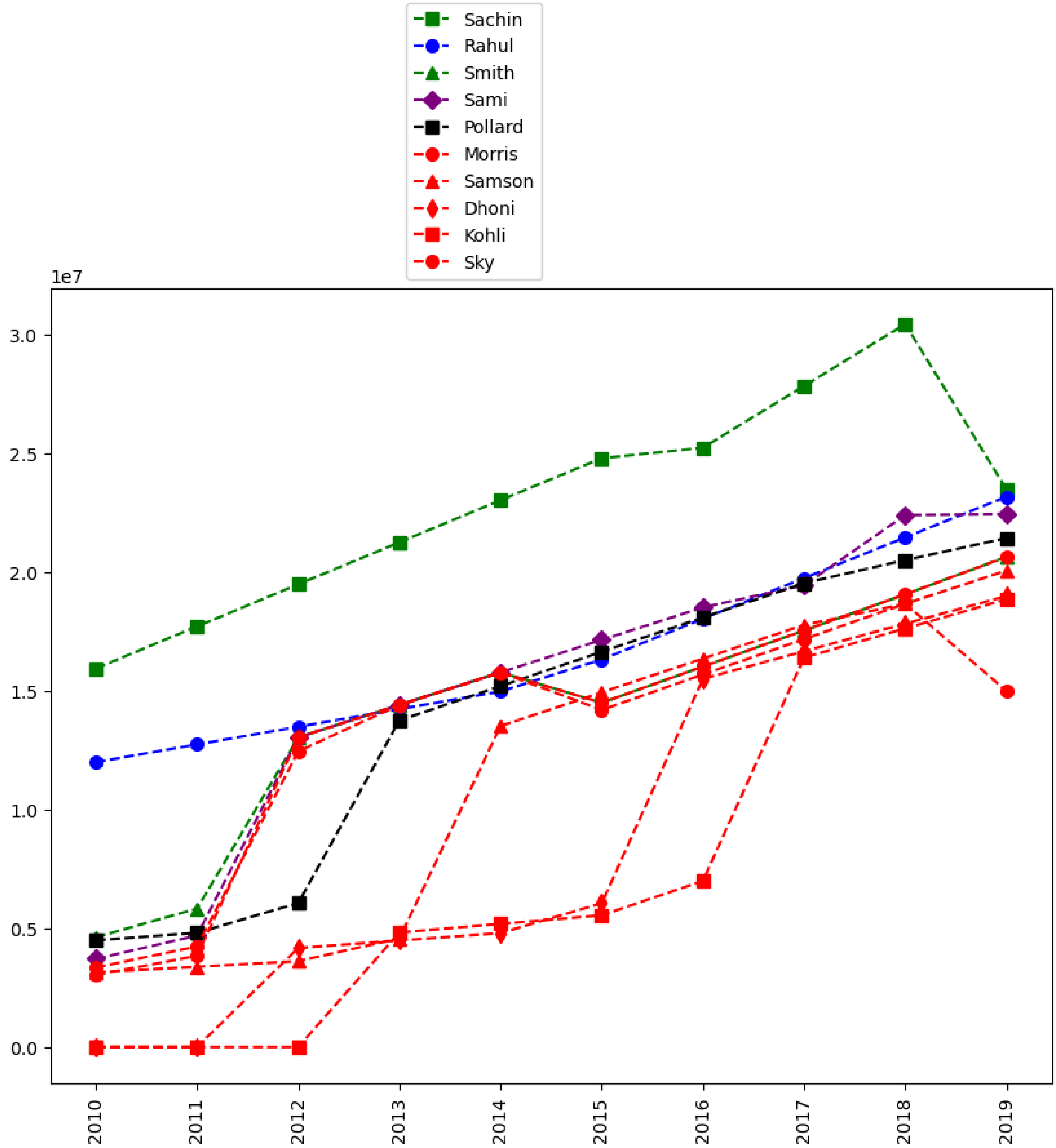
In [136…

```
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()
```



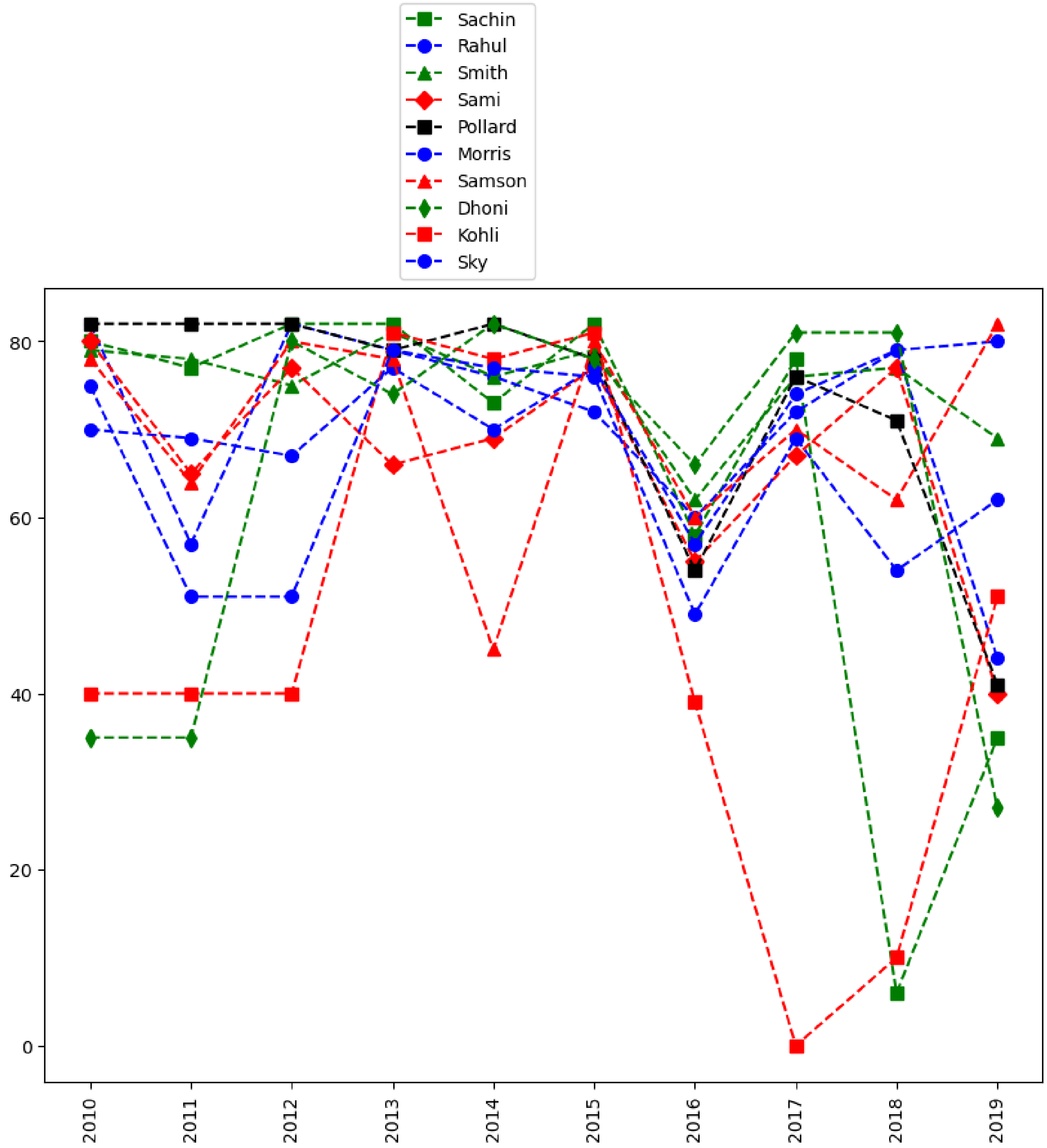
In [137…

```
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 [138…

```
# 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.