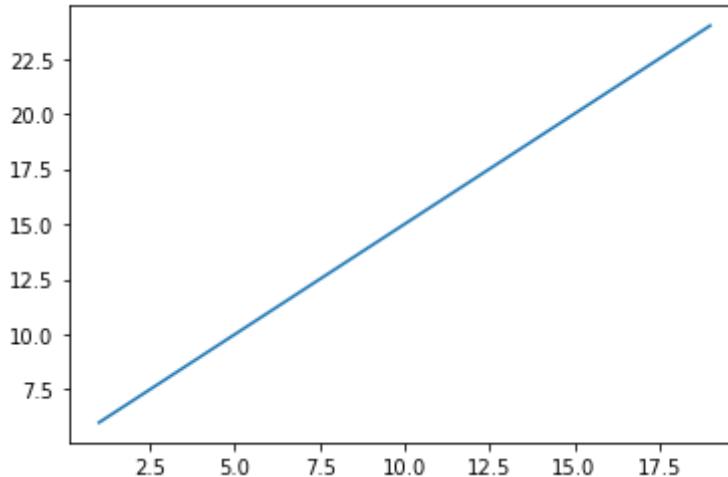


```
In [1]: #Matplotlib:- Matplotlib is a python library used for data visualisation.  
#We can create bar, plot, scatter-plot, histogram, and more with matplotlib library.  
  
In [2]: #(a).Line Plot:  
  
In [3]: #Example-01:  
  
In [4]: import numpy as np  
from matplotlib import pyplot as plt  
x = np.arange(1,20)  
y = x + 5  
  
In [5]: x  
  
Out[5]: array([ 1,  2,  3,  4,  5,  6,  7,  8,  9, 10, 11, 12, 13, 14, 15, 16,  
17,  
18, 19])  
  
In [6]: y  
  
Out[6]: array([ 6,  7,  8,  9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21,  
22,  
23, 24])  
  
In [7]: plt.plot(x,y)  
plt.show()
```



```
In [8]: #Example-02:
```

```
In [9]: import numpy as np
from matplotlib import pyplot as plt
x = np.arange(100,200,5)
y = x - 4
```

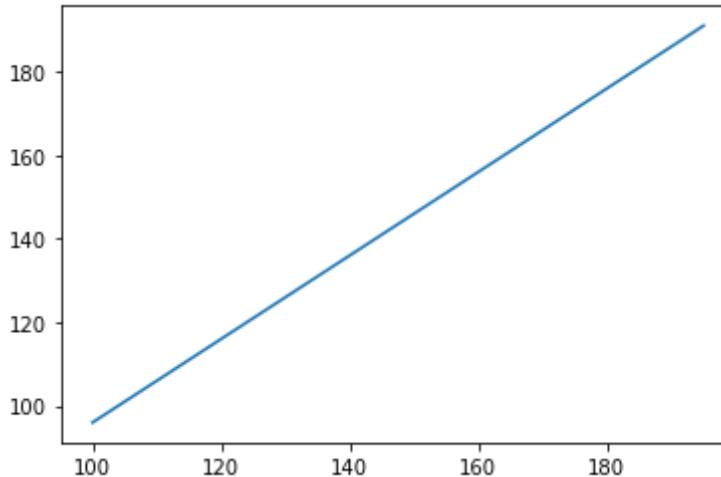
```
In [10]: x
```

```
Out[10]: array([100, 105, 110, 115, 120, 125, 130, 135, 140, 145, 150, 155, 160,
165, 170, 175, 180, 185, 190, 195])
```

```
In [11]: y
```

```
Out[11]: array([ 96, 101, 106, 111, 116, 121, 126, 131, 136, 141, 146, 151, 156,
161, 166, 171, 176, 181, 186, 191])
```

```
In [12]: plt.plot(x,y)
plt.show()
```



```
In [13]: #Example-03:
```

```
In [14]: import numpy as np
from matplotlib import pyplot as plt
x = np.arange(1,20)
y = x * 3
```

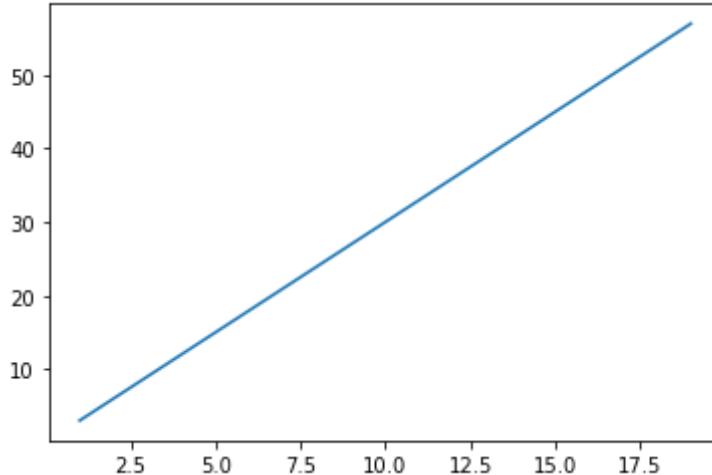
```
In [15]: x
```

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

```
In [16]: y
```

```
Out[16]: array([ 3,  6,  9, 12, 15, 18, 21, 24, 27, 30, 33, 36, 39, 42, 45, 48,
51,
54, 57])
```

```
In [17]: plt.plot(x,y)
plt.show()
```



```
In [18]: #Example-04:
```

```
In [19]: import numpy as np
from matplotlib import pyplot as plt
x = np.random.randint(15,90,10)
y = x / 5
```

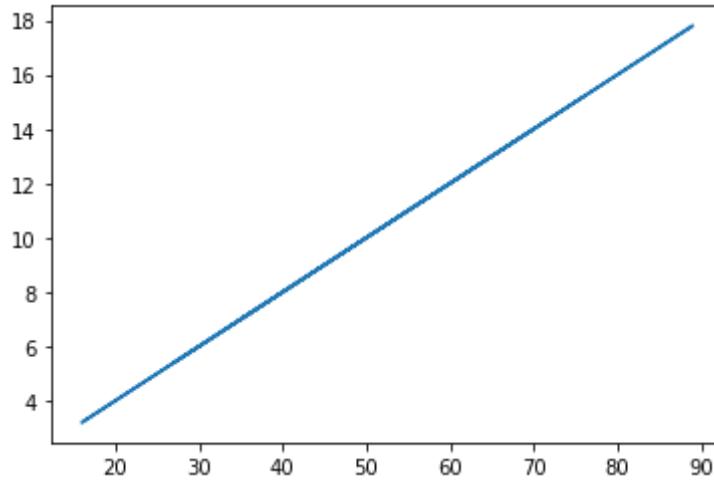
```
In [20]: x
```

```
Out[20]: array([37, 16, 36, 89, 88, 43, 35, 70, 27, 76])
```

```
In [21]: y
```

```
Out[21]: array([ 7.4,  3.2,  7.2, 17.8, 17.6,  8.6,  7. , 14. ,  5.4, 15.2])
```

```
In [22]: plt.plot(x,y)
plt.show()
```



```
In [23]: #(a).(i).Adding title,x-axis and y-axis to line plot:
```

```
In [24]: #Example-01:
```

```
In [25]: x = np.random.randint(1,50,10)
y = np.random.randint(-55,-5,10)
```

```
In [26]: x
```

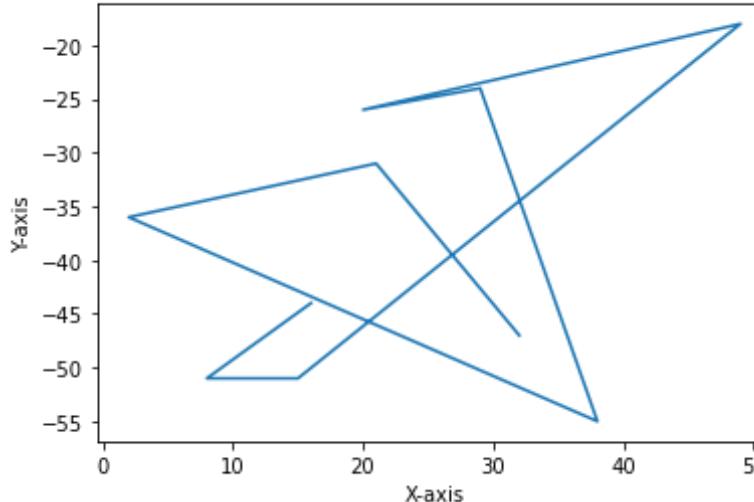
```
Out[26]: array([32, 21,  2, 38, 29, 20, 49, 15,  8, 16])
```

```
In [27]: y
```

```
Out[27]: array([-47, -31, -36, -55, -24, -26, -18, -51, -51, -44])
```

```
In [28]: plt.plot(x,y)
plt.title("A Line Plot")
plt.xlabel('X-axis')
plt.ylabel('Y-axis')
plt.show()
```

A Line Plot



```
In [29]: #Example-02:
```

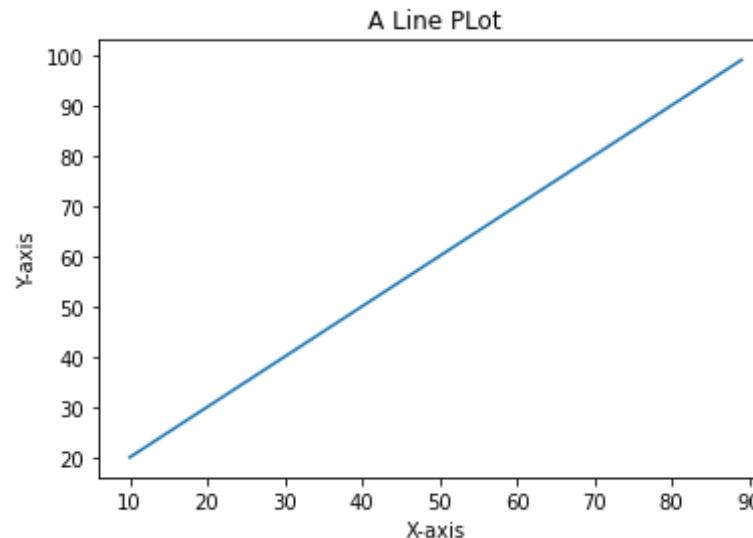
```
In [30]: x = np.arange(10,90)
y = x + 10
```

```
In [31]: x,y
```

```
Out[31]: (array([10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25,
       26,
       27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42,
       43,
       44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59,
       60,
       61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76,
       77,
       78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89]),
 array([20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35,
       36,
       37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52,
       53,
       54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69,
       70,
```

```
    71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86,  
87,  
88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99]))
```

```
In [32]: plt.plot(x,y)  
plt.title('A Line PLOT')  
plt.xlabel('X-axis')  
plt.ylabel('Y-axis')  
plt.show()
```



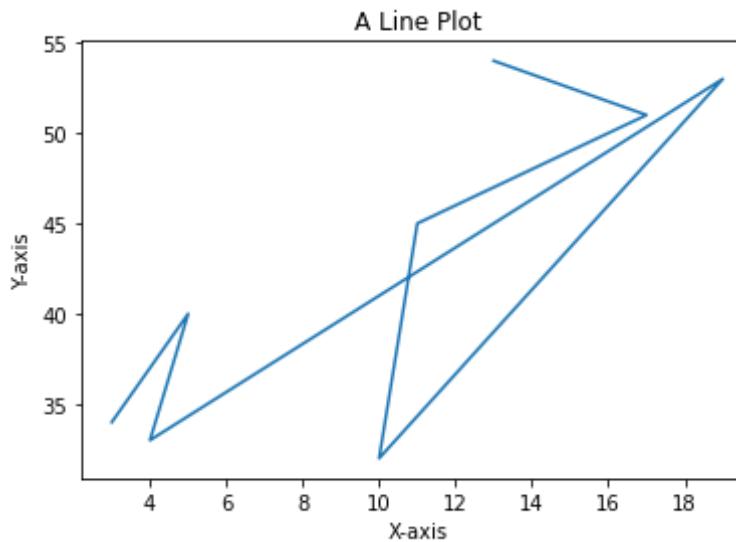
```
In [33]: #Example-03:
```

```
In [34]: x = np.random.randint(1,20,8)  
y = np.random.randint(30,60,8)
```

```
In [35]: x,y
```

```
Out[35]: (array([13, 17, 11, 10, 19, 4, 5, 3]),  
array([54, 51, 45, 32, 53, 33, 40, 34]))
```

```
In [36]: plt.plot(x,y)
plt.title('A Line Plot')
plt.xlabel('X-axis')
plt.ylabel('Y-axis')
plt.show()
```



```
In [37]: #(a).(ii).Changing the line aesthetics:
```

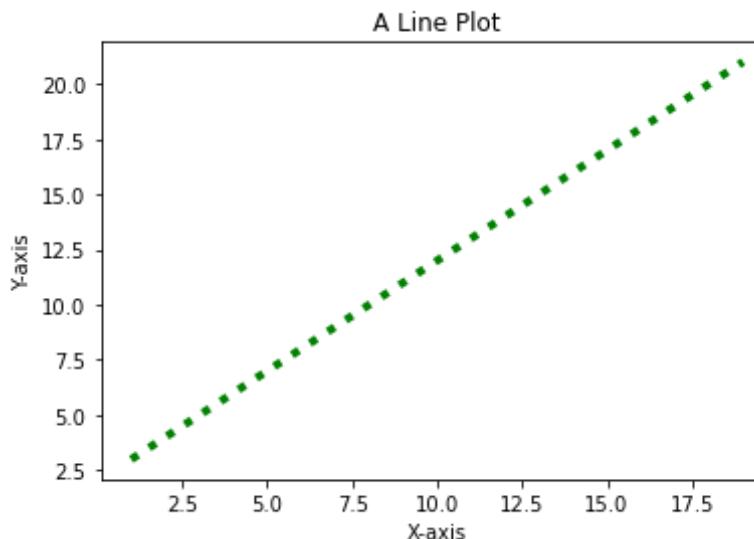
```
In [38]: #Example-01:
```

```
In [39]: x = np.arange(1,20)
y = x + 2
```

```
In [40]: x,y
```

```
Out[40]: (array([ 1,  2,  3,  4,  5,  6,  7,  8,  9, 10, 11, 12, 13, 14, 15, 16,
17,
18, 19]),
array([ 3,  4,  5,  6,  7,  8,  9, 10, 11, 12, 13, 14, 15, 16, 17, 18,
19,
20, 21]))
```

```
In [41]: plt.plot(x,y,color = 'g',linestyle = ':',linewidth = 4)
plt.title("A Line Plot")
plt.xlabel("X-axis")
plt.ylabel("Y-axis")
plt.show()
```



```
In [42]: #Example-02:
```

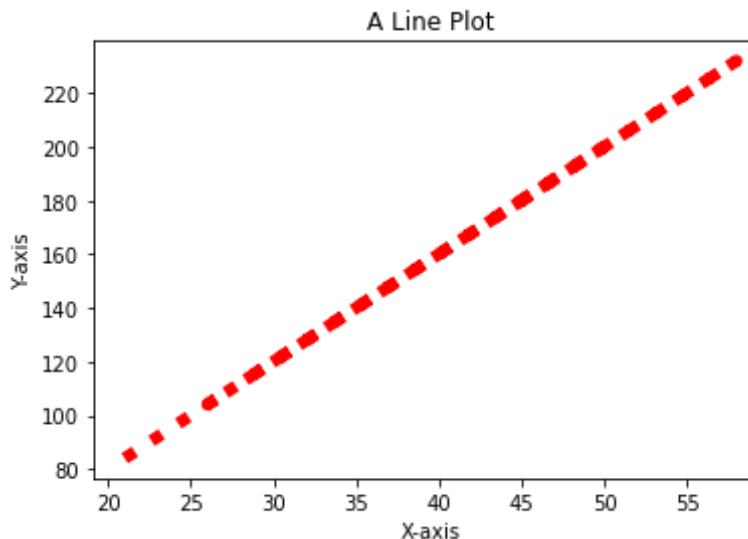
```
In [43]: x = np.random.randint(20,80,8)
y = x*4
```

```
In [44]: x,y
```

```
Out[44]: (array([21, 25, 27, 26, 58, 28, 50, 44]),
           array([ 84, 100, 108, 104, 232, 112, 200, 176]))
```

```
In [45]: plt.plot(x,y,color = 'r',linestyle = ':',linewidth = 6)
plt.title("A Line Plot")
plt.xlabel("X-axis")
```

```
plt.ylabel("Y-axis")
plt.show()
```



In [46]: #Example-03:

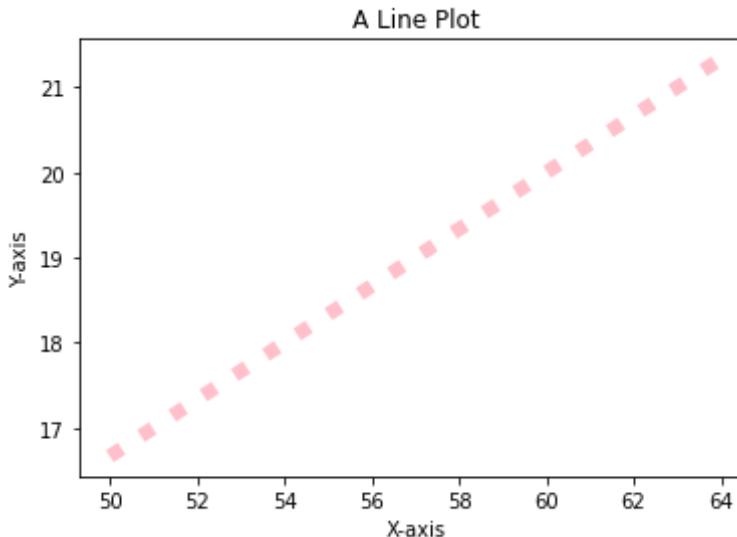
In [47]:  
x = np.arange(50,65)  
y = x/3

In [48]: x,y

Out[48]: (array([50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64]),
array([16.66666667, 17. , 17.33333333, 17.66666667, 18.
,
18.33333333, 18.66666667, 19. , 19.33333333, 19.66666666
7,
20. , 20.33333333, 20.66666667, 21. , 21.3333333
3]))

In [49]:  
plt.plot(x,y,color = 'pink',linestyle = ':',linewidth = 7)  
plt.title("A Line Plot")  
plt.xlabel("X-axis")

```
plt.ylabel("Y-axis")
plt.show()
```



In [50]:  *#(a).(iii).Adding one or more lines in the same plot and grid in the plot:*

In [51]: *#Example-01:*

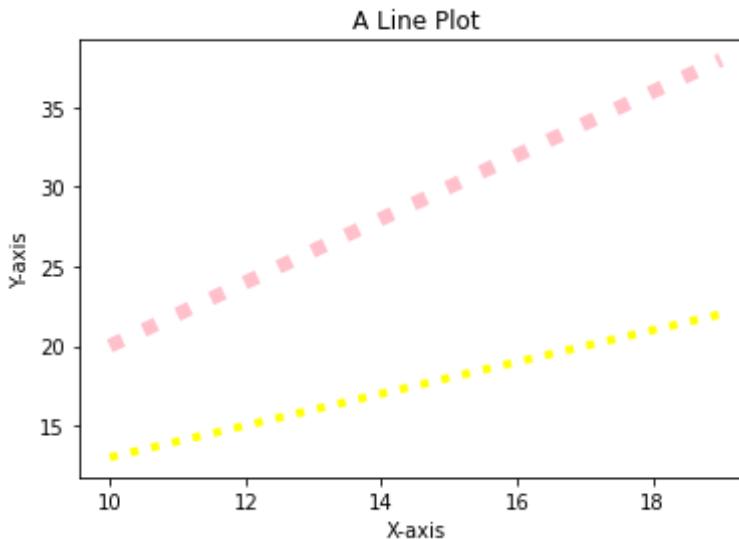
In [52]:  
x = np.arange(10,20)  
y1 = x \* 2  
y2 = x + 3

In [53]: x,y1,y2

Out[53]: (array([10, 11, 12, 13, 14, 15, 16, 17, 18, 19]),
array([20, 22, 24, 26, 28, 30, 32, 34, 36, 38]),
array([13, 14, 15, 16, 17, 18, 19, 20, 21, 22]))

In [54]: plt.plot(x,y1,color = 'pink',linestyle = ':',linewidth = 7)
plt.plot(x,y2,color = 'yellow',linestyle = ':',linewidth = 4)

```
plt.title("A Line Plot")
plt.xlabel("X-axis")
plt.ylabel("Y-axis")
plt.show()
```



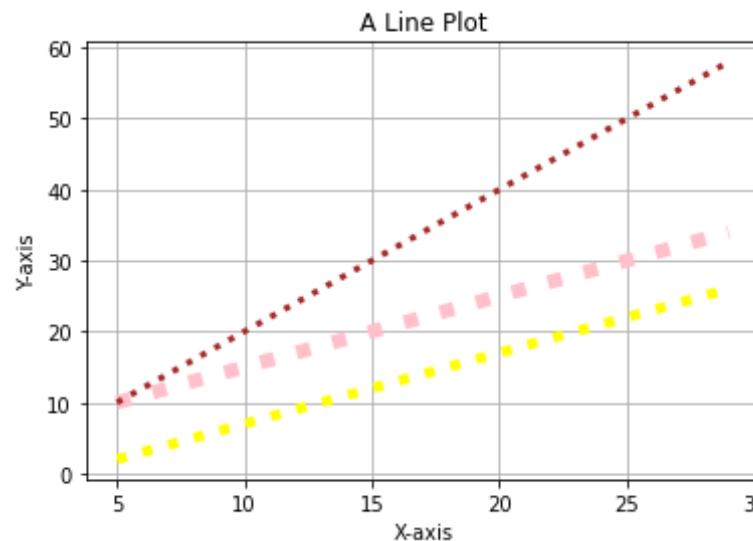
In [55]: #Example-02:

```
In [56]: x = np.arange(5,30)
y1 = x + 5
y2 = x - 3
y3 = x * 2
x,y1,y2,y3
```

```
Out[56]: (array([ 5,  6,  7,  8,  9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20,
21,
       22, 23, 24, 25, 26, 27, 28, 29]),
 array([10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25,
26,
       27, 28, 29, 30, 31, 32, 33, 34]),
 array([ 2,  3,  4,  5,  6,  7,  8,  9, 10, 11, 12, 13, 14, 15, 16, 17,
18,
       19, 20, 21, 22, 23, 24, 25, 26]),
```

```
array([10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40,  
42,  
        44, 46, 48, 50, 52, 54, 56, 58]))
```

```
In [57]: plt.plot(x,y1,color = 'pink',linestyle = ':',linewidth = 7)  
plt.plot(x,y2,color = 'yellow',linestyle = ':',linewidth = 5)  
plt.plot(x,y3,color = 'brown',linestyle = ':',linewidth = 3)  
plt.title("A Line Plot")  
plt.xlabel("X-axis")  
plt.ylabel("Y-axis")  
plt.grid()  
plt.show()
```



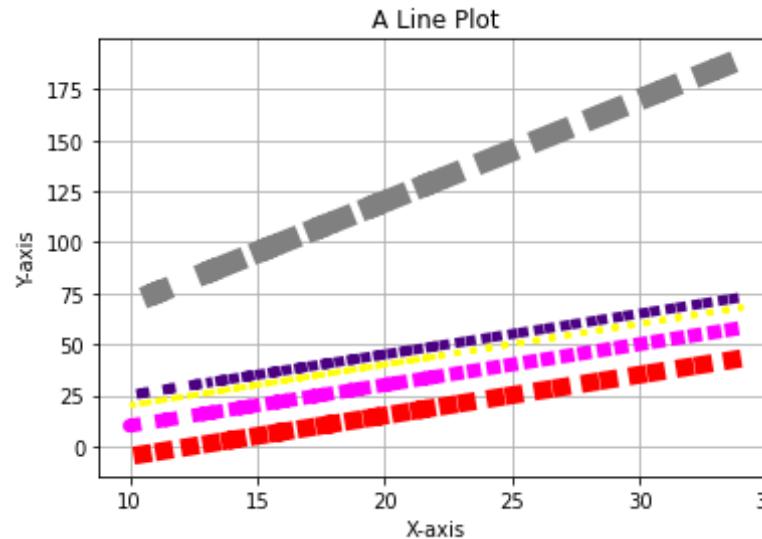
```
In [58]: #Example-03:
```

```
In [59]: x = np.random.randint(10,50,6)  
y1 = x*2  
y2 = y1 + 5  
y3 = y2 - 15  
y4 = y3*2 - y2  
y5 = x + y1 + y2 + y3 - y4
```

```
In [60]: x,y1,y2,y3,y4,y5
```

```
Out[60]: (array([22, 22, 10, 22, 34, 13]),  
 array([44, 44, 20, 44, 68, 26]),  
 array([49, 49, 25, 49, 73, 31]),  
 array([34, 34, 10, 34, 58, 16]),  
 array([19, 19, -5, 19, 43, 1]),  
 array([130, 130, 70, 130, 190, 85]))
```

```
In [61]: plt.plot(x,y1,color = 'yellow',linestyle = ':',linewidth = 3)  
plt.plot(x,y2,color = 'indigo',linestyle = ':',linewidth = 5)  
plt.plot(x,y3,color = 'magenta',linestyle = ':',linewidth = 7)  
plt.plot(x,y4,color = 'red',linestyle = ':',linewidth = 9)  
plt.plot(x,y5,color = 'grey',linestyle = ':',linewidth = 11)  
plt.title("A Line Plot")  
plt.xlabel("X-axis")  
plt.ylabel("Y-axis")  
plt.grid(True)  
plt.show()
```



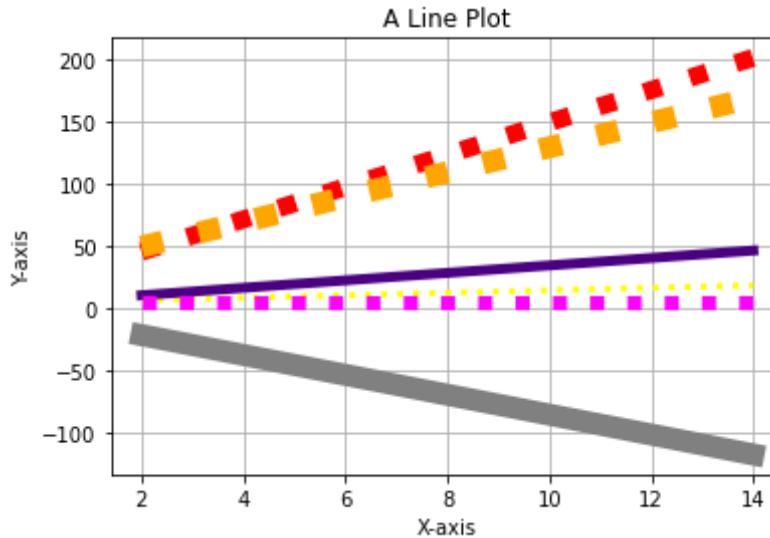
```
In [62]: #Example-04:
```

```
In [63]: x = np.arange(2,15)
y1 = x + 5
y2 = x*2 + y1
y3 = x + y1*2 - y2
y4 = x*2 + y1*2 + y2*3 -y3
y5 = x+y1+y2+y3-y4
y6 = x+y1+y2+y3+y4+y5
```

```
In [64]: x,y1,y2,y3,y4,y5,y6
```

```
Out[64]: (array([ 2,  3,  4,  5,  6,  7,  8,  9, 10, 11, 12, 13, 14]),
 array([ 7,  8,  9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19]),
 array([11, 14, 17, 20, 23, 26, 29, 32, 35, 38, 41, 44, 47]),
 array([5, 5, 5, 5, 5, 5, 5, 5, 5, 5, 5, 5]),
 array([ 46,  59,  72,  85,  98, 111, 124, 137, 150, 163, 176, 189, 20
 2]),
 array([-21, -29, -37, -45, -53, -61, -69, -77, -85, -93, -10
 1,
 -109, -117]),
 array([ 50,  60,  70,  80,  90, 100, 110, 120, 130, 140, 150, 160, 17
 0]))
```

```
In [65]: plt.plot(x,y1,color = 'yellow',linestyle = ':',linewidth = 3)
plt.plot(x,y2,color = 'indigo',linewidth = 5)
plt.plot(x,y3,color = 'magenta',linestyle = ':',linewidth = 7)
plt.plot(x,y4,color = 'red',linestyle = ':',linewidth = 9)
plt.plot(x,y5,color = 'grey',linestyle = '--',linewidth = 11)
plt.plot(x,y6,color = 'orange',linestyle = ':',linewidth = 11)
plt.title("A Line Plot")
plt.xlabel("X-axis")
plt.ylabel("Y-axis")
plt.grid(True)
plt.show()
```



```
In [66]: #(a).(iv).Adding subplots in a plot:
```

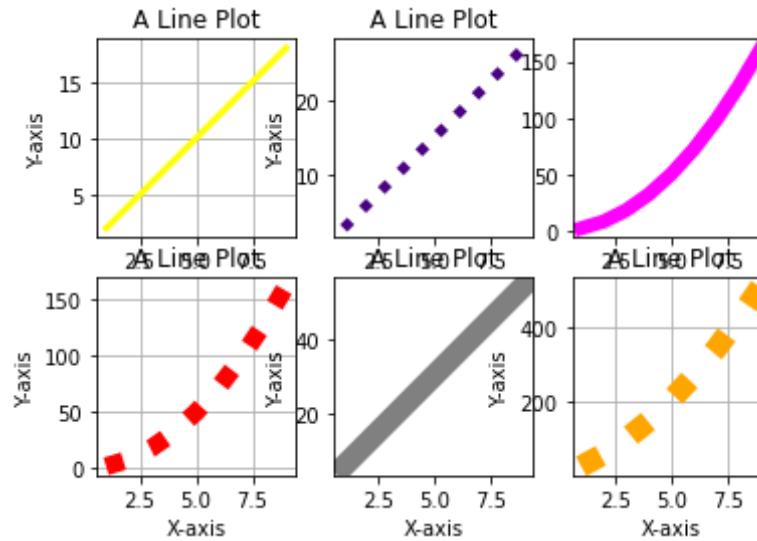
```
In [67]: #Example-01:
```

```
In [68]: x = np.arange(1,10)
y1 = 2*x
y2 = x+y1
y3 = x*y1
y4 = x+y1-y2+y3
y5 = x+y1+y2+y3-y4
y6 = x*y1+y2-y3+y4*2+3*y5
```

```
In [69]: x,y1,y2,y3,y4,y5,y6
```

```
Out[69]: (array([1, 2, 3, 4, 5, 6, 7, 8, 9]),
 array([ 2,  4,  6,  8, 10, 12, 14, 16, 18]),
 array([ 3,  6,  9, 12, 15, 18, 21, 24, 27]),
 array([ 2,   8,  18,  32,  50,  72,  98, 128, 162]),
 array([ 2,   8,  18,  32,  50,  72,  98, 128, 162]),
 array([ 6, 12, 18, 24, 30, 36, 42, 48, 54]),
 array([ 25,  58,  99, 148, 205, 270, 343, 424, 513]))
```

```
In [70]: plt.subplot(2,3,1)
plt.plot(x,y1,color = 'yellow',linestyle = '-.',linewidth = 3)
plt.title("A Line Plot")
plt.xlabel("X-axis")
plt.ylabel("Y-axis")
plt.grid(True)
plt.subplot(2,3,2)
plt.plot(x,y2,color = 'indigo',linestyle=':',linewidth = 5)
plt.title("A Line Plot")
plt.xlabel("X-axis")
plt.ylabel("Y-axis")
plt.grid(False)
plt.subplot(2,3,3)
plt.plot(x,y3,color = 'magenta',linewidth = 7)
plt.subplot(2,3,4)
plt.plot(x,y4,color = 'red',linestyle = ':',linewidth = 9)
plt.title("A Line Plot")
plt.xlabel("X-axis")
plt.ylabel("Y-axis")
plt.grid(True)
plt.subplot(2,3,5)
plt.plot(x,y5,color = 'grey',linewidth = 11)
plt.title("A Line Plot")
plt.xlabel("X-axis")
plt.ylabel("Y-axis")
plt.grid(False)
plt.subplot(2,3,6)
plt.plot(x,y6,color = 'orange',linestyle = ':',linewidth = 11)
plt.title("A Line Plot")
plt.xlabel("X-axis")
plt.ylabel("Y-axis")
plt.grid(True)
plt.show()
```



```
In [71]: #Example-02:
```

```
In [72]: x,y1,y2,y3,y4,y5,y6
```

```
Out[72]: (array([1, 2, 3, 4, 5, 6, 7, 8, 9]),
 array([ 2, 4, 6, 8, 10, 12, 14, 16, 18]),
 array([ 3, 6, 9, 12, 15, 18, 21, 24, 27]),
 array([ 2, 8, 18, 32, 50, 72, 98, 128, 162]),
 array([ 2, 8, 18, 32, 50, 72, 98, 128, 162]),
 array([ 6, 12, 18, 24, 30, 36, 42, 48, 54]),
 array([ 25, 58, 99, 148, 205, 270, 343, 424, 513]))
```

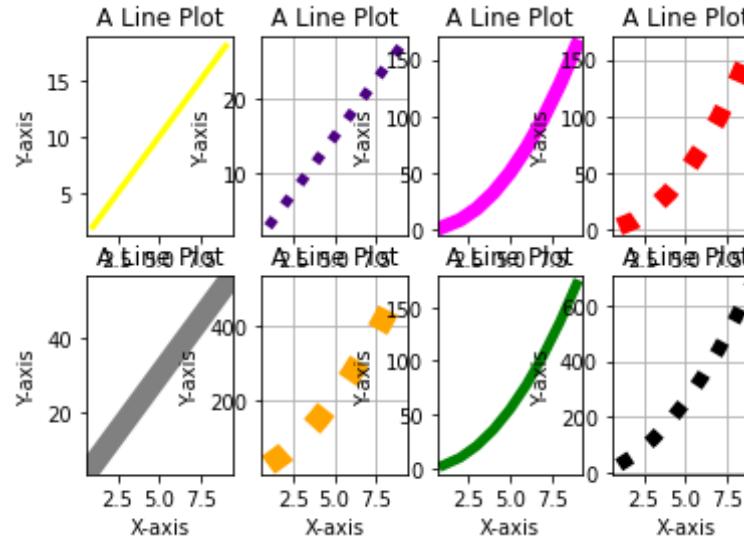
```
In [73]: y7 = x + y4
y8 = y3 + y6
y7,y8
```

```
Out[73]: (array([ 3, 10, 21, 36, 55, 78, 105, 136, 171]),
 array([ 27, 66, 117, 180, 255, 342, 441, 552, 675]))
```

```
In [74]: plt.subplot(2,4,1)
plt.plot(x,y1,color = 'yellow',linestyle = '-.',linewidth = 3)
```

```
plt.title("A Line Plot")
plt.xlabel("X-axis")
plt.ylabel("Y-axis")
plt.grid(False)
plt.subplot(2,4,2)
plt.plot(x,y2,color = 'indigo',linestyle=':',linewidth = 5)
plt.title("A Line Plot")
plt.xlabel("X-axis")
plt.ylabel("Y-axis")
plt.grid(True)
plt.subplot(2,4,3)
plt.plot(x,y3,color = 'magenta',linewidth = 7)
plt.title("A Line Plot")
plt.xlabel("X-axis")
plt.ylabel("Y-axis")
plt.grid(False)
plt.subplot(2,4,4)
plt.plot(x,y4,color = 'red',linestyle = ':',linewidth = 9)
plt.title("A Line Plot")
plt.xlabel("X-axis")
plt.ylabel("Y-axis")
plt.grid(True)
plt.subplot(2,4,5)
plt.plot(x,y5,color = 'grey',linewidth = 11)
plt.title("A Line Plot")
plt.xlabel("X-axis")
plt.ylabel("Y-axis")
plt.grid(False)
plt.subplot(2,4,6)
plt.plot(x,y6,color = 'orange',linestyle = ':',linewidth = 11)
plt.title("A Line Plot")
plt.xlabel("X-axis")
plt.ylabel("Y-axis")
plt.grid(True)
plt.subplot(2,4,7)
plt.plot(x,y7,color = 'green',linewidth = 5)
plt.title("A Line Plot")
plt.xlabel("X-axis")
plt.ylabel("Y-axis")
plt.grid(False)
```

```
plt.subplot(2,4,8)
plt.plot(x,y8,color = 'black',linestyle = ':',linewidth = 7)
plt.title("A Line Plot")
plt.xlabel("X-axis")
plt.ylabel("Y-axis")
plt.grid(True)
plt.show()
```



In [75]: #Example-03:

In [76]: x,y1,y2,y3,y4,y5,y6,y7,y8

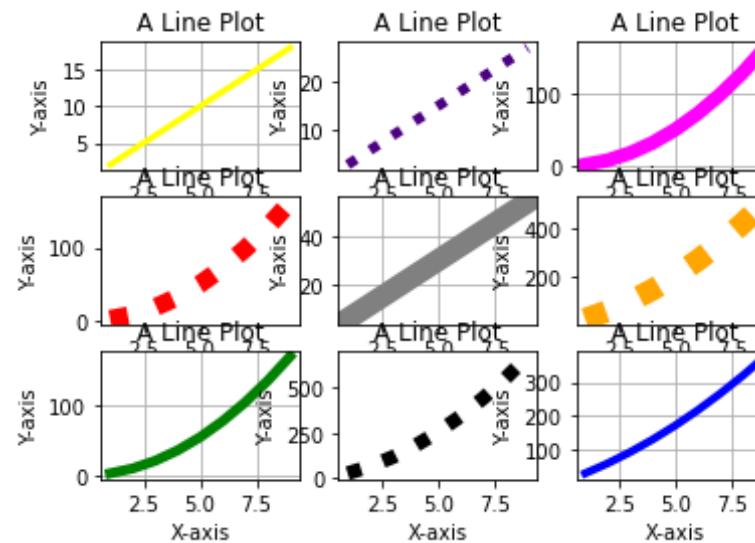
Out[76]: (array([1, 2, 3, 4, 5, 6, 7, 8, 9]),
 array([ 2, 4, 6, 8, 10, 12, 14, 16, 18]),
 array([ 3, 6, 9, 12, 15, 18, 21, 24, 27]),
 array([ 2, 8, 18, 32, 50, 72, 98, 128, 162]),
 array([ 2, 8, 18, 32, 50, 72, 98, 128, 162]),
 array([ 6, 12, 18, 24, 30, 36, 42, 48, 54]),
 array([ 25, 58, 99, 148, 205, 270, 343, 424, 513]),
 array([ 3, 10, 21, 36, 55, 78, 105, 136, 171]),
 array([ 27, 66, 117, 180, 255, 342, 441, 552, 675]))

```
In [77]: y9 = x+y1-y3+y6  
y9
```

```
Out[77]: array([ 26,  56,  90, 128, 170, 216, 266, 320, 378])
```

```
In [78]: plt.subplot(3,3,1)  
plt.plot(x,y1,color = 'yellow',linestyle = '-.',linewidth = 3)  
plt.title("A Line Plot")  
plt.xlabel("X-axis")  
plt.ylabel("Y-axis")  
plt.grid(True)  
plt.subplot(3,3,2)  
plt.plot(x,y2,color = 'indigo',linestyle=':',linewidth = 5)  
plt.title("A Line Plot")  
plt.xlabel("X-axis")  
plt.ylabel("Y-axis")  
plt.grid(False)  
plt.subplot(3,3,3)  
plt.plot(x,y3,color = 'magenta',linewidth = 7)  
plt.title("A Line Plot")  
plt.xlabel("X-axis")  
plt.ylabel("Y-axis")  
plt.grid(True)  
plt.subplot(3,3,4)  
plt.plot(x,y4,color = 'red',linestyle = ':',linewidth = 9)  
plt.title("A Line Plot")  
plt.xlabel("X-axis")  
plt.ylabel("Y-axis")  
plt.grid(False)  
plt.subplot(3,3,5)  
plt.plot(x,y5,color = 'grey',linewidth = 11)  
plt.title("A Line Plot")  
plt.xlabel("X-axis")  
plt.ylabel("Y-axis")  
plt.grid(True)  
plt.subplot(3,3,6)  
plt.plot(x,y6,color = 'orange',linestyle = ':',linewidth = 11)  
plt.title("A Line Plot")  
plt.xlabel("X-axis")
```

```
plt.ylabel("Y-axis")
plt.grid(False)
plt.subplot(3,3,7)
plt.plot(x,y7,color = 'green',linewidth = 5)
plt.title("A Line Plot")
plt.xlabel("X-axis")
plt.ylabel("Y-axis")
plt.grid(True)
plt.subplot(3,3,8)
plt.plot(x,y8,color = 'black',linestyle = ':',linewidth = 7)
plt.title("A Line Plot")
plt.xlabel("X-axis")
plt.ylabel("Y-axis")
plt.grid(False)
plt.subplot(3,3,9)
plt.plot(x,y9,color = 'blue',linewidth = 4)
plt.title("A Line Plot")
plt.xlabel("X-axis")
plt.ylabel("Y-axis")
plt.grid(True)
plt.show()
```



```
In [79]: #Example-05:
```

```
In [80]: x,y1,y2,y3,y4,y5,y6,y7,y8,y9
```

```
Out[80]: (array([1, 2, 3, 4, 5, 6, 7, 8, 9]),
           array([ 2,  4,  6,  8, 10, 12, 14, 16, 18]),
           array([ 3,  6,  9, 12, 15, 18, 21, 24, 27]),
           array([ 2,   8, 18, 32, 50, 72, 98, 128, 162]),
           array([ 2,   8, 18, 32, 50, 72, 98, 128, 162]),
           array([ 6, 12, 18, 24, 30, 36, 42, 48, 54]),
           array([ 25, 58, 99, 148, 205, 270, 343, 424, 513]),
           array([ 3, 10, 21, 36, 55, 78, 105, 136, 171]),
           array([ 27, 66, 117, 180, 255, 342, 441, 552, 675]),
           array([ 26, 56, 90, 128, 170, 216, 266, 320, 378]))
```

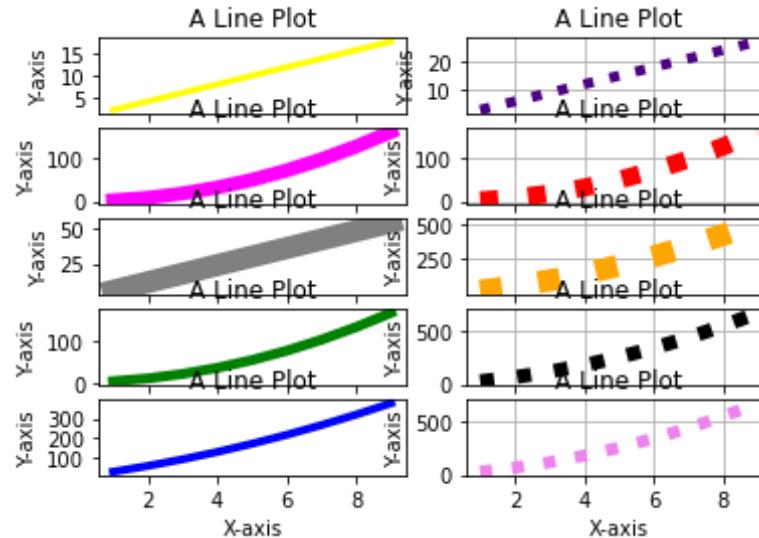
```
In [81]: y10 = x+y5+y3+y8-y9
y10
```

```
Out[81]: array([ 10,  32,  66, 112, 170, 240, 322, 416, 522])
```

```
In [82]: plt.subplot(5,2,1)
plt.plot(x,y1,color = 'yellow',linestyle = '-.',linewidth = 3)
plt.title("A Line Plot")
plt.xlabel("X-axis")
plt.ylabel("Y-axis")
plt.grid(False)
plt.subplot(5,2,2)
plt.plot(x,y2,color = 'indigo',linestyle=':',linewidth = 5)
plt.title("A Line Plot")
plt.xlabel("X-axis")
plt.ylabel("Y-axis")
plt.grid(True)
plt.subplot(5,2,3)
plt.plot(x,y3,color = 'magenta',linewidth = 7)
plt.title("A Line Plot")
plt.xlabel("X-axis")
plt.ylabel("Y-axis")
plt.grid(False)
plt.subplot(5,2,4)
```

```
plt.plot(x,y4,color = 'red',linestyle = ':' , linewidth = 9)
plt.title("A Line Plot")
plt.xlabel("X-axis")
plt.ylabel("Y-axis")
plt.grid(True)
plt.subplot(5,2,5)
plt.plot(x,y5,color = 'grey' , linewidth = 11)
plt.title("A Line Plot")
plt.xlabel("X-axis")
plt.ylabel("Y-axis")
plt.grid(False)
plt.subplot(5,2,6)
plt.plot(x,y6,color = 'orange' , linestyle = ':' , linewidth = 11)
plt.title("A Line Plot")
plt.xlabel("X-axis")
plt.ylabel("Y-axis")
plt.grid(True)
plt.subplot(5,2,7)
plt.plot(x,y7,color = 'green' , linewidth = 5)
plt.title("A Line Plot")
plt.xlabel("X-axis")
plt.ylabel("Y-axis")
plt.grid(False)
plt.subplot(5,2,8)
plt.plot(x,y8,color = 'black' , linestyle = ':' , linewidth = 7)
plt.title("A Line Plot")
plt.xlabel("X-axis")
plt.ylabel("Y-axis")
plt.grid(True)
plt.subplot(5,2,9)
plt.plot(x,y9,color = 'blue' , linewidth = 4)
plt.title("A Line Plot")
plt.xlabel("X-axis")
plt.ylabel("Y-axis")
plt.grid(False)
plt.subplot(5,2,10)
plt.plot(x,y8,color = 'violet' , linestyle = ':' , linewidth = 6)
plt.title("A Line Plot")
plt.xlabel("X-axis")
plt.ylabel("Y-axis")
```

```
plt.grid(True)  
plt.show()
```



In [83]: #b.Bar Plot:

In [84]: #b.(i).Vertical:

In [85]: #Example-01:

In [86]: dict = {'k1':10, 'k2':20, 'k3':40, 'k4':50}  
dict

Out[86]: {'k1': 10, 'k2': 20, 'k3': 40, 'k4': 50}

In [87]: x = list(dict.keys())  
x

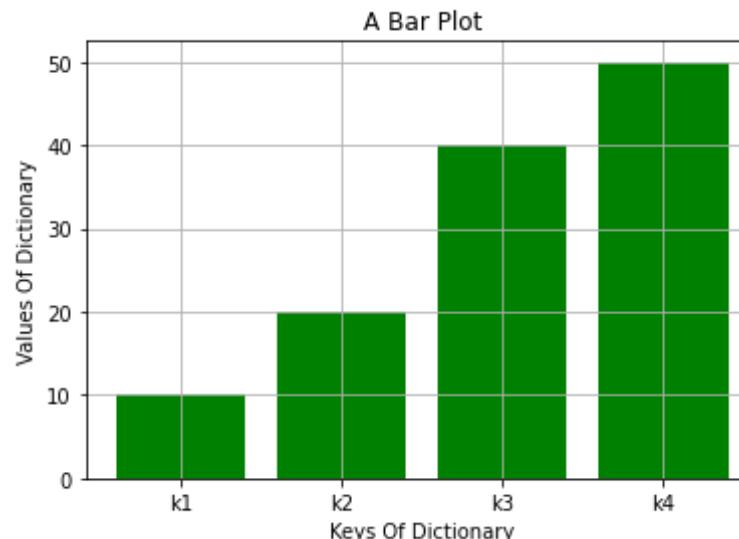
Out[87]: ['k1', 'k2', 'k3', 'k4']

In [88]: y = list(dict.values())

```
y
```

```
Out[88]: [10, 20, 40, 50]
```

```
In [89]: plt.bar(x,y,color='g')
plt.title("A Bar Plot")
plt.xlabel('Keys Of Dictionary')
plt.ylabel('Values Of Dictionary')
plt.grid(True)
plt.show()
```



```
In [90]: #Example-02:
```

```
In [91]: student = {'Jason':76,'Aaron':99,'Andy':45,'Bob':5,'Karl':28,'Melos':67
,'Philips':85}
```

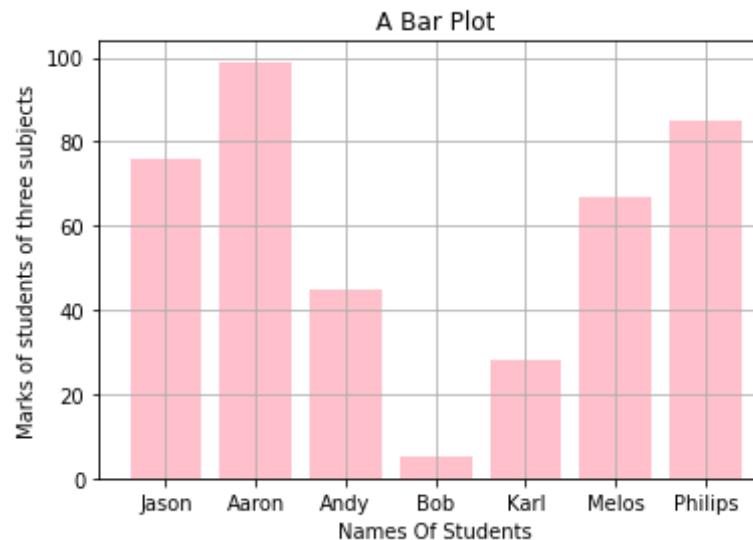
```
In [92]: names = list(student.keys())
names
```

```
Out[92]: ['Jason', 'Aaron', 'Andy', 'Bob', 'Karl', 'Melos', 'Philips']
```

```
In [93]: marks = list(student.values())
marks
```

```
Out[93]: [76, 99, 45, 5, 28, 67, 85]
```

```
In [94]: plt.bar(names,marks,color='pink')
plt.title("A Bar Plot")
plt.xlabel('Names Of Students')
plt.ylabel('Marks of students of three subjects')
plt.grid(True)
plt.show()
```



```
In [95]: #Example-03:
```

```
In [96]: people = {'Brite':5.5,'Mike':4.6,'Sandy':6,'Solomon':5.5,'Jolly':4,'Car
ol':6.5,'Kristy':6,'John':5,'Lendy':4}
```

```
In [97]: names = list(people.keys())
names
```

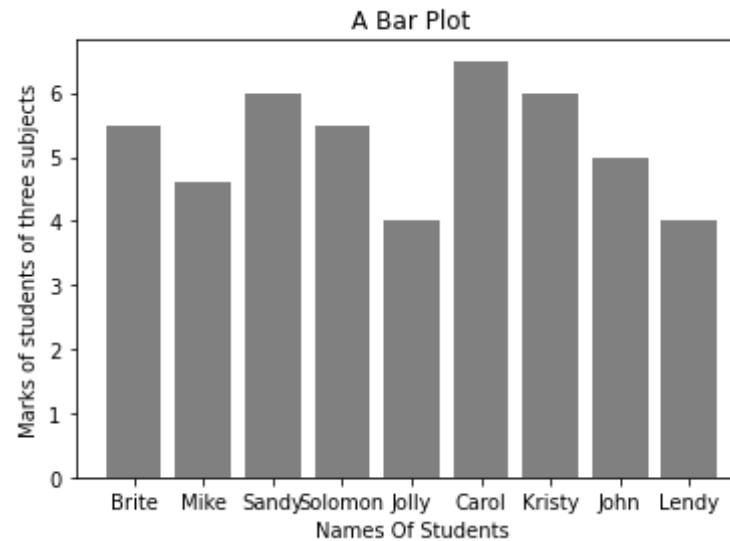
```
Out[97]: ['Brite',
```

```
'Mike',
'Sandy',
'Solomon',
'Jolly',
'Carol',
'Kristy',
'John',
'Lendy']
```

```
In [98]: height = list(people.values())
height
```

```
Out[98]: [5.5, 4.6, 6, 5.5, 4, 6.5, 6, 5, 4]
```

```
In [99]: plt.bar(names,height,color='grey')
plt.title("A Bar Plot")
plt.xlabel('Names Of Students')
plt.ylabel('Marks of students of three subjects')
plt.grid(False)
plt.show()
```



```
In [100]: #b.(i).(i).Adding subplots to barchart:
```

```
In [101]: #Example-01:
```

```
In [102]: d1 = {'k1':10,'k2':20,'k3':30,'k4':40}
d2 = {'x1':12,'x2':22,'x3':32,'x4':42}
d3 = {'m1':11,'m2':21,'m3':31,'m4':41}
d4 = {'n1':5,'n2':15,'n3':25,'n4':35}
```

```
In [103]: dict1 = list(d1.keys())
dict1
```

```
Out[103]: ['k1', 'k2', 'k3', 'k4']
```

```
In [104]: dict2 = list(d1.values())
dict2
```

```
Out[104]: [10, 20, 30, 40]
```

```
In [105]: dict3 = list(d2.keys())
dict3
```

```
Out[105]: ['x1', 'x2', 'x3', 'x4']
```

```
In [106]: dict4 = list(d2.values())
dict4
```

```
Out[106]: [12, 22, 32, 42]
```

```
In [107]: dict5 = list(d3.keys())
dict5
```

```
Out[107]: ['m1', 'm2', 'm3', 'm4']
```

```
In [108]: dict6 = list(d3.values())
dict6
```

```
Out[108]: [11, 21, 31, 41]
```

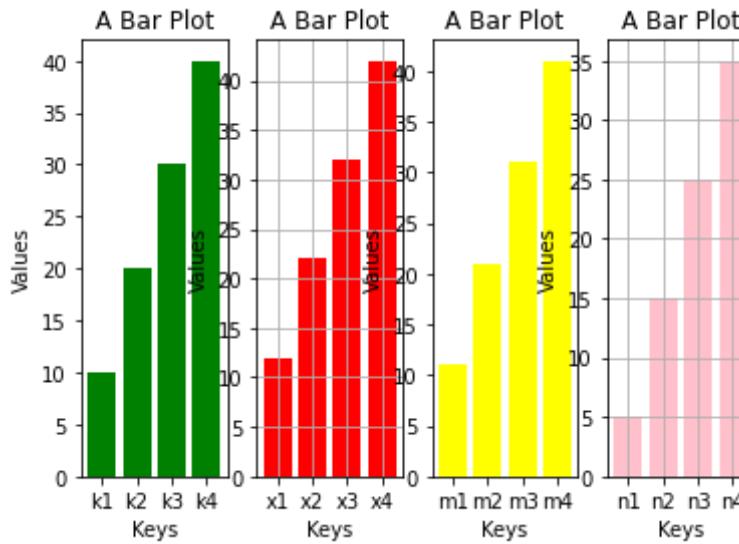
```
In [109]: dict7 = list(d4.keys())
dict7
```

```
Out[109]: ['n1', 'n2', 'n3', 'n4']
```

```
In [110]: dict8 = list(d4.values())
dict8
```

```
Out[110]: [5, 15, 25, 35]
```

```
In [111]: plt.subplot(1,4,1)
plt.bar(dict1,dict2,color='g')
plt.title('A Bar Plot')
plt.xlabel('Keys')
plt.ylabel('Values')
plt.grid(False)
plt.subplot(1,4,2)
plt.bar(dict3,dict4,color='r')
plt.title('A Bar Plot')
plt.xlabel('Keys')
plt.ylabel('Values')
plt.grid(True)
plt.subplot(1,4,3)
plt.bar(dict5,dict6,color='yellow')
plt.title('A Bar Plot')
plt.xlabel('Keys')
plt.ylabel('Values')
plt.grid(False)
plt.subplot(1,4,4)
plt.bar(dict7,dict8,color='pink')
plt.title('A Bar Plot')
plt.xlabel('Keys')
plt.ylabel('Values')
plt.grid()
plt.show()
```



```
In [112]: #Example-02:
```

```
In [113]: dict1,dict2
```

```
Out[113]: (['k1', 'k2', 'k3', 'k4'], [10, 20, 30, 40])
```

```
In [114]: dict3,dict4
```

```
Out[114]: (['x1', 'x2', 'x3', 'x4'], [12, 22, 32, 42])
```

```
In [115]: dict5,dict6
```

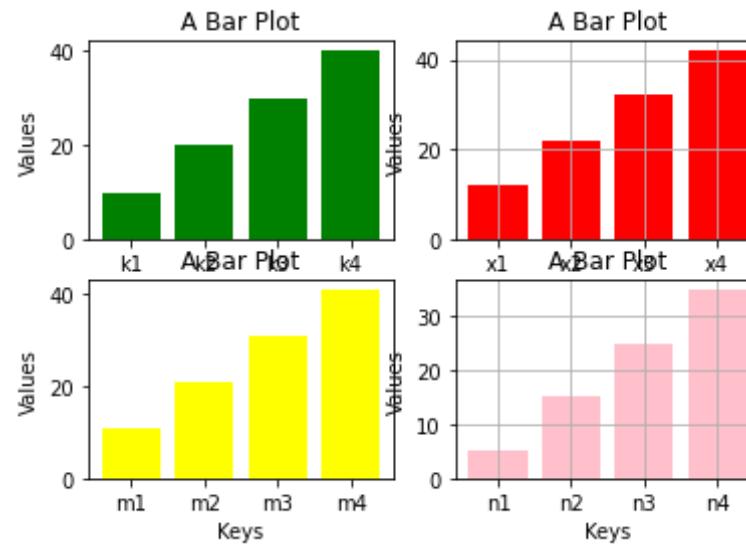
```
Out[115]: (['m1', 'm2', 'm3', 'm4'], [11, 21, 31, 41])
```

```
In [116]: dict7,dict8
```

```
Out[116]: (['n1', 'n2', 'n3', 'n4'], [5, 15, 25, 35])
```

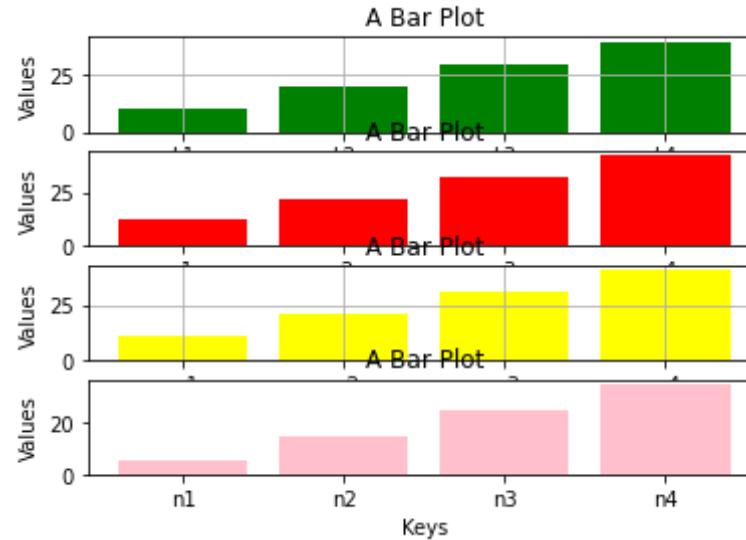
```
In [117]: plt.subplot(2,2,1)  
plt.bar(dict1,dict2,color='g')
```

```
plt.title('A Bar Plot')
plt.xlabel('Keys')
plt.ylabel('Values')
plt.grid(False)
plt.subplot(2,2,1)
plt.bar(dict3,dict4,color='r')
plt.title('A Bar Plot')
plt.xlabel('Keys')
plt.ylabel('Values')
plt.grid(True)
plt.subplot(2,2,3)
plt.bar(dict5,dict6,color='yellow')
plt.title('A Bar Plot')
plt.xlabel('Keys')
plt.ylabel('Values')
plt.grid(False)
plt.subplot(2,2,4)
plt.bar(dict7,dict8,color='pink')
plt.title('A Bar Plot')
plt.xlabel('Keys')
plt.ylabel('Values')
plt.grid()
plt.show()
```



```
In [118]: #Example-03:  
  
In [119]: dict1,dict2  
Out[119]: (['k1', 'k2', 'k3', 'k4'], [10, 20, 30, 40])  
  
In [120]: dict3,dict4  
Out[120]: (['x1', 'x2', 'x3', 'x4'], [12, 22, 32, 42])  
  
In [121]: dict5,dict6  
Out[121]: (['m1', 'm2', 'm3', 'm4'], [11, 21, 31, 41])  
  
In [122]: dict7,dict8  
Out[122]: (['n1', 'n2', 'n3', 'n4'], [5, 15, 25, 35])  
  
In [123]: plt.subplot(4,1,1)  
plt.bar(dict1,dict2,color='g')  
plt.title('A Bar Plot')  
plt.xlabel('Keys')  
plt.ylabel('Values')  
plt.grid(True)  
plt.subplot(4,1,2)  
plt.bar(dict3,dict4,color='r')  
plt.title('A Bar Plot')  
plt.xlabel('Keys')  
plt.ylabel('Values')  
plt.grid(False)  
plt.subplot(4,1,3)  
plt.bar(dict5,dict6,color='yellow')  
plt.title('A Bar Plot')  
plt.xlabel('Keys')  
plt.ylabel('Values')  
plt.grid()
```

```
plt.subplot(4,1,4)
plt.bar(dict7,dict8,color='pink')
plt.title('A Bar Plot')
plt.xlabel('Keys')
plt.ylabel('Values')
plt.grid(False)
plt.show()
```



In [124]: #b.(ii).Horizontal:

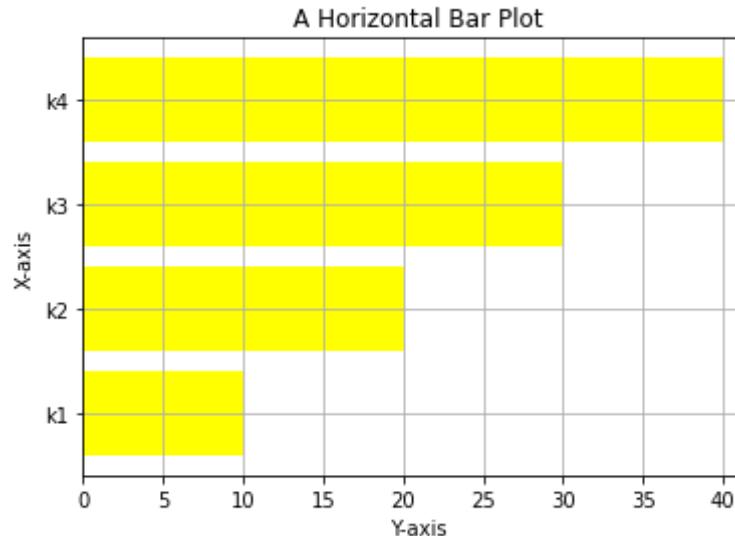
In [125]: #Example-01:

In [126]: dict1,dict

Out[126]: ([{'k1': 'k1', 'k2': 'k2', 'k3': 'k3', 'k4': 'k4'}, {'k1': 10, 'k2': 20, 'k3': 40, 'k4': 50}])

In [127]: plt.barh(dict1,dict2,color='yellow')
plt.title('A Horizontal Bar Plot')
plt.ylabel('X-axis')
plt.xlabel("Y-axis")

```
plt.grid(True)  
plt.show()
```



In [128]: #Example-02:

In [129]: dict3,dict4

Out[129]: (['x1', 'x2', 'x3', 'x4'], [12, 22, 32, 42])

In [130]: plt.barh(dict3,dict4,color='violet')  
plt.title('A Horizontal Bar Plot')  
plt.ylabel('X-axis')  
plt.xlabel("Y-axis")  
plt.grid()  
plt.show()

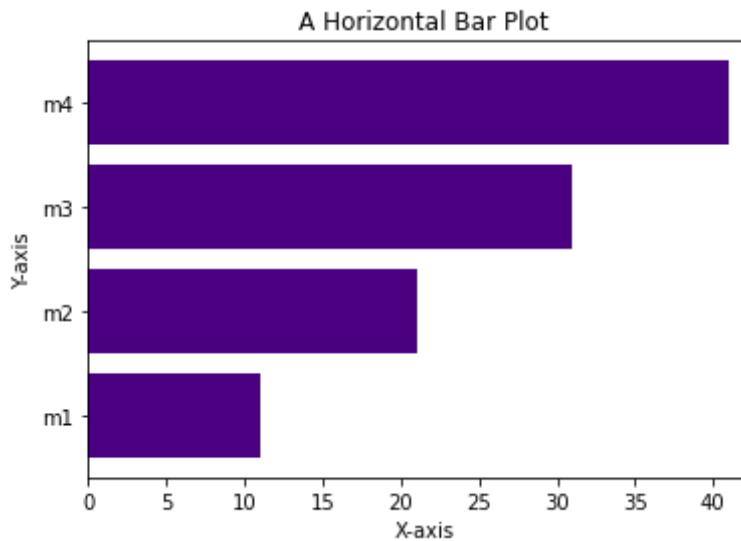


```
In [131]: #Example-03:
```

```
In [132]: dict5,dict6
```

```
Out[132]: (['m1', 'm2', 'm3', 'm4'], [11, 21, 31, 41])
```

```
In [133]: plt.barh(dict5,dict6,color='indigo')
plt.title('A Horizontal Bar Plot')
plt.xlabel('X-axis')
plt.ylabel("Y-axis")
plt.grid(False)
plt.show()
```

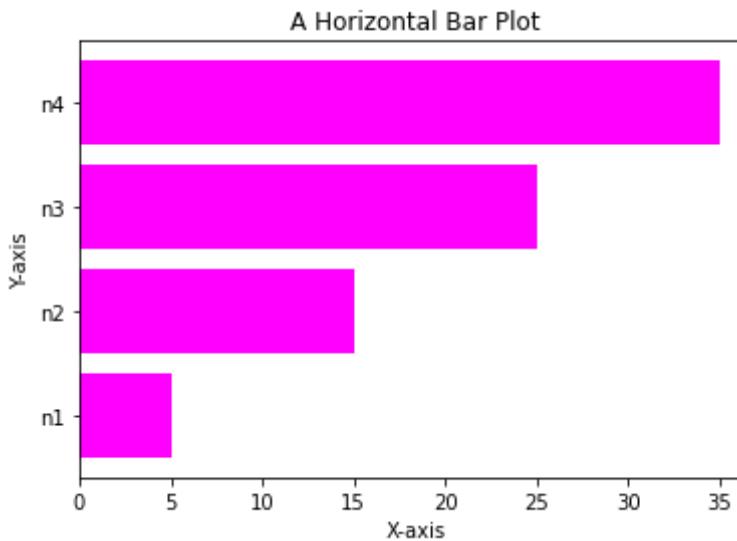


```
In [134]: #Example-04:
```

```
In [135]: dict7,dict8
```

```
Out[135]: (['n1', 'n2', 'n3', 'n4'], [5, 15, 25, 35])
```

```
In [136]: plt.barh(dict7,dict8,color='magenta')
plt.title('A Horizontal Bar Plot')
plt.xlabel('X-axis')
plt.ylabel("Y-axis")
plt.grid(False)
plt.show()
```



```
In [137]: #b.(ii).(i).Adding subplots to horizontal barchart:
```

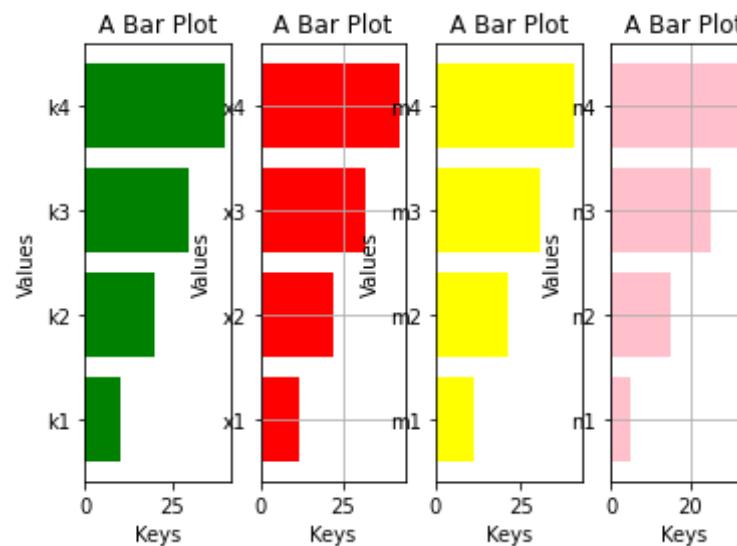
```
In [138]: #Example-01:
```

```
In [139]: dict1,dict2,dict3,dict4,dict5,dict6,dict7,dict8
```

```
Out[139]: ([['k1', 'k2', 'k3', 'k4'],
 [10, 20, 30, 40],
 ['x1', 'x2', 'x3', 'x4'],
 [12, 22, 32, 42],
 ['m1', 'm2', 'm3', 'm4'],
 [11, 21, 31, 41],
 ['n1', 'n2', 'n3', 'n4'],
 [5, 15, 25, 35])
```

```
In [140]: plt.subplot(1,4,1)
plt.barh(dict1,dict2,color='g')
plt.title('A Bar Plot')
plt.xlabel('Keys')
plt.ylabel('Values')
plt.grid(False)
```

```
plt.subplot(1,4,2)
plt.barh(dict3,dict4,color='r')
plt.title('A Bar Plot')
plt.xlabel('Keys')
plt.ylabel('Values')
plt.grid(True)
plt.subplot(1,4,3)
plt.barh(dict5,dict6,color='yellow')
plt.title('A Bar Plot')
plt.xlabel('Keys')
plt.ylabel('Values')
plt.grid(False)
plt.subplot(1,4,4)
plt.barh(dict7,dict8,color='pink')
plt.title('A Bar Plot')
plt.xlabel('Keys')
plt.ylabel('Values')
plt.grid()
plt.show()
```



In [141]: #Example-02:

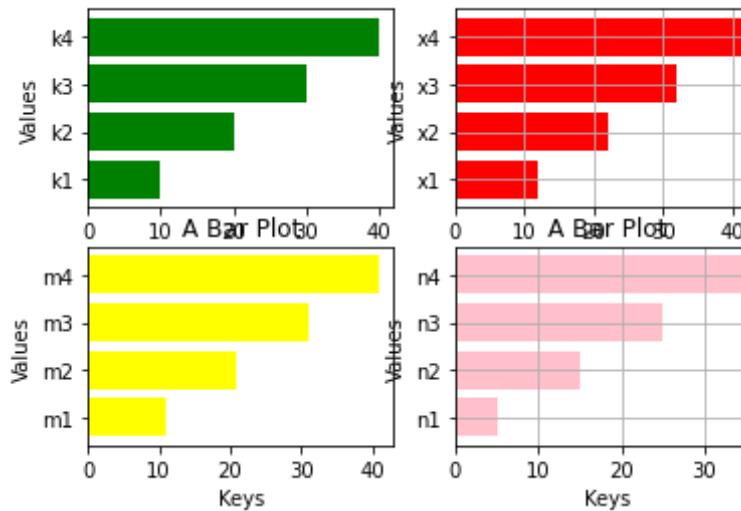
```
In [142]: dict1,dict2,dict3,dict5,dict6,dict7,dict8
```

```
Out[142]: ([['k1', 'k2', 'k3', 'k4'],
 [10, 20, 30, 40],
 ['x1', 'x2', 'x3', 'x4'],
 ['m1', 'm2', 'm3', 'm4'],
 [11, 21, 31, 41],
 ['n1', 'n2', 'n3', 'n4'],
 [5, 15, 25, 35]])
```

```
In [143]: plt.subplot(2,2,1)
plt.barh(dict1,dict2,color='g')
plt.title('A Bar Plot')
plt.xlabel('Keys')
plt.ylabel('Values')
plt.grid(False)
plt.subplot(2,2,2)
plt.barh(dict3,dict4,color='r')
plt.title('A Bar Plot')
plt.xlabel('Keys')
plt.ylabel('Values')
plt.grid(True)
plt.subplot(2,2,3)
plt.barh(dict5,dict6,color='yellow')
plt.title('A Bar Plot')
plt.xlabel('Keys')
plt.ylabel('Values')
plt.grid(False)
plt.subplot(2,2,4)
plt.barh(dict7,dict8,color='pink')
plt.title('A Bar Plot')
plt.xlabel('Keys')
plt.ylabel('Values')
plt.grid()
plt.show()
```

A Bar Plot

A Bar Plot



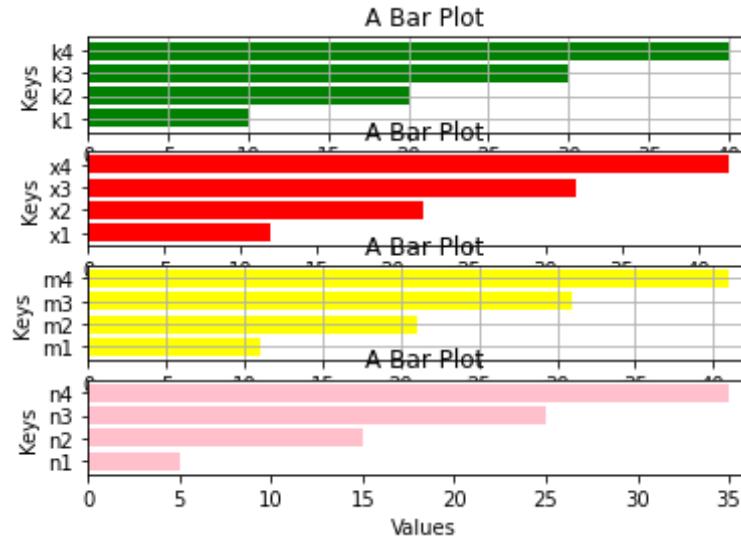
```
In [144]: #Example-03:
```

```
In [145]: dict1,dict2,dict3,dict5,dict6,dict7,dict8
```

```
Out[145]: ([['k1', 'k2', 'k3', 'k4'],
 [10, 20, 30, 40],
 ['x1', 'x2', 'x3', 'x4'],
 ['m1', 'm2', 'm3', 'm4'],
 [11, 21, 31, 41],
 ['n1', 'n2', 'n3', 'n4'],
 [5, 15, 25, 35]])
```

```
In [146]: plt.subplot(4,1,1)
plt.barh(dict1,dict2,color='g')
plt.title('A Bar Plot')
plt.ylabel('Keys')
plt.xlabel('Values')
plt.grid(True)
plt.subplot(4,1,2)
plt.barh(dict3,dict4,color='r')
plt.title('A Bar Plot')
plt.ylabel('Keys')
```

```
plt.xlabel('Values')
plt.grid(False)
plt.subplot(4,1,3)
plt.barh(dict5,dict6,color='yellow')
plt.title('A Bar Plot')
plt.ylabel('Keys')
plt.xlabel('Values')
plt.grid()
plt.subplot(4,1,4)
plt.barh(dict7,dict8,color='pink')
plt.title('A Bar Plot')
plt.ylabel('Keys')
plt.xlabel('Values')
plt.grid(False)
plt.show()
```



In [147]: #c.Scatter plot:

In [148]: #Example-01:

In [149]: x = np.arange(1,15)

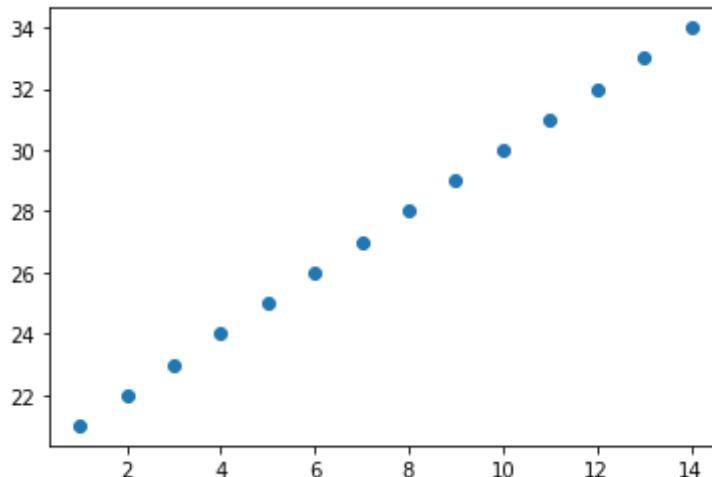
```
x
```

```
Out[149]: array([ 1,  2,  3,  4,  5,  6,  7,  8,  9, 10, 11, 12, 13, 14])
```

```
In [150]: y = np.arange(21,35)
y
```

```
Out[150]: array([21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34])
```

```
In [151]: plt.scatter(x,y)
plt.show()
```



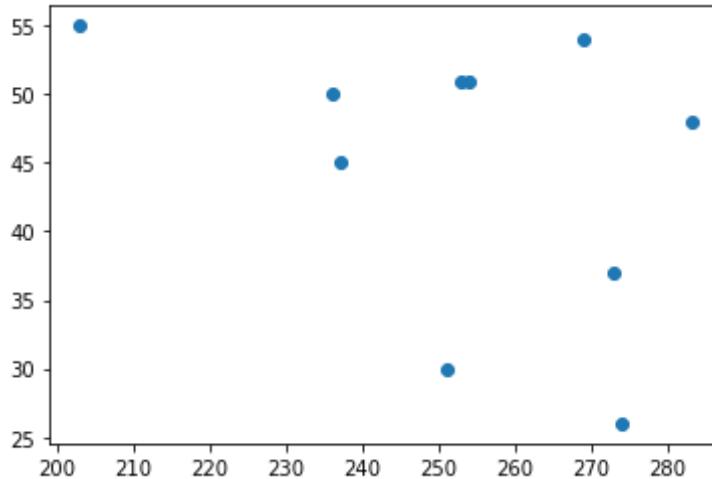
```
In [152]: #Example-02:
```

```
In [153]: x = np.random.randint(200,300,10)
y = np.random.randint(20,60,10)
x,y
```

```
Out[153]: (array([254, 253, 237, 269, 283, 274, 203, 251, 236, 273]),
array([51, 51, 45, 54, 48, 26, 55, 30, 50, 37]))
```

```
In [154]: plt.scatter(x,y)
plt.show
```

```
Out[154]: <function matplotlib.pyplot.show(*args, **kw)>
```

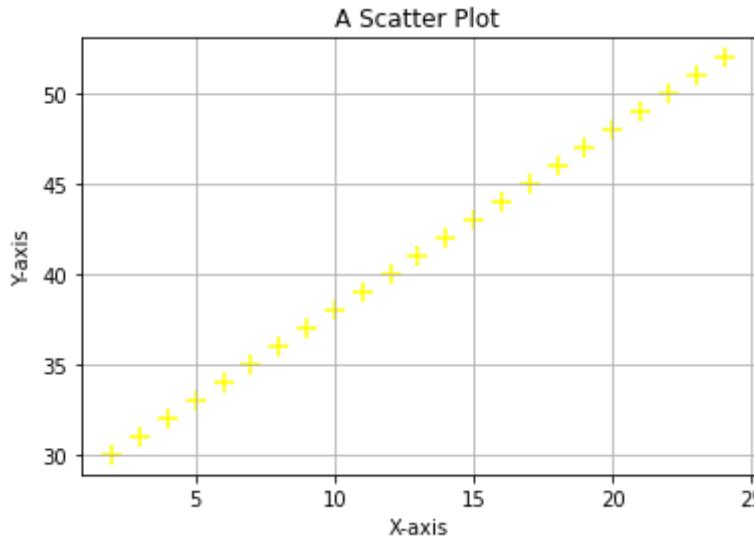


```
In [155]: #Example-03:
```

```
In [156]: x = np.arange(2,25)
y = np.arange(30,53)
x,y
```

```
Out[156]: (array([ 2,  3,  4,  5,  6,  7,  8,  9, 10, 11, 12, 13, 14, 15, 16, 17,
18,
         19, 20, 21, 22, 23, 24]),
 array([30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45,
46,
         47, 48, 49, 50, 51, 52]))
```

```
In [157]: plt.scatter(x,y,marker = '+',c = 'yellow',s=100)
plt.title("A Scatter Plot")
plt.xlabel("X-axis")
plt.ylabel("Y-axis")
plt.grid()
plt.show()
```



```
In [158]: #c.(i). Adding multiple scatter plots in a single plot:
```

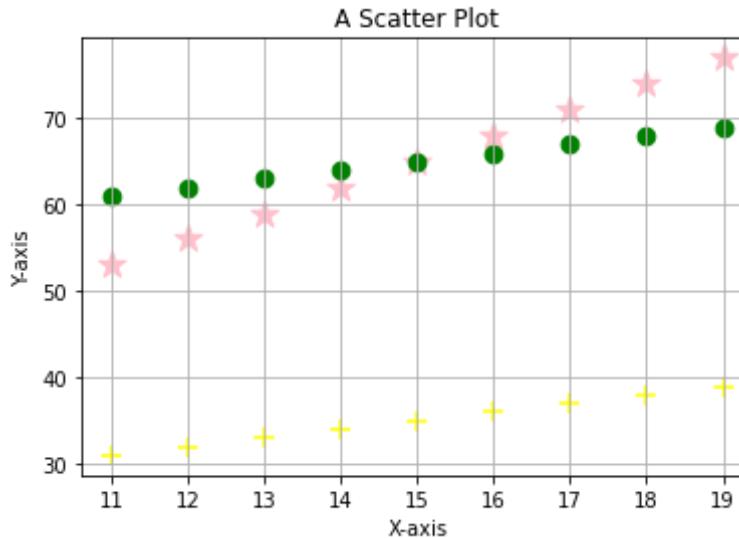
```
In [159]: #Example-01:
```

```
In [160]: x = np.arange(11,20)
y1 = np.arange(31,40)
y2 = x*2 + y1
y3 = np.arange(61,70)
x,y1,y2,y3
```

```
Out[160]: (array([11, 12, 13, 14, 15, 16, 17, 18, 19]),
 array([31, 32, 33, 34, 35, 36, 37, 38, 39]),
 array([53, 56, 59, 62, 65, 68, 71, 74, 77]),
 array([61, 62, 63, 64, 65, 66, 67, 68, 69]))
```

```
In [161]: plt.scatter(x,y1,marker = '+',c = 'yellow',s=100)
plt.scatter(x,y2,marker = '*',c = 'pink',s=200)
plt.scatter(x,y3,marker = '.',c = 'green',s=300)
plt.title("A Scatter Plot")
plt.xlabel("X-axis")
plt.ylabel("Y-axis")
```

```
plt.grid()  
plt.show()
```



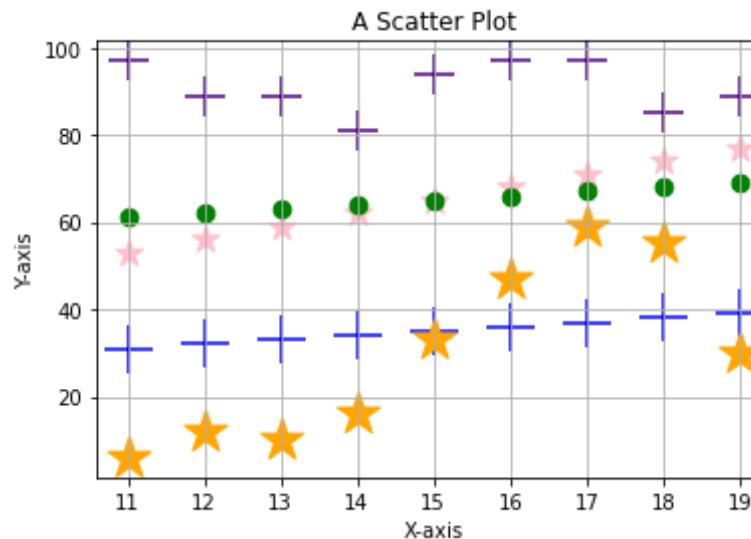
In [162]: #Example-02:

```
In [163]: x = np.arange(11,20)  
y1 = np.arange(31,40)  
y2 = x*2 + y1  
y3 = np.arange(61,70)  
y4 = np.random.randint(80,100,9)  
y5 = np.random.randint(4,65,9)  
x,y1,y2,y3,y4,y5
```

Out[163]: (array([11, 12, 13, 14, 15, 16, 17, 18, 19]),  
 array([31, 32, 33, 34, 35, 36, 37, 38, 39]),  
 array([53, 56, 59, 62, 65, 68, 71, 74, 77]),  
 array([61, 62, 63, 64, 65, 66, 67, 68, 69]),  
 array([97, 89, 89, 81, 94, 97, 97, 85, 89]),  
 array([ 6, 12, 10, 16, 33, 47, 59, 55, 30]))

In [164]: plt.scatter(x,y1,marker = '+',c = 'blue',s=600)

```
plt.scatter(x,y2,marker = '*',c = 'pink',s=200)
plt.scatter(x,y3,marker = '.',c = 'green',s=300)
plt.scatter(x,y4,marker = '+',c = 'indigo',s=400)
plt.scatter(x,y5,marker = '*',c = 'orange',s=500)
plt.title("A Scatter Plot")
plt.xlabel("X-axis")
plt.ylabel("Y-axis")
plt.grid()
plt.show()
```



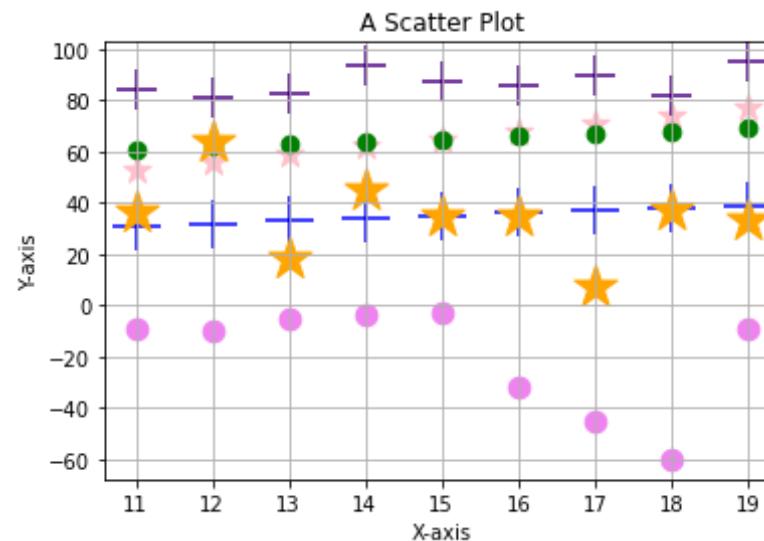
In [165]: #Example-03:

```
In [166]: x = np.arange(11,20)
y1 = np.arange(31,40)
y2 = x*2 + y1
y3 = np.arange(61,70)
y4 = np.random.randint(80,100,9)
y5 = np.random.randint(4,65,9)
y6 = [-9,-10,-5,-4,-3,-32,-45,-60,-9]
x,y1,y2,y3,y4,y5,y6
```

Out[166]: array([11, 12, 13, 14, 15, 16, 17, 18, 19])

```
In [166]: array([11, 12, 13, 14, 15, 16, 17, 18, 19]),  
array([31, 32, 33, 34, 35, 36, 37, 38, 39]),  
array([53, 56, 59, 62, 65, 68, 71, 74, 77]),  
array([61, 62, 63, 64, 65, 66, 67, 68, 69]),  
array([84, 81, 83, 94, 87, 86, 90, 82, 95]),  
array([36, 64, 18, 45, 35, 35, 7, 37, 33]),  
[-9, -10, -5, -4, -3, -32, -45, -60, -9])
```

```
In [167]: plt.scatter(x,y1,marker = '+',c = 'blue',s=600)  
plt.scatter(x,y2,marker = '*',c = 'pink',s=200)  
plt.scatter(x,y3,marker = '.',c = 'green',s=300)  
plt.scatter(x,y4,marker = '+',c = 'indigo',s=400)  
plt.scatter(x,y5,marker = '*',c = 'orange',s=500)  
plt.scatter(x,y6,marker = '.',c = 'violet',s=450)  
plt.title("A Scatter Plot")  
plt.xlabel("X-axis")  
plt.ylabel("Y-axis")  
plt.grid()  
plt.show()
```



```
In [168]: #c.(ii). Adding subplots in a single plot:
```

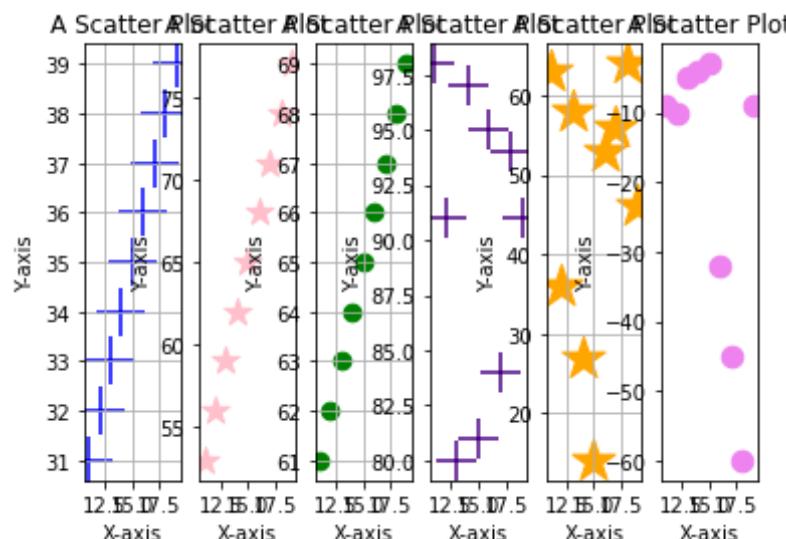
```
In [169]: #Example-01:
```

```
In [170]: x = np.arange(11,20)
y1 = np.arange(31,40)
y2 = x*2 + y1
y3 = np.arange(61,70)
y4 = np.random.randint(80,100,9)
y5 = np.random.randint(4,65,9)
y6 = [-9,-10,-5,-4,-3,-32,-45,-60,-9]
x,y1,y2,y3,y4,y5,y6
```

```
Out[170]: (array([11, 12, 13, 14, 15, 16, 17, 18, 19]),
 array([31, 32, 33, 34, 35, 36, 37, 38, 39]),
 array([53, 56, 59, 62, 65, 68, 71, 74, 77]),
 array([61, 62, 63, 64, 65, 66, 67, 68, 69]),
 array([98, 91, 80, 97, 81, 95, 84, 94, 91]),
 array([63, 36, 58, 27, 14, 53, 56, 64, 46]),
 [-9, -10, -5, -4, -3, -32, -45, -60, -9])
```

```
In [171]: plt.subplot(1,6,1)
plt.scatter(x,y1,marker = '+',c = 'blue',s=600)
plt.title("A Scatter Plot")
plt.xlabel("X-axis")
plt.ylabel("Y-axis")
plt.grid(True)
plt.subplot(1,6,2)
plt.scatter(x,y2,marker = '*',c = 'pink',s=200)
plt.title("A Scatter Plot")
plt.xlabel("X-axis")
plt.ylabel("Y-axis")
plt.grid(False)
plt.subplot(1,6,3)
plt.scatter(x,y3,marker = '.',c = 'green',s=300)
plt.title("A Scatter Plot")
plt.xlabel("X-axis")
plt.ylabel("Y-axis")
plt.grid()
plt.subplot(1,6,4)
plt.scatter(x,y4,marker = '+',c = 'indigo',s=400)
```

```
plt.title("A Scatter Plot")
plt.xlabel("X-axis")
plt.ylabel("Y-axis")
plt.grid(False)
plt.subplot(1,6,5)
plt.scatter(x,y5,marker = '*',c = 'orange',s=500)
plt.title("A Scatter Plot")
plt.xlabel("X-axis")
plt.ylabel("Y-axis")
plt.grid()
plt.subplot(1,6,6)
plt.scatter(x,y6,marker = '.',c = 'violet',s=450)
plt.title("A Scatter Plot")
plt.xlabel("X-axis")
plt.ylabel("Y-axis")
plt.grid(False)
plt.show()
```



In [172]: #Example-02:

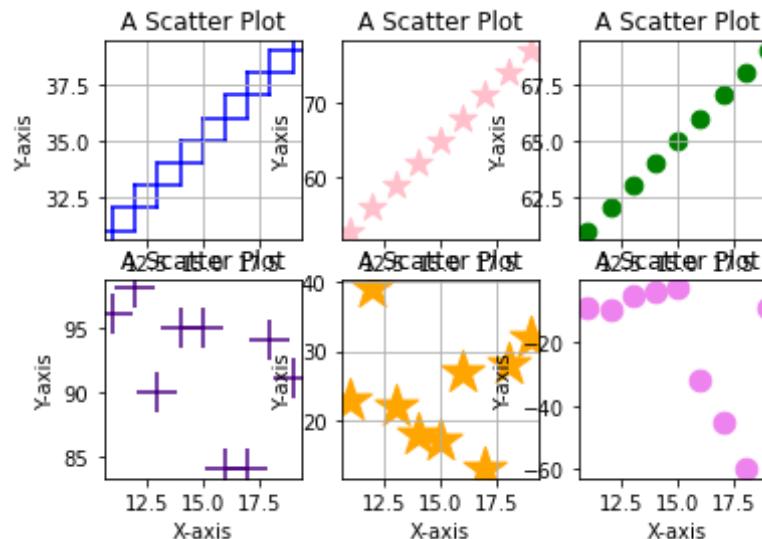
In [173]: `x = np.arange(11,20)`  
`y1 = np.arange(31,40)`

```
y2 = x*2 + y1
y3 = np.arange(61,70)
y4 = np.random.randint(80,100,9)
y5 = np.random.randint(4,65,9)
y6 = [-9,-10,-5,-4,-3,-32,-45,-60,-9]
x,y1,y2,y3,y4,y5,y6
```

Out[173]: (array([11, 12, 13, 14, 15, 16, 17, 18, 19]),  
 array([31, 32, 33, 34, 35, 36, 37, 38, 39]),  
 array([53, 56, 59, 62, 65, 68, 71, 74, 77]),  
 array([61, 62, 63, 64, 65, 66, 67, 68, 69]),  
 array([96, 98, 90, 95, 95, 84, 84, 94, 91]),  
 array([23, 39, 22, 18, 17, 27, 13, 28, 32]),  
 [-9, -10, -5, -4, -3, -32, -45, -60, -9])

In [174]: plt.subplot(2,3,1)
plt.scatter(x,y1,marker = '+',c = 'blue',s=600)
plt.title("A Scatter Plot")
plt.xlabel("X-axis")
plt.ylabel("Y-axis")
plt.grid(True)
plt.subplot(2,3,2)
plt.scatter(x,y2,marker = '\*',c = 'pink',s=200)
plt.title("A Scatter Plot")
plt.xlabel("X-axis")
plt.ylabel("Y-axis")
plt.grid(False)
plt.subplot(2,3,3)
plt.scatter(x,y3,marker = '.',c = 'green',s=300)
plt.title("A Scatter Plot")
plt.xlabel("X-axis")
plt.ylabel("Y-axis")
plt.grid()
plt.subplot(2,3,4)
plt.scatter(x,y4,marker = '+',c = 'indigo',s=400)
plt.title("A Scatter Plot")
plt.xlabel("X-axis")
plt.ylabel("Y-axis")
plt.grid(False)

```
plt.subplot(2,3,5)
plt.scatter(x,y5,marker = '*',c = 'orange',s=500)
plt.title("A Scatter Plot")
plt.xlabel("X-axis")
plt.ylabel("Y-axis")
plt.grid()
plt.subplot(2,3,6)
plt.scatter(x,y6,marker = '.',c = 'violet',s=450)
plt.title("A Scatter Plot")
plt.xlabel("X-axis")
plt.ylabel("Y-axis")
plt.grid(False)
plt.show()
```



In [175]: #Example-03:

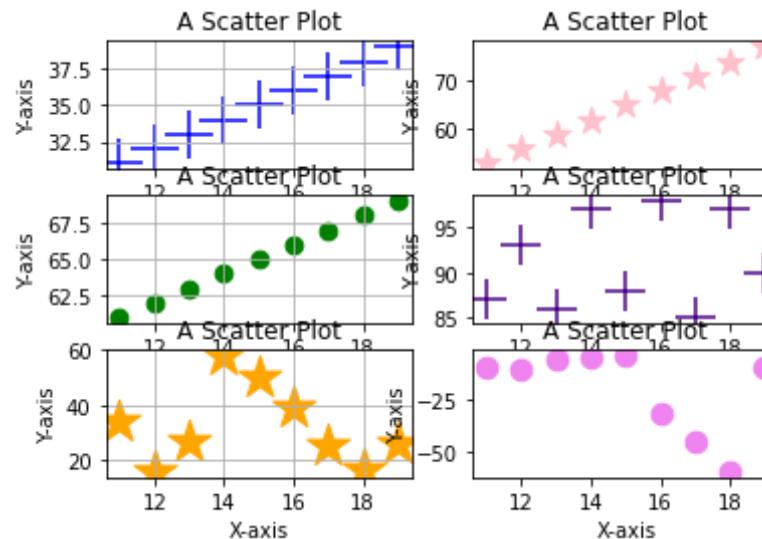
```
x = np.arange(11,20)
y1 = np.arange(31,40)
y2 = x*2 + y1
y3 = np.arange(61,70)
y4 = np.random.randint(80,100,9)
y5 = np.random.randint(4,65,9)
```

```
y6 = [-9,-10,-5,-4,-3,-32,-45,-60,-9]
x,y1,y2,y3,y4,y5,y6
```

```
Out[176]: (array([11, 12, 13, 14, 15, 16, 17, 18, 19]),
 array([31, 32, 33, 34, 35, 36, 37, 38, 39]),
 array([53, 56, 59, 62, 65, 68, 71, 74, 77]),
 array([61, 62, 63, 64, 65, 66, 67, 68, 69]),
 array([87, 93, 86, 97, 88, 98, 85, 97, 90]),
 array([34, 16, 27, 58, 50, 39, 25, 17, 26]),
 [-9, -10, -5, -4, -3, -32, -45, -60, -9])
```

```
In [177]: plt.subplot(3,2,1)
plt.scatter(x,y1,marker = '+',c = 'blue',s=600)
plt.title("A Scatter Plot")
plt.xlabel("X-axis")
plt.ylabel("Y-axis")
plt.grid(True)
plt.subplot(3,2,2)
plt.scatter(x,y2,marker = '*',c = 'pink',s=200)
plt.title("A Scatter Plot")
plt.xlabel("X-axis")
plt.ylabel("Y-axis")
plt.grid(False)
plt.subplot(3,2,3)
plt.scatter(x,y3,marker = '.',c = 'green',s=300)
plt.title("A Scatter Plot")
plt.xlabel("X-axis")
plt.ylabel("Y-axis")
plt.grid()
plt.subplot(3,2,4)
plt.scatter(x,y4,marker = '+',c = 'indigo',s=400)
plt.title("A Scatter Plot")
plt.xlabel("X-axis")
plt.ylabel("Y-axis")
plt.grid(False)
plt.subplot(3,2,5)
plt.scatter(x,y5,marker = '*',c = 'orange',s=500)
plt.title("A Scatter Plot")
plt.xlabel("X-axis")
```

```
plt.ylabel("Y-axis")
plt.grid()
plt.subplot(3,2,6)
plt.scatter(x,y6,marker = '.',c = 'violet',s=450)
plt.title("A Scatter Plot")
plt.xlabel("X-axis")
plt.ylabel("Y-axis")
plt.grid(False)
plt.show()
```



In [178]: #Example-04:

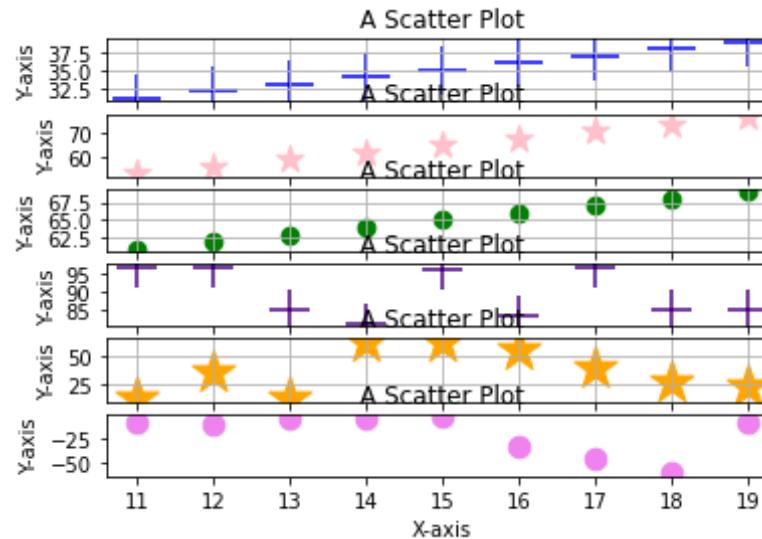
```
x = np.arange(11,20)
y1 = np.arange(31,40)
y2 = x*2 + y1
y3 = np.arange(61,70)
y4 = np.random.randint(80,100,9)
y5 = np.random.randint(4,65,9)
y6 = [-9,-10,-5,-4,-3,-32,-45,-60,-9]
x,y1,y2,y3,y4,y5,y6
```

Out[179]: (array([11, 12, 13, 14, 15, 16, 17, 18, 19]),

```
array([31, 32, 33, 34, 35, 36, 37, 38, 39]),  
array([53, 56, 59, 62, 65, 68, 71, 74, 77]),  
array([61, 62, 63, 64, 65, 66, 67, 68, 69]),  
array([97, 97, 85, 81, 96, 83, 97, 85, 85]),  
array([14, 37, 13, 62, 63, 55, 39, 28, 23]),  
[-9, -10, -5, -4, -3, -32, -45, -60, -9])
```

```
In [180]: plt.subplot(6,1,1)  
plt.scatter(x,y1,marker = '+',c = 'blue',s=600)  
plt.title("A Scatter Plot")  
plt.xlabel("X-axis")  
plt.ylabel("Y-axis")  
plt.grid(True)  
plt.subplot(6,1,2)  
plt.scatter(x,y2,marker = '*',c = 'pink',s=200)  
plt.title("A Scatter Plot")  
plt.xlabel("X-axis")  
plt.ylabel("Y-axis")  
plt.grid(False)  
plt.subplot(6,1,3)  
plt.scatter(x,y3,marker = '.',c = 'green',s=300)  
plt.title("A Scatter Plot")  
plt.xlabel("X-axis")  
plt.ylabel("Y-axis")  
plt.grid()  
plt.subplot(6,1,4)  
plt.scatter(x,y4,marker = '+',c = 'indigo',s=400)  
plt.title("A Scatter Plot")  
plt.xlabel("X-axis")  
plt.ylabel("Y-axis")  
plt.grid(False)  
plt.subplot(6,1,5)  
plt.scatter(x,y5,marker = '*',c = 'orange',s=500)  
plt.title("A Scatter Plot")  
plt.xlabel("X-axis")  
plt.ylabel("Y-axis")  
plt.grid()  
plt.subplot(6,1,6)  
plt.scatter(x,y6,marker = '.',c = 'violet',s=450)
```

```
plt.title("A Scatter Plot")
plt.xlabel("X-axis")
plt.ylabel("Y-axis")
plt.grid(False)
plt.show()
```



In [181]: `#d.Histogram:`

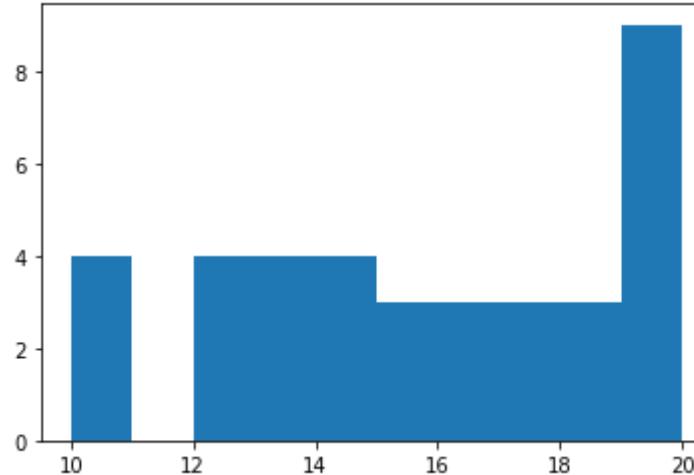
In [182]: `#Example-01:`

In [183]: `data = [10,12,12,12,10,13,14,15,12,13,14,14,14,14,15,10,16,17,18,17,19,17,19,15,13,10,16,18,19,13,16,18,19,19,20,20,20,20]`  
data

Out[183]: `[10,
 12,
 12,
 12,
 10,
 13,
 14,`

```
15,  
12,  
13,  
14,  
14,  
14,  
15,  
10,  
16,  
17,  
18,  
17,  
19,  
17,  
19,  
15,  
13,  
10,  
16,  
18,  
19,  
13,  
16,  
18,  
19,  
19,  
20,  
20,  
20,  
20]
```

In [184]: `plt.hist(data)  
plt.show()`



```
In [185]: #Example-02:
```

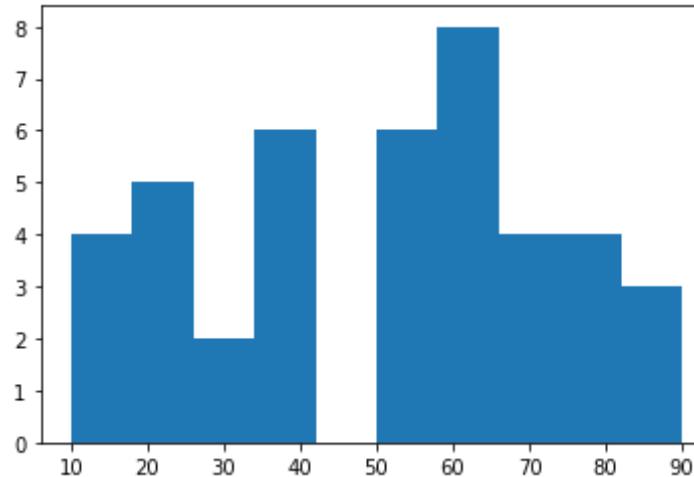
```
In [186]: data = [10,20,30,40,50,60,70,80,90,90,90,90,10,20,30,20,20,20,10,10,40,50,  
40,40,40,50,70,60,50,80,80,70,60,70,60,60,60,60,50,50]
```

```
In [187]: data
```

```
Out[187]: [10,  
 20,  
 30,  
 40,  
 50,  
 60,  
 70,  
 80,  
 90,  
 90,  
 90,  
 10,  
 20,  
 30,  
 20,  
 20,
```

```
20,  
10,  
10,  
40,  
50,  
40,  
40,  
40,  
40,  
50,  
70,  
60,  
50,  
80,  
80,  
80,  
70,  
60,  
70,  
60,  
60,  
60,  
60,  
60,  
50,  
50]
```

In [188]: `plt.hist(data)  
plt.show()`



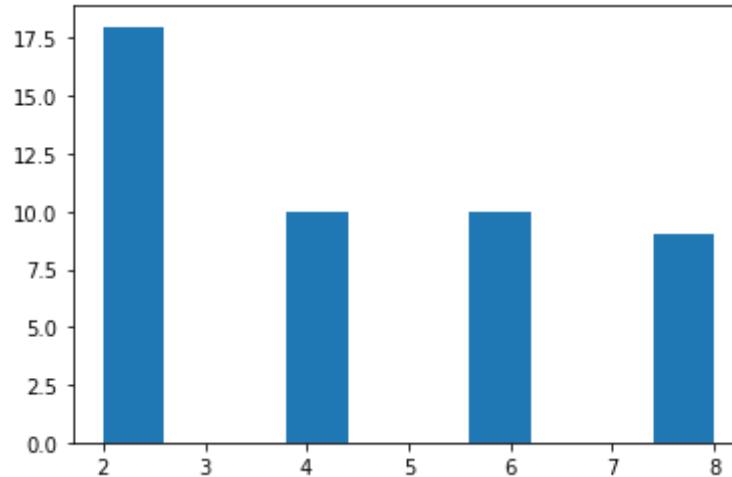
In [189]: #Example-03:

In [190]: data = [2,4,6,8,2,2,2,2,2,2,2,2,2,2,2,4,4,4,4,4,4,6,6,6,6,6,2,2,2,2,2,2,8,8,8,8,6,6,6,8,8,4,4,4,2,2,2,4]  
data

Out[190]: [2,  
4,  
6,  
8,  
2,  
2,  
2,  
2,  
2,  
2,  
2,  
2,  
2,  
2,  
4,  
4,  
4,  
4,

```
4,  
6,  
6,  
6,  
6,  
6,  
6,  
2,  
2,  
2,  
2,  
2,  
8,  
8,  
8,  
8,  
8,  
6,  
6,  
6,  
6,  
8,  
8,  
8,  
8,  
4,  
4,  
4,  
2,  
2,  
2,  
4]
```

In [191]: `plt.hist(data)  
plt.show()`



```
In [192]: #d.(i). Changing the aesthetics:
```

```
In [193]: #Example-01:
```

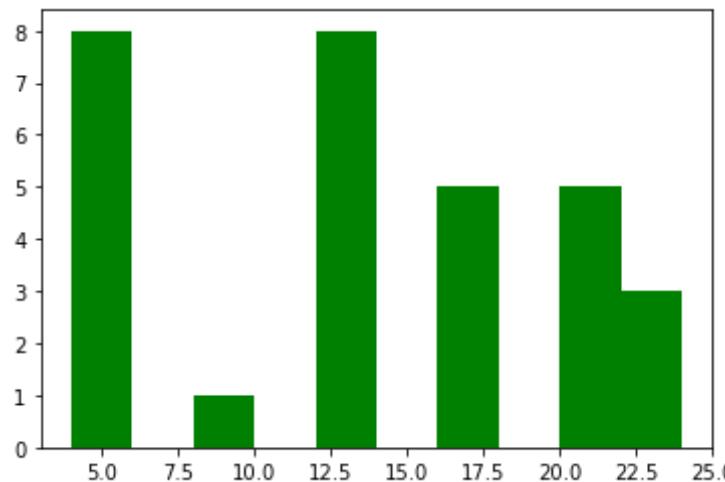
```
In [194]: data = [4,8,12,16,20,24,4,4,4,4,4,4,4,12,12,12,12,12,12,16,16,16,20,20,20,24,24]
data
```

```
Out[194]: [4,
           8,
           12,
           16,
           20,
           24,
           4,
           4,
           4,
           4,
           4,
           4,
           4,
           4,
           12,
           12,
           --]
```

```
12,  
12,  
12,  
12,  
12,  
16,  
16,  
16,  
16,  
20,  
20,  
20,  
20,  
24,  
24]
```

```
In [195]: plt.hist(data,color='g')
```

```
Out[195]: (array([8., 0., 1., 0., 8., 0., 5., 0., 5., 3.]),  
 array([ 4.,  6.,  8., 10., 12., 14., 16., 18., 20., 22., 24.]),  
 <a list of 10 Patch objects>)
```

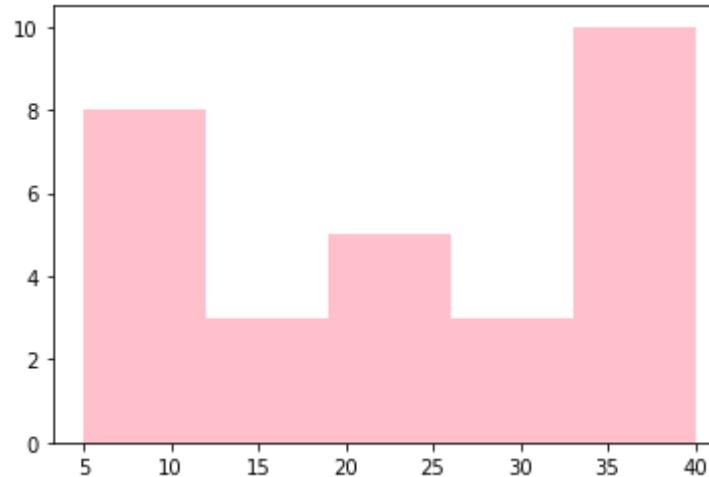


```
In [196]: #Example-02:
```

```
In [197]: data = [5,10,15,20,25,30,35,40,5,5,5,5,25,25,25,10,10,15,15,30,30,35,35  
,35,40,40,40,40,40]  
data
```

```
Out[197]: [5,  
 10,  
 15,  
 20,  
 25,  
 30,  
 35,  
 40,  
 5,  
 5,  
 5,  
 5,  
 25,  
 25,  
 25,  
 10,  
 10,  
 15,  
 15,  
 30,  
 30,  
 35,  
 35,  
 35,  
 40,  
 40,  
 40,  
 40]
```

```
In [198]: plt.hist(data,color = 'pink',bins = 5)  
plt.show()
```



```
In [199]: #Example-03:
```

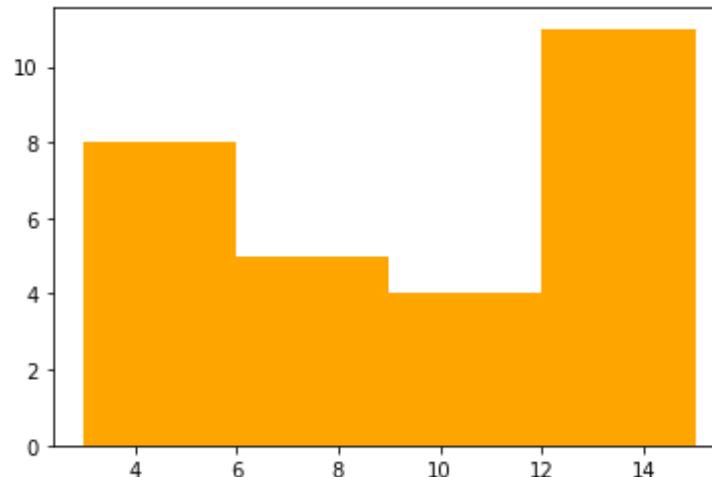
```
In [200]: data = [3,3,3,3,3,3,3,3,6,6,6,6,6,9,9,9,9,12,12,12,12,12,12,15,15,15,15,15]
```

```
In [201]: data
```

```
Out[201]: [3,  
 3,  
 3,  
 3,  
 3,  
 3,  
 3,  
 3,  
 6,  
 6,  
 6,  
 6,  
 6,  
 9,  
 9,  
 9,  
 9,
```

```
9,  
12,  
12,  
12,  
12,  
12,  
12,  
15,  
15,  
15,  
15,  
15]
```

```
In [202]: plt.hist(data,color='orange',bins=4)  
plt.show()
```



```
In [203]: #d.(ii). Adding subplots to histogram plots:
```

```
In [204]: #Example-01:
```

```
In [205]: data1 = [10,12,12,12,10,13,14,15,12,13,14,14,14,15,10,16,17,18,17,19,17  
,19,15,13,10,16,18,19,13,16,18,19,19,20,20,20,20]
```

```
data2 = [10,20,30,40,50,60,70,80,90,90,10,20,30,20,10,10,40,50,40,40,40,50,70,60,50,80,80,80,70,60,70,60,60,60,60,60,50,50]
data3 = [3,3,3,3,3,3,3,6,6,6,6,9,9,9,9,12,12,12,12,12,15,15,15,15,15]
data4 = [5,10,15,20,25,30,35,40,5,5,5,5,25,25,25,10,10,15,15,30,30,35,35,40,40,40,40]
data1,data2,data3,data4
```

Out[205]: ([10,

12,

12,

12,

10,

13,

14,

15,

12,

13,

14,

14,

14,

15,

10,

16,

17,

18,

17,

19,

17,

19,

15,

13,

10,

16,

18,

19,

13,

16,

18,

19,

--

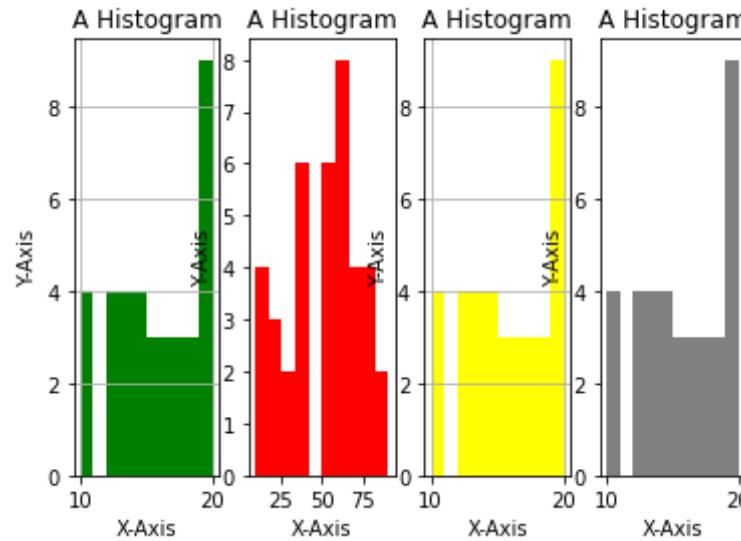
```
19,  
20,  
20,  
20,  
20],  
[10,  
20,  
30,  
40,  
50,  
60,  
70,  
80,  
90,  
90,  
10,  
20,  
30,  
20,  
10,  
10,  
40,  
50,  
40,  
40,  
40,  
40,  
50,  
70,  
60,  
50,  
80,  
80,  
80,  
70,  
60,  
70,  
60,  
60,  
60,  
--
```

```
60,  
60,  
50,  
50],  
[3,  
3,  
3,  
3,  
3,  
3,  
3,  
3,  
6,  
6,  
6,  
6,  
6,  
9,  
9,  
9,  
9,  
9,  
12,  
12,  
12,  
12,  
12,  
12,  
15,  
15,  
15,  
15,  
15],  
[5,  
10,  
15,  
20,  
25,  
30,  
35,  
40,  
-
```

```
5,  
5,  
5,  
5,  
25,  
25,  
25,  
10,  
10,  
15,  
15,  
30,  
30,  
35,  
35,  
35,  
40,  
40,  
40,  
40,  
40])
```

```
In [206]: plt.subplot(1,4,1)  
plt.hist(data1,color = 'g')  
plt.title('A Histogram')  
plt.xlabel("X-Axis")  
plt.ylabel("Y-Axis")  
plt.grid(True)  
plt.subplot(1,4,2)  
plt.hist(data2,color = 'r')  
plt.title('A Histogram')  
plt.xlabel("X-Axis")  
plt.ylabel("Y-Axis")  
plt.grid(False)  
plt.subplot(1,4,3)  
plt.hist(data1,color = 'yellow')  
plt.title('A Histogram')  
plt.xlabel("X-Axis")  
plt.ylabel("Y-Axis")
```

```
plt.grid(True)
plt.subplot(1,4,1)
plt.hist(data1,color = 'grey')
plt.title('A Histogram')
plt.xlabel("X-Axis")
plt.ylabel("Y-Axis")
plt.grid(False)
plt.show()
```



In [207]: #Example-02:

In [208]: data1,data2,data3,data4

Out[208]: ([10,  
 12,  
 12,  
 12,  
 10,  
 13,  
 14,  
 15,  
 12,

```
13,  
14,  
14,  
14,  
15,  
10,  
16,  
17,  
18,  
17,  
19,  
17,  
19,  
15,  
13,  
10,  
16,  
18,  
19,  
13,  
16,  
18,  
19,  
19,  
20,  
20,  
20,  
20],  
[10,  
20,  
30,  
40,  
50,  
60,  
70,  
80,  
90,  
90,  
10,  
20,
```

```
30,  
20,  
10,  
10,  
40,  
50,  
40,  
40,  
40,  
40,  
50,  
70,  
60,  
50,  
80,  
80,  
80,  
70,  
60,  
70,  
60,  
60,  
60,  
60,  
60,  
50,  
50],  
[3,  
3,  
3,  
3,  
3,  
3,  
3,  
3,  
3,  
6,  
6,  
6,  
6,  
6,
```

```
9,  
9,  
9,  
9,  
12,  
12,  
12,  
12,  
12,  
12,  
15,  
15,  
15,  
15,  
15],  
[5,  
10,  
15,  
20,  
25,  
30,  
35,  
40,  
5,  
5,  
5,  
5,  
25,  
25,  
25,  
10,  
10,  
15,  
15,  
30,  
30,  
35,  
35,  
35,  
40,
```

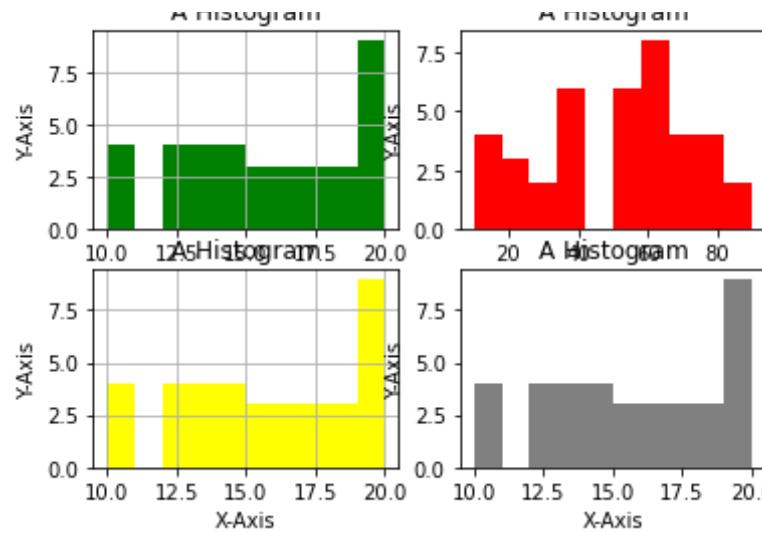
```
40,  
40,  
40,  
40])
```

In [209]:

```
plt.subplot(2,2,1)  
plt.hist(data1,color = 'g')  
plt.title('A Histogram')  
plt.xlabel("X-Axis")  
plt.ylabel("Y-Axis")  
plt.grid(True)  
plt.subplot(2,2,2)  
plt.hist(data2,color = 'r')  
plt.title('A Histogram')  
plt.xlabel("X-Axis")  
plt.ylabel("Y-Axis")  
plt.grid(False)  
plt.subplot(2,2,3)  
plt.hist(data1,color = 'yellow')  
plt.title('A Histogram')  
plt.xlabel("X-Axis")  
plt.ylabel("Y-Axis")  
plt.grid(True)  
plt.subplot(2,2,4)  
plt.hist(data1,color = 'grey')  
plt.title('A Histogram')  
plt.xlabel("X-Axis")  
plt.ylabel("Y-Axis")  
plt.grid(False)  
plt.show()
```

A Histogram

A Histogram



```
In [210]: ##example-03:
```

```
In [211]: data1,data2,data3,data4
```

```
Out[211]: ([10,  
 12,  
 12,  
 12,  
 10,  
 13,  
 14,  
 15,  
 12,  
 13,  
 14,  
 14,  
 14,  
 15,  
 10,  
 16,  
 17,  
 18,
```

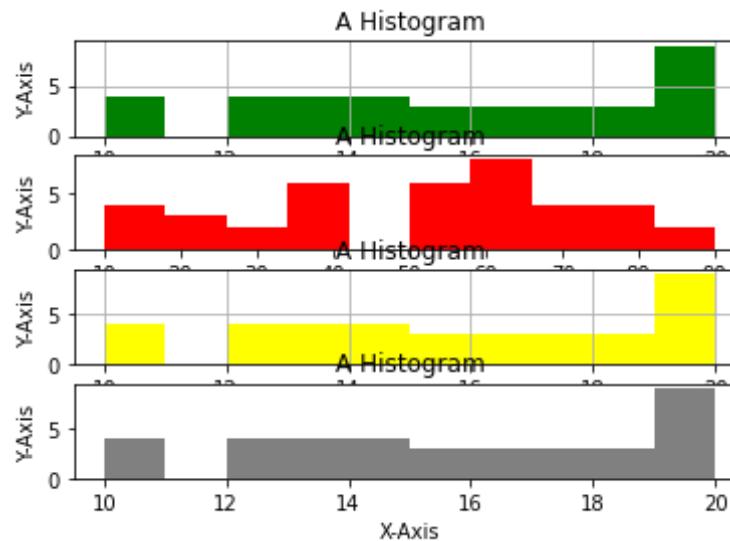
```
17,  
19,  
17,  
19,  
15,  
13,  
10,  
16,  
18,  
19,  
13,  
16,  
18,  
19,  
19,  
20,  
20,  
20,  
20],  
[10,  
20,  
30,  
40,  
50,  
60,  
70,  
80,  
90,  
90,  
10,  
20,  
30,  
20,  
10,  
10,  
40,  
50,  
40,  
40,  
40,
```

```
40,  
50,  
70,  
60,  
50,  
80,  
80,  
80,  
70,  
60,  
70,  
60,  
60,  
60,  
60,  
60,  
50,  
50],  
[3,  
3,  
3,  
3,  
3,  
3,  
3,  
3,  
3,  
6,  
6,  
6,  
6,  
6,  
9,  
9,  
9,  
9,  
12,  
12,  
12,  
12,  
12,
```

```
12,  
15,  
15,  
15,  
15,  
15,  
15],  
[5,  
10,  
15,  
20,  
25,  
30,  
35,  
40,  
5,  
5,  
5,  
5,  
25,  
25,  
25,  
10,  
10,  
15,  
15,  
30,  
30,  
35,  
35,  
35,  
40,  
40,  
40,  
40,  
40])
```

```
In [212]: plt.subplot(4,1,1)  
plt.hist(data1,color = 'g')  
plt.title('A Histogram')
```

```
plt.xlabel("X-Axis")
plt.ylabel("Y-Axis")
plt.grid(True)
plt.subplot(4,1,2)
plt.hist(data2,color = 'r')
plt.title('A Histogram')
plt.xlabel("X-Axis")
plt.ylabel("Y-Axis")
plt.grid(False)
plt.subplot(4,1,3)
plt.hist(data1,color = 'yellow')
plt.title('A Histogram')
plt.xlabel("X-Axis")
plt.ylabel("Y-Axis")
plt.grid(True)
plt.subplot(4,1,4)
plt.hist(data1,color = 'grey')
plt.title('A Histogram')
plt.xlabel("X-Axis")
plt.ylabel("Y-Axis")
plt.grid(False)
plt.show()
```



```
In [213]: #d.(iii). Working with 'iris' data set:
```

```
In [214]: pwd
```

```
Out[214]: 'C:\\\\Users\\\\Badshah'
```

```
In [215]: import pandas as pd
```

```
In [216]: iris = pd.read_csv('iris.csv')
iris
```

```
Out[216]:
```

	sepal_length	sepal_width	petal_length	petal_width	species
0	5.1	3.5	1.4	0.2	setosa
1	4.9	3.0	1.4	0.2	setosa
2	4.7	3.2	1.3	0.2	setosa
3	4.6	3.1	1.5	0.2	setosa
4	5.0	3.6	1.4	0.2	setosa
...	...	...	...	...	...
145	6.7	3.0	5.2	2.3	virginica
146	6.3	2.5	5.0	1.9	virginica
147	6.5	3.0	5.2	2.0	virginica
148	6.2	3.4	5.4	2.3	virginica
149	5.9	3.0	5.1	1.8	virginica

150 rows × 5 columns

```
In [217]: iris.head()
```

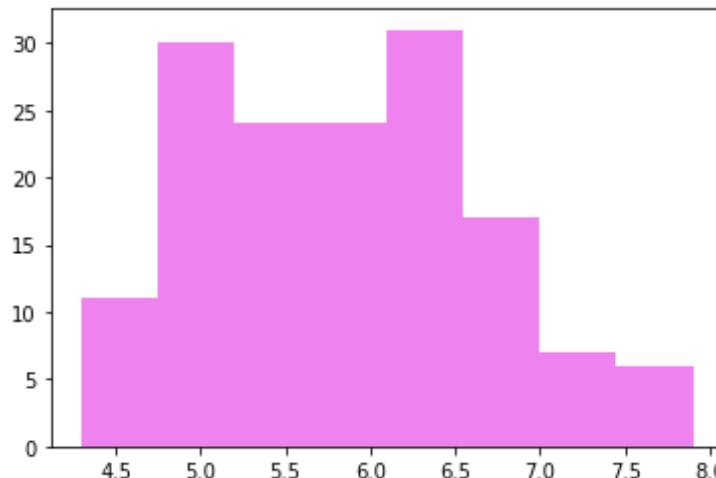
```
Out[217]:
```

sepal_length	sepal_width	petal_length	petal_width	species
--------------	-------------	--------------	-------------	---------

	sepal_length	sepal_width	petal_length	petal_width	species
0	5.1	3.5	1.4	0.2	setosa
1	4.9	3.0	1.4	0.2	setosa
2	4.7	3.2	1.3	0.2	setosa
3	4.6	3.1	1.5	0.2	setosa
4	5.0	3.6	1.4	0.2	setosa

In [218]: #Example-01:

In [219]: plt.hist(iris['sepal\_length'], color = 'violet', bins = 8)  
plt.show()



In [220]: #Example-02:

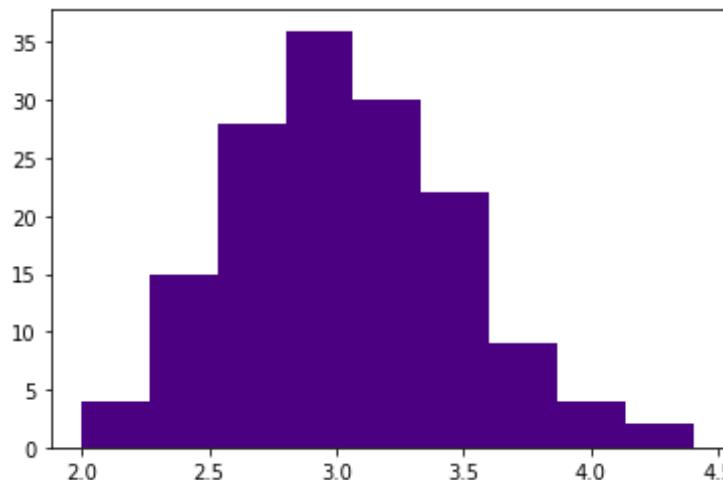
In [221]: iris.head()

Out[221]:

	sepal_length	sepal_width	petal_length	petal_width	species
0	5.1	3.5	1.4	0.2	setosa

	sepal_length	sepal_width	petal_length	petal_width	species
1	4.9	3.0	1.4	0.2	setosa
2	4.7	3.2	1.3	0.2	setosa
3	4.6	3.1	1.5	0.2	setosa
4	5.0	3.6	1.4	0.2	setosa

```
In [222]: plt.hist(iris['sepal_width'], color ='indigo', bins=9)  
plt.show()
```



```
In [223]: #Example-03:
```

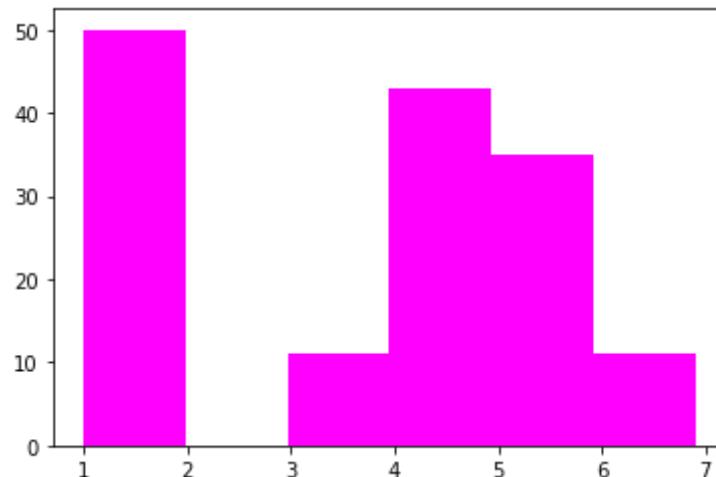
```
In [224]: iris.head()
```

Out[224]:

	sepal_length	sepal_width	petal_length	petal_width	species
0	5.1	3.5	1.4	0.2	setosa
1	4.9	3.0	1.4	0.2	setosa
2	4.7	3.2	1.3	0.2	setosa

	sepal_length	sepal_width	petal_length	petal_width	species
3	4.6	3.1	1.5	0.2	setosa
4	5.0	3.6	1.4	0.2	setosa

```
In [225]: plt.hist(iris['petal_length'],color='magenta',bins=6)
plt.show()
```



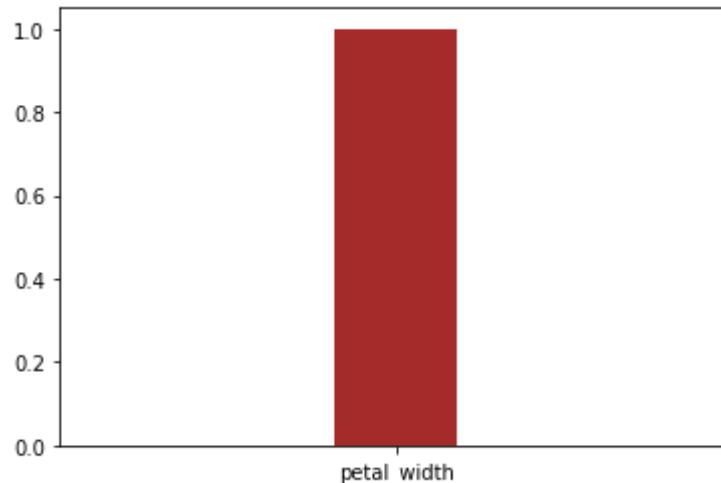
```
In [226]: #Example-03:
```

```
In [227]: iris.head()
```

Out[227]:

	sepal_length	sepal_width	petal_length	petal_width	species
0	5.1	3.5	1.4	0.2	setosa
1	4.9	3.0	1.4	0.2	setosa
2	4.7	3.2	1.3	0.2	setosa
3	4.6	3.1	1.5	0.2	setosa
4	5.0	3.6	1.4	0.2	setosa

```
In [228]: plt.hist(['petal_width'],color = 'brown',bins =5)  
plt.show()
```



```
In [229]: iris.sort_values('petal_width')
```

Out[229]:

	sepal_length	sepal_width	petal_length	petal_width	species
32	5.2	4.1	1.5	0.1	setosa
13	4.3	3.0	1.1	0.1	setosa
37	4.9	3.6	1.4	0.1	setosa
9	4.9	3.1	1.5	0.1	setosa
12	4.8	3.0	1.4	0.1	setosa
...	...	...	...	...	...
140	6.7	3.1	5.6	2.4	virginica
114	5.8	2.8	5.1	2.4	virginica
100	6.3	3.3	6.0	2.5	virginica
144	6.7	3.3	5.7	2.5	virginica
109	7.2	3.6	6.1	2.5	virginica

150 rows × 5 columns

In [230]: `iris.sort_values(by = 'petal_width')`

Out[230]:

	sepal_length	sepal_width	petal_length	petal_width	species
32	5.2	4.1	1.5	0.1	setosa
13	4.3	3.0	1.1	0.1	setosa
37	4.9	3.6	1.4	0.1	setosa
9	4.9	3.1	1.5	0.1	setosa
12	4.8	3.0	1.4	0.1	setosa
...	...	...	...	...	...
140	6.7	3.1	5.6	2.4	virginica
114	5.8	2.8	5.1	2.4	virginica
100	6.3	3.3	6.0	2.5	virginica
144	6.7	3.3	5.7	2.5	virginica
109	7.2	3.6	6.1	2.5	virginica

150 rows × 5 columns

In [231]: `#Example - 05:`

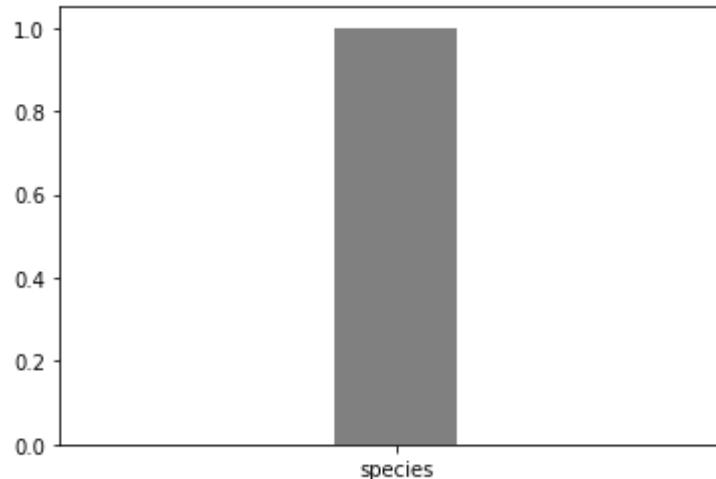
In [232]: `iris.head()`

Out[232]:

	sepal_length	sepal_width	petal_length	petal_width	species
0	5.1	3.5	1.4	0.2	setosa
1	4.9	3.0	1.4	0.2	setosa
2	4.7	3.2	1.3	0.2	setosa
3	4.6	3.1	1.5	0.2	setosa

	sepal_length	sepal_width	petal_length	petal_width	species
4	5.0	3.6	1.4	0.2	setosa

```
In [233]: plt.hist(['species'],color = 'grey',bins =5)
plt.show()
```

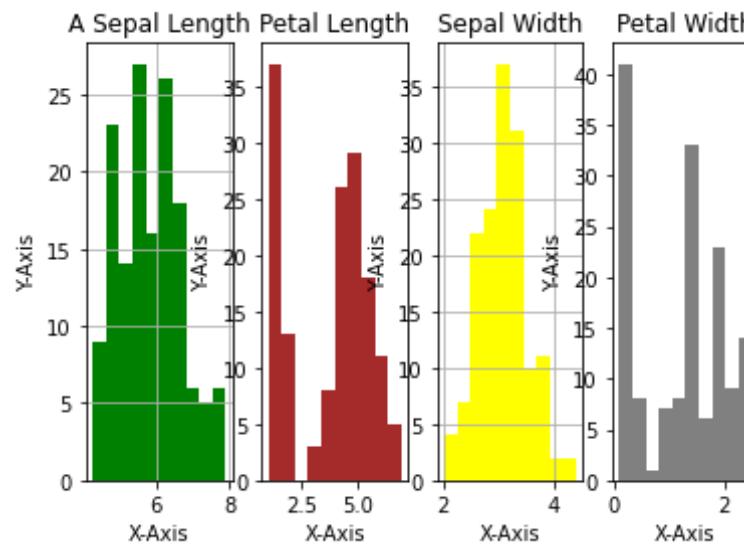


```
In [234]: #d.(iv).Adding subplots to iris data set:
```

```
In [235]: #Example-01:
```

```
In [236]: plt.subplot(1,4,1)
plt.hist(iris["sepal_length"],color = 'g')
plt.title('A Sepal Length')
plt.xlabel("X-Axis")
plt.ylabel("Y-Axis")
plt.grid(True)
plt.subplot(1,4,2)
plt.hist(iris["petal_length"],color = 'brown')
plt.title('Petal Length')
plt.xlabel("X-Axis")
plt.ylabel("Y-Axis")
```

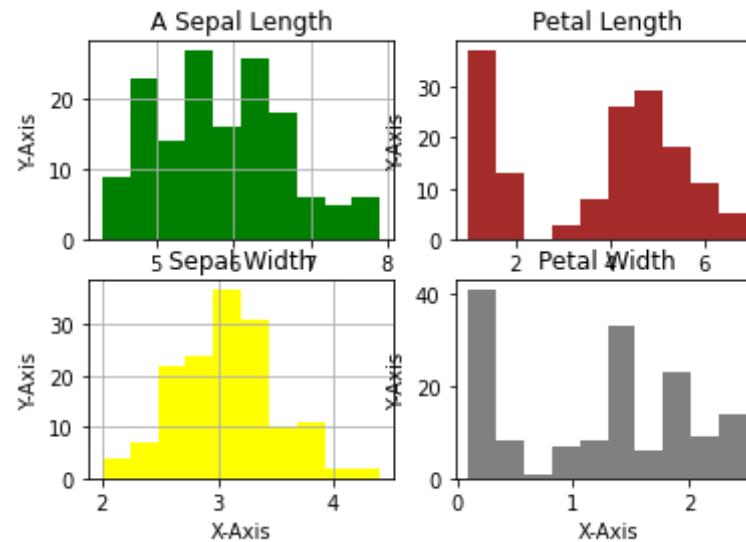
```
plt.grid(False)
plt.subplot(1,4,3)
plt.hist(iris["sepal_width"],color = 'yellow')
plt.title('Sepal Width')
plt.xlabel("X-Axis")
plt.ylabel("Y-Axis")
plt.grid(True)
plt.subplot(1,4,4)
plt.hist(iris["petal_width"],color = 'grey')
plt.title('Petal Width')
plt.xlabel("X-Axis")
plt.ylabel("Y-Axis")
plt.grid(False)
plt.show()
```



In [237]: #Example-02:

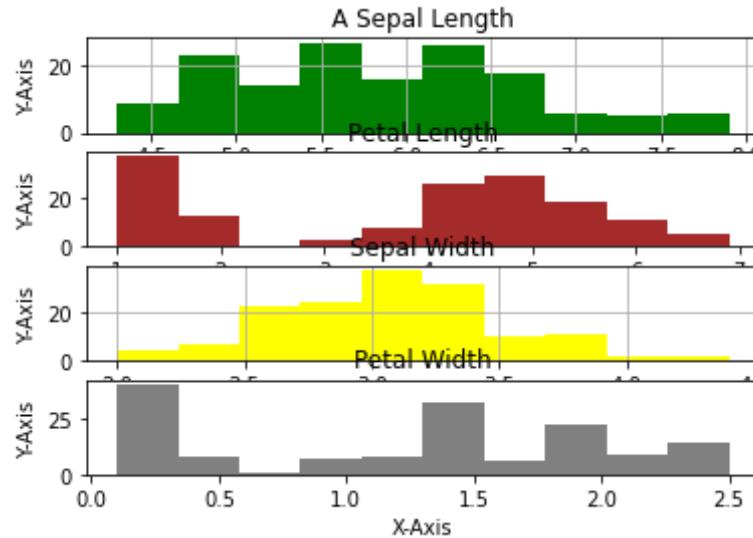
```
In [238]: plt.subplot(2,2,1)
plt.hist(iris["sepal_length"],color = 'g')
plt.title('A Sepal Length')
plt.xlabel("X-Axis")
plt.ylabel("Y-Axis")
```

```
plt.grid(True)
plt.subplot(2,2,2)
plt.hist(iris["petal_length"],color = 'brown')
plt.title('Petal Length')
plt.xlabel("X-Axis")
plt.ylabel("Y-Axis")
plt.grid(False)
plt.subplot(2,2,3)
plt.hist(iris["sepal_width"],color = 'yellow')
plt.title('Sepal Width')
plt.xlabel("X-Axis")
plt.ylabel("Y-Axis")
plt.grid(True)
plt.subplot(2,2,4)
plt.hist(iris["petal_width"],color = 'grey')
plt.title('Petal Width')
plt.xlabel("X-Axis")
plt.ylabel("Y-Axis")
plt.grid(False)
plt.show()
```



In [239]: #Example-03:

```
In [240]: plt.subplot(4,1,1)
plt.hist(iris["sepal_length"],color = 'g')
plt.title('A Sepal Length')
plt.xlabel("X-Axis")
plt.ylabel("Y-Axis")
plt.grid(True)
plt.subplot(4,1,2)
plt.hist(iris["petal_length"],color = 'brown')
plt.title('Petal Length')
plt.xlabel("X-Axis")
plt.ylabel("Y-Axis")
plt.grid(False)
plt.subplot(4,1,3)
plt.hist(iris["sepal_width"],color = 'yellow')
plt.title('Sepal Width')
plt.xlabel("X-Axis")
plt.ylabel("Y-Axis")
plt.grid(True)
plt.subplot(4,1,4)
plt.hist(iris["petal_width"],color = 'grey')
plt.title('Petal Width')
plt.xlabel("X-Axis")
plt.ylabel("Y-Axis")
plt.grid(False)
plt.show()
```



```
In [241]: #e.Box-Plot:
```

```
In [242]: #Example-01:
```

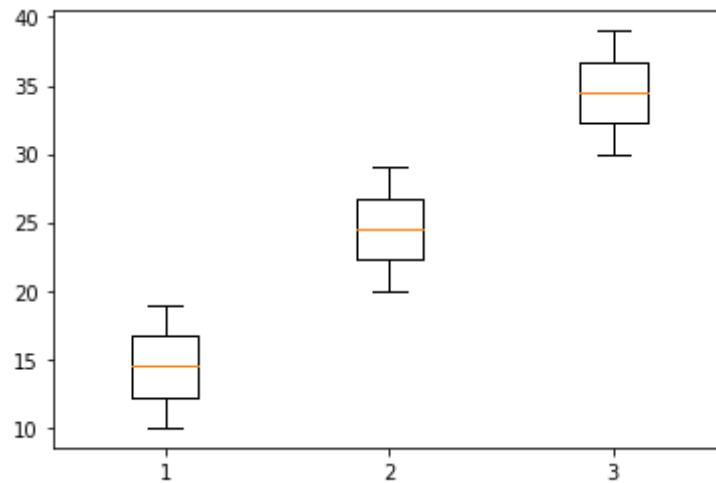
```
In [243]: l1 = np.arange(10,20)
l2 = np.arange(20,30)
l3 = np.arange(30,40)
```

```
In [244]: l1,l2,l3
```

```
Out[244]: (array([10, 11, 12, 13, 14, 15, 16, 17, 18, 19]),
            array([20, 21, 22, 23, 24, 25, 26, 27, 28, 29]),
            array([30, 31, 32, 33, 34, 35, 36, 37, 38, 39]))
```

```
In [245]: data = (l1,l2,l3)
```

```
In [246]: plt.boxplot(data)
plt.show()
```



```
In [247]: #Example-02:
```

```
In [248]: l1 = np.arange(5,50,3)
l2 = np.arange(8,80,3)
l3 = np.arange(6,60,3)
l4 = np.arange(7,70,3)
```

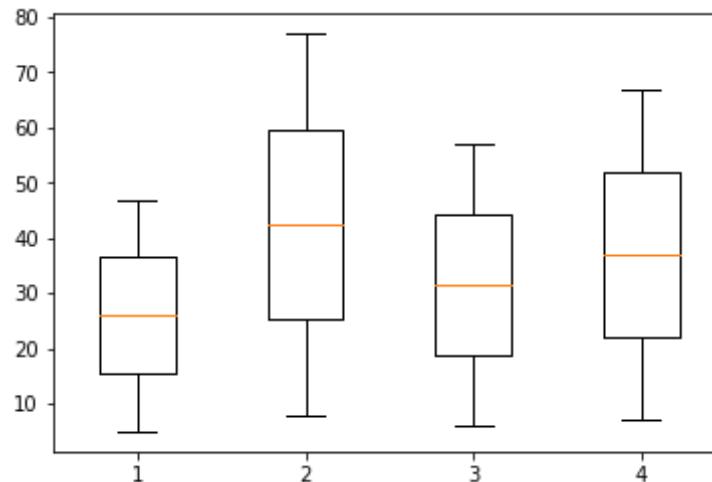
```
In [249]: l1,l2,l3,l4
```

```
Out[249]: (array([ 5,  8, 11, 14, 17, 20, 23, 26, 29, 32, 35, 38, 41, 44, 47]),
 array([ 8, 11, 14, 17, 20, 23, 26, 29, 32, 35, 38, 41, 44, 47, 50, 53,
 56,
 59, 62, 65, 68, 71, 74, 77]),
 array([ 6,  9, 12, 15, 18, 21, 24, 27, 30, 33, 36, 39, 42, 45, 48, 51,
 54,
 57]),
 array([ 7, 10, 13, 16, 19, 22, 25, 28, 31, 34, 37, 40, 43, 46, 49, 52,
 55,
 58, 61, 64, 67]))
```

```
In [250]: data = (l1,l2,l3,l4)
data
```

```
Out[250]: (array([ 5,  8, 11, 14, 17, 20, 23, 26, 29, 32, 35, 38, 41, 44, 47]),  
 array([ 8, 11, 14, 17, 20, 23, 26, 29, 32, 35, 38, 41, 44, 47, 50, 53,  
 56,  
         59, 62, 65, 68, 71, 74, 77]),  
 array([ 6,  9, 12, 15, 18, 21, 24, 27, 30, 33, 36, 39, 42, 45, 48, 51,  
 54,  
         57]),  
 array([ 7, 10, 13, 16, 19, 22, 25, 28, 31, 34, 37, 40, 43, 46, 49, 52,  
 55,  
         58, 61, 64, 67]))
```

```
In [251]: plt.boxplot(data)  
plt.show()
```



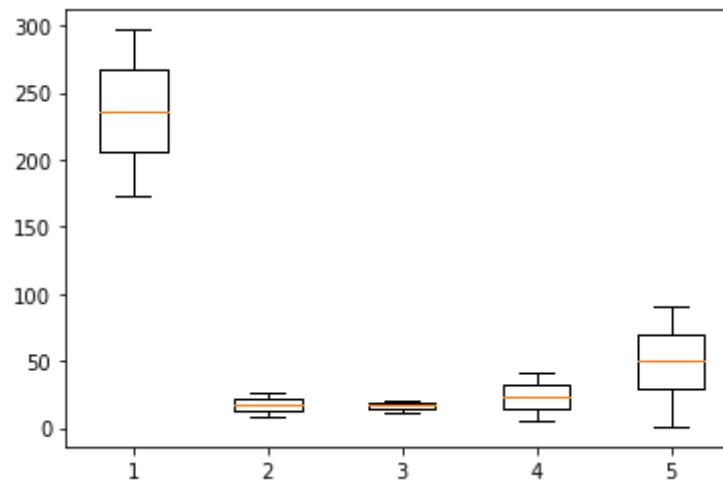
```
In [252]: #Example-03:
```

```
In [253]: l1 = np.random.randint(100,300,8)  
l2 = np.arange(8,28,2)  
l3 = [12,13,14,15,16,17,18,19,19,19,20,20]  
l4 = np.arange(5,45,4)  
l5 = [1,20,30,40,50,60,70,80,90,80,80,50,40,50,40,30,20]  
data = (l1,l2,l3,l4,l5)
```

```
In [254]: data
```

```
Out[254]: (array([247, 173, 226, 260, 297, 183, 287, 213]),  
 array([ 8, 10, 12, 14, 16, 18, 20, 22, 24, 26]),  
 array([12, 13, 14, 15, 16, 17, 18, 19, 19, 19, 20, 20]),  
 array([ 5,  9, 13, 17, 21, 25, 29, 33, 37, 41]),  
 array([1, 20, 30, 40, 50, 60, 70, 80, 90, 80, 80, 50, 40, 50, 40, 30, 20]))
```

```
In [255]: plt.boxplot(data)  
plt.show()
```



```
In [256]: #e.(i).Adding sub-plots to box-plot:
```

```
In [257]: #Example-01:
```

```
In [258]: l1 = np.arange(10,20)  
l2 = np.arange(20,30)  
data1 = (l1,l2,l3)  
data1
```

```
Out[258]: (array([10, 11, 12, 13, 14, 15, 16, 17, 18, 19]),  
 array([20, 21, 22, 23, 24, 25, 26, 27, 28, 29]),
```

```
[12, 13, 14, 15, 16, 17, 18, 19, 19, 19, 20, 20])
```

In [259]:

```
l1 = np.arange(5,50,3)
l2 = np.arange(8,80,3)
l3 = np.arange(6,60,3)
data2 = (l1,l2,l3,l4)
data2
```

Out[259]:

```
(array([ 5,  8, 11, 14, 17, 20, 23, 26, 29, 32, 35, 38, 41, 44, 47]),
 array([ 8, 11, 14, 17, 20, 23, 26, 29, 32, 35, 38, 41, 44, 47, 50, 53,
 56,
 59, 62, 65, 68, 71, 74, 77]),
 array([ 6,  9, 12, 15, 18, 21, 24, 27, 30, 33, 36, 39, 42, 45, 48, 51,
 54,
 57]),
 array([ 5,  9, 13, 17, 21, 25, 29, 33, 37, 41]))
```

In [260]:

```
l1 = np.random.randint(100,300,8)
l2 = np.arange(8,28,2)
l3 = [12,13,14,15,16,17,18,19,19,19,20,20]
l4 = np.arange(5,45,4)
data3 = (l1,l2,l3,l4)
data3
```

Out[260]:

```
(array([197, 243, 237, 248, 197, 159, 179, 192]),
 array([ 8, 10, 12, 14, 16, 18, 20, 22, 24, 26]),
 [12, 13, 14, 15, 16, 17, 18, 19, 19, 19, 20, 20],
 array([ 5,  9, 13, 17, 21, 25, 29, 33, 37, 41]))
```

In [261]:

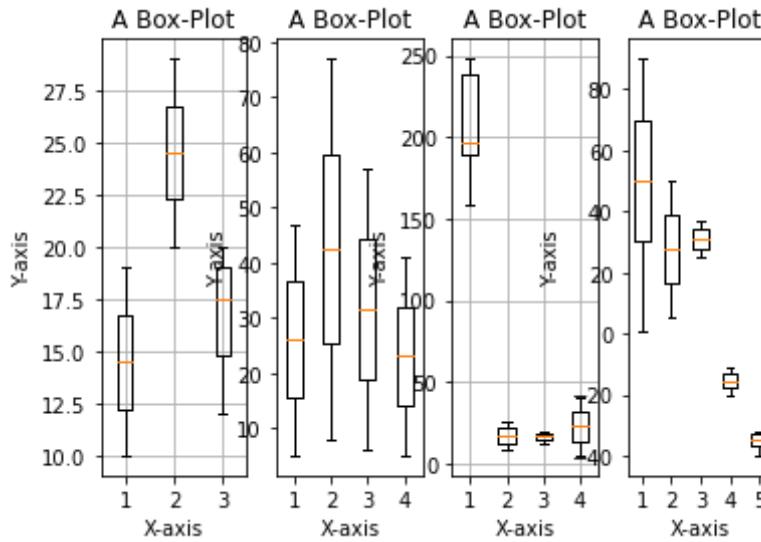
```
l1 = [1,20,30,40,50,60,70,80,90,80,80,50,40,50,40,30,20]
l2 = [5,10,15,20,25,30,35,40,45,50]
l3 = np.arange(25,40,4)
l4 = np.arange(-20,-10)
l5 = np.random.randint(-40,-30,7)
data4 = (l1,l2,l3,l4,l5)
data4
```

Out[261]:

```
([1, 20, 30, 40, 50, 60, 70, 80, 90, 80, 80, 50, 40, 50, 40, 30, 20],
 [5, 10, 15, 20, 25, 30, 35, 40, 45, 50],
```

```
array([25, 29, 33, 37]),  
array([-20, -19, -18, -17, -16, -15, -14, -13, -12, -11]),  
array([-37, -35, -32, -40, -37, -34, -32]))
```

```
In [262]: plt.subplot(1,4,1)  
plt.boxplot(data1)  
plt.title('A Box-Plot')  
plt.xlabel('X-axis')  
plt.ylabel("Y-axis")  
plt.grid(True)  
plt.subplot(1,4,2)  
plt.boxplot(data2)  
plt.title('A Box-Plot')  
plt.xlabel('X-axis')  
plt.ylabel("Y-axis")  
plt.grid(False)  
plt.subplot(1,4,3)  
plt.boxplot(data3)  
plt.title('A Box-Plot')  
plt.xlabel('X-axis')  
plt.ylabel("Y-axis")  
plt.grid(True)  
plt.subplot(1,4,4)  
plt.boxplot(data4)  
plt.title('A Box-Plot')  
plt.xlabel('X-axis')  
plt.ylabel("Y-axis")  
plt.grid(False)  
plt.show()
```



```
In [263]: #Example-02:
```

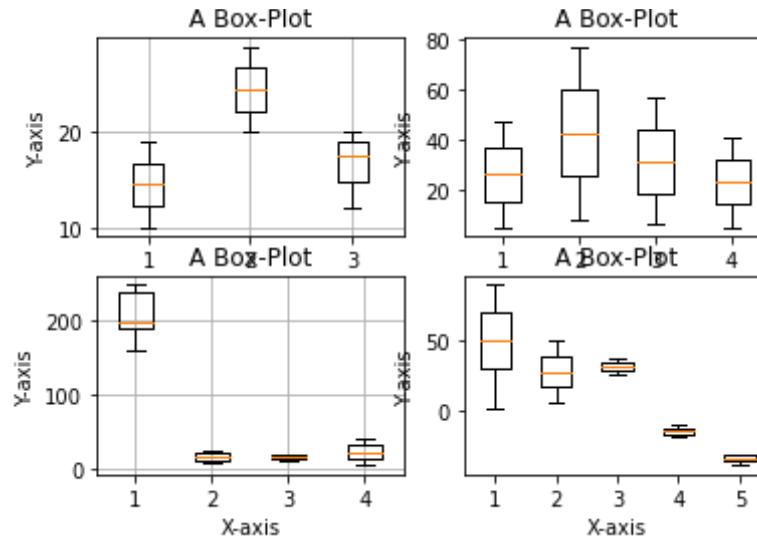
```
In [264]: data1,data2,data3,data4
```

```
Out[264]: ((array([10, 11, 12, 13, 14, 15, 16, 17, 18, 19]),
 array([20, 21, 22, 23, 24, 25, 26, 27, 28, 29]),
 [12, 13, 14, 15, 16, 17, 18, 19, 19, 19, 20, 20]),
 (array([ 5,  8, 11, 14, 17, 20, 23, 26, 29, 32, 35, 38, 41, 44, 47]),
 array([ 8, 11, 14, 17, 20, 23, 26, 29, 32, 35, 38, 41, 44, 47, 50, 5
 3, 56,
      59, 62, 65, 68, 71, 74, 77]),
 array([ 6,  9, 12, 15, 18, 21, 24, 27, 30, 33, 36, 39, 42, 45, 48, 5
 1, 54,
      57]),
 array([ 5,  9, 13, 17, 21, 25, 29, 33, 37, 41])),
 (array([197, 243, 237, 248, 197, 159, 179, 192]),
 array([ 8, 10, 12, 14, 16, 18, 20, 22, 24, 26]),
 [12, 13, 14, 15, 16, 17, 18, 19, 19, 19, 20, 20],
 array([ 5,  9, 13, 17, 21, 25, 29, 33, 37, 41])),
 ([1, 20, 30, 40, 50, 60, 70, 80, 90, 80, 80, 50, 40, 50, 40, 30, 20],
 [5, 10, 15, 20, 25, 30, 35, 40, 45, 50],
 array([25, 29, 33, 37])),
```

```
array([-20, -19, -18, -17, -16, -15, -14, -13, -12, -11]),  
array([-37, -35, -32, -40, -37, -34, -32]))
```

In [265]:

```
plt.subplot(2,2,1)  
plt.boxplot(data1)  
plt.title('A Box-Plot')  
plt.xlabel('X-axis')  
plt.ylabel("Y-axis")  
plt.grid(True)  
plt.subplot(2,2,2)  
plt.boxplot(data2)  
plt.title('A Box-Plot')  
plt.xlabel('X-axis')  
plt.ylabel("Y-axis")  
plt.grid(False)  
plt.subplot(2,2,3)  
plt.boxplot(data3)  
plt.title('A Box-Plot')  
plt.xlabel('X-axis')  
plt.ylabel("Y-axis")  
plt.grid(True)  
plt.subplot(2,2,4)  
plt.boxplot(data4)  
plt.title('A Box-Plot')  
plt.xlabel('X-axis')  
plt.ylabel("Y-axis")  
plt.grid(False)  
plt.show()
```



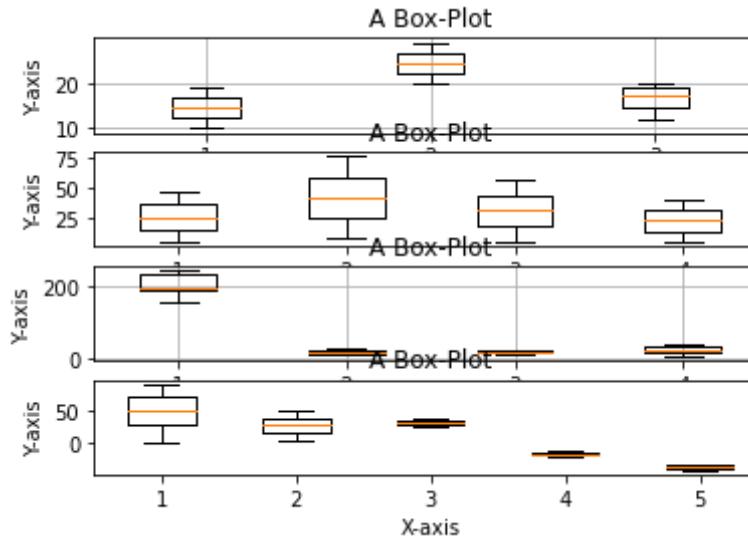
```
In [266]: #Example-03:
```

```
In [267]: data1,data2,data3,data4
```

```
Out[267]: ((array([10, 11, 12, 13, 14, 15, 16, 17, 18, 19]),
 array([20, 21, 22, 23, 24, 25, 26, 27, 28, 29]),
 [12, 13, 14, 15, 16, 17, 18, 19, 19, 19, 20, 20]),
 (array([ 5,  8, 11, 14, 17, 20, 23, 26, 29, 32, 35, 38, 41, 44, 47]),
 array([ 8, 11, 14, 17, 20, 23, 26, 29, 32, 35, 38, 41, 44, 47, 50,
 53, 56,
 59, 62, 65, 68, 71, 74, 77]),
 array([ 6,  9, 12, 15, 18, 21, 24, 27, 30, 33, 36, 39, 42, 45, 48, 51,
 54,
 57]),
 array([ 5,  9, 13, 17, 21, 25, 29, 33, 37, 41])),
 (array([197, 243, 237, 248, 197, 159, 179, 192]),
 array([ 8, 10, 12, 14, 16, 18, 20, 22, 24, 26]),
 [12, 13, 14, 15, 16, 17, 18, 19, 19, 19, 20, 20]),
 array([ 5,  9, 13, 17, 21, 25, 29, 33, 37, 41])),
 ([1, 20, 30, 40, 50, 60, 70, 80, 90, 80, 80, 50, 40, 50, 40, 30, 20],
 [5, 10, 15, 20, 25, 30, 35, 40, 45, 50],
 array([25, 29, 33, 37]),
```

```
array([-20, -19, -18, -17, -16, -15, -14, -13, -12, -11]),  
array([-37, -35, -32, -40, -37, -34, -32])))
```

```
In [268]: plt.subplot(4,1,1)  
plt.boxplot(data1)  
plt.title('A Box-Plot')  
plt.xlabel('X-axis')  
plt.ylabel("Y-axis")  
plt.grid(True)  
plt.subplot(4,1,2)  
plt.boxplot(data2)  
plt.title('A Box-Plot')  
plt.xlabel('X-axis')  
plt.ylabel("Y-axis")  
plt.grid(False)  
plt.subplot(4,1,3)  
plt.boxplot(data3)  
plt.title('A Box-Plot')  
plt.xlabel('X-axis')  
plt.ylabel("Y-axis")  
plt.grid(True)  
plt.subplot(4,1,4)  
plt.boxplot(data4)  
plt.title('A Box-Plot')  
plt.xlabel('X-axis')  
plt.ylabel("Y-axis")  
plt.grid(False)  
plt.show()
```



In [269]: `#f.Violin - Plot:`

In [270]: `#Example-01:`

In [271]:

```
l1 = np.arange(10,20)
l2 = np.arange(20,30)
l3 = np.arange(30,40)
l1,l2,l3
```

Out[271]:

```
(array([10, 11, 12, 13, 14, 15, 16, 17, 18, 19]),
 array([20, 21, 22, 23, 24, 25, 26, 27, 28, 29]),
 array([30, 31, 32, 33, 34, 35, 36, 37, 38, 39]))
```

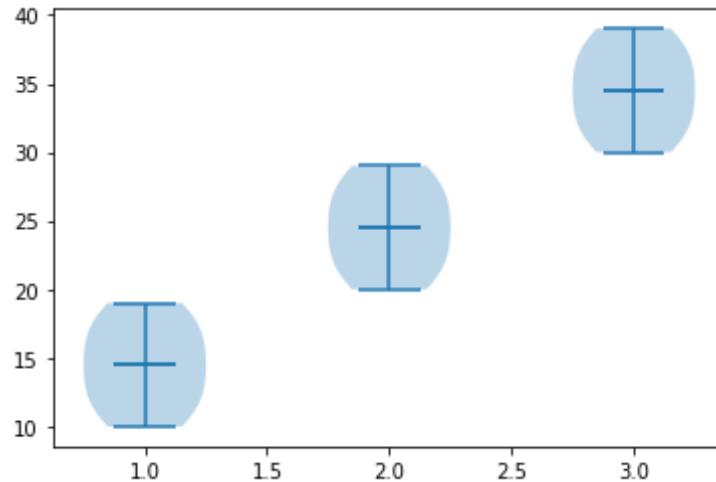
In [272]:

```
data = (l1,l2,l3)
data
```

Out[272]:

```
(array([10, 11, 12, 13, 14, 15, 16, 17, 18, 19]),
 array([20, 21, 22, 23, 24, 25, 26, 27, 28, 29]),
 array([30, 31, 32, 33, 34, 35, 36, 37, 38, 39]))
```

```
In [273]: plt.violinplot(data, showmedians=True, showmeans=True)
plt.show()
```



```
In [274]: #Example-02:
```

```
In [275]: l1 = np.arange(5,50,3)
l2 = np.arange(8,80,3)
l3 = np.arange(6,60,3)
l4 = np.arange(7,70,3)
l1,l2,l3,l4
```

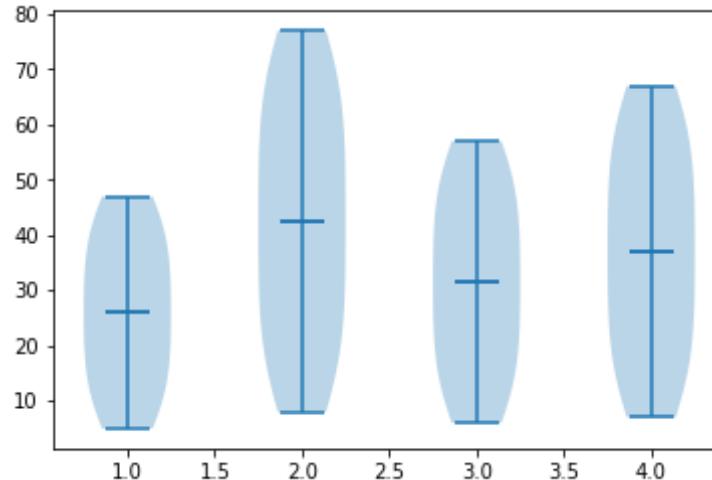
```
Out[275]: (array([ 5,  8, 11, 14, 17, 20, 23, 26, 29, 32, 35, 38, 41, 44, 47]),
 array([ 8, 11, 14, 17, 20, 23, 26, 29, 32, 35, 38, 41, 44, 47, 50, 53,
 56,
 59, 62, 65, 68, 71, 74, 77]),
 array([ 6,  9, 12, 15, 18, 21, 24, 27, 30, 33, 36, 39, 42, 45, 48, 51,
 54,
 57]),
 array([ 7, 10, 13, 16, 19, 22, 25, 28, 31, 34, 37, 40, 43, 46, 49, 52,
 55,
 58, 61, 64, 67]))
```

```
In [276]: data = (l1,l2,l3,l4)
```

```
data
```

```
Out[276]: (array([ 5,  8, 11, 14, 17, 20, 23, 26, 29, 32, 35, 38, 41, 44, 47]),  
 array([ 8, 11, 14, 17, 20, 23, 26, 29, 32, 35, 38, 41, 44, 47, 50, 53,  
 56,  
         59, 62, 65, 68, 71, 74, 77]),  
 array([ 6,  9, 12, 15, 18, 21, 24, 27, 30, 33, 36, 39, 42, 45, 48, 51,  
 54,  
         57]),  
 array([ 7, 10, 13, 16, 19, 22, 25, 28, 31, 34, 37, 40, 43, 46, 49, 52,  
 55,  
         58, 61, 64, 67]))
```

```
In [277]: plt.violinplot(data, showmedians=True, showmeans=True)  
plt.show()
```



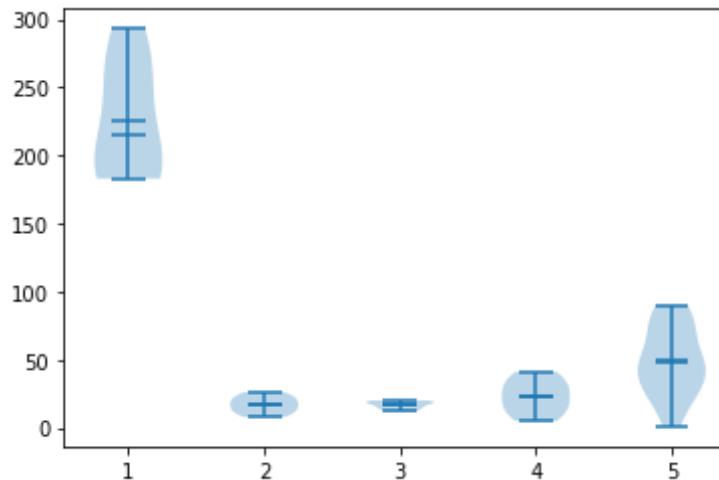
```
In [278]: #Example-03:
```

```
In [279]: l1 = np.random.randint(100,300,8)  
l2 = np.arange(8,28,2)  
l3 = [12,13,14,15,16,17,18,19,19,19,20,20]  
l4 = np.arange(5,45,4)  
l5 = [1,20,30,40,50,60,70,80,90,80,80,50,40,50,40,30,20]
```

```
data = (l1,l2,l3,l4,l5)
data
```

```
Out[279]: (array([204, 183, 186, 184, 225, 264, 261, 293]),
 array([ 8, 10, 12, 14, 16, 18, 20, 22, 24, 26]),
 [12, 13, 14, 15, 16, 17, 18, 19, 19, 19, 20, 20],
 array([ 5,  9, 13, 17, 21, 25, 29, 33, 37, 41]),
 [1, 20, 30, 40, 50, 60, 70, 80, 90, 80, 80, 50, 40, 50, 40, 30, 20])
```

```
In [280]: plt.violinplot(data,showmedians = True,showmeans = True)
plt.show()
```



```
In [281]: #f.(i).Adding sub-plots to box-plot:
```

```
In [282]: #Example-01:
```

```
In [283]: l1 = np.arange(10,20)
l2 = np.arange(20,30)
data1 = (l1,l2,l3)
data1
```

```
Out[283]: (array([10, 11, 12, 13, 14, 15, 16, 17, 18, 19]),
 array([20, 21, 22, 23, 24, 25, 26, 27, 28, 29]),
```

```
[12, 13, 14, 15, 16, 17, 18, 19, 19, 19, 20, 20])
```

In [284]:

```
l1 = np.arange(5,50,3)
l2 = np.arange(8,80,3)
l3 = np.arange(6,60,3)
data2 = (l1,l2,l3,l4)
data2
```

Out[284]:

```
(array([ 5,  8, 11, 14, 17, 20, 23, 26, 29, 32, 35, 38, 41, 44, 47]),
 array([ 8, 11, 14, 17, 20, 23, 26, 29, 32, 35, 38, 41, 44, 47, 50, 53,
 56,
 59, 62, 65, 68, 71, 74, 77]),
 array([ 6,  9, 12, 15, 18, 21, 24, 27, 30, 33, 36, 39, 42, 45, 48, 51,
 54,
 57]),
 array([ 5,  9, 13, 17, 21, 25, 29, 33, 37, 41]))
```

In [285]:

```
l1 = np.random.randint(100,300,8)
l2 = np.arange(8,28,2)
l3 = [12,13,14,15,16,17,18,19,19,19,20,20]
l4 = np.arange(5,45,4)
data3 = (l1,l2,l3,l4)
data3
```

Out[285]:

```
(array([128, 232, 256, 129, 294, 290, 221, 215]),
 array([ 8, 10, 12, 14, 16, 18, 20, 22, 24, 26]),
 [12, 13, 14, 15, 16, 17, 18, 19, 19, 19, 20, 20],
 array([ 5,  9, 13, 17, 21, 25, 29, 33, 37, 41]))
```

In [286]:

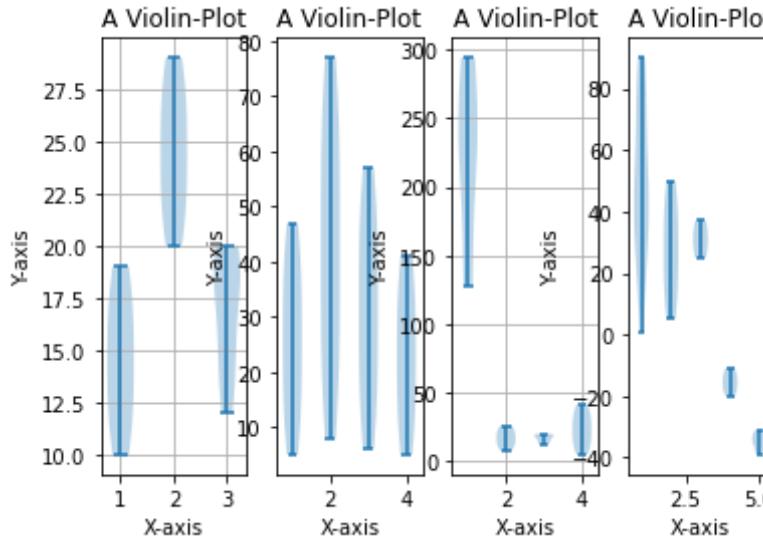
```
l1 = [1,20,30,40,50,60,70,80,90,80,80,50,40,50,40,30,20]
l2 = [5,10,15,20,25,30,35,40,45,50]
l3 = np.arange(25,40,4)
l4 = np.arange(-20,-10)
l5 = np.random.randint(-40,-30,7)
data4 = (l1,l2,l3,l4,l5)
data4
```

Out[286]:

```
([1, 20, 30, 40, 50, 60, 70, 80, 90, 80, 80, 50, 40, 50, 40, 30, 20],
 [5, 10, 15, 20, 25, 30, 35, 40, 45, 50],
```

```
array([25, 29, 33, 37]),  
array([-20, -19, -18, -17, -16, -15, -14, -13, -12, -11]),  
array([-35, -31, -37, -34, -32, -34, -39]))
```

```
In [287]: plt.subplot(1,4,1)  
plt.violinplot(data1)  
plt.title('A Violin-Plot')  
plt.xlabel('X-axis')  
plt.ylabel("Y-axis")  
plt.grid(True)  
plt.subplot(1,4,2)  
plt.violinplot(data2)  
plt.title('A Violin-Plot')  
plt.xlabel('X-axis')  
plt.ylabel("Y-axis")  
plt.grid(False)  
plt.subplot(1,4,3)  
plt.violinplot(data3)  
plt.title('A Violin-Plot')  
plt.xlabel('X-axis')  
plt.ylabel("Y-axis")  
plt.grid(True)  
plt.subplot(1,4,4)  
plt.violinplot(data4)  
plt.title('A Violin-Plot')  
plt.xlabel('X-axis')  
plt.ylabel("Y-axis")  
plt.grid(False)  
plt.show()
```



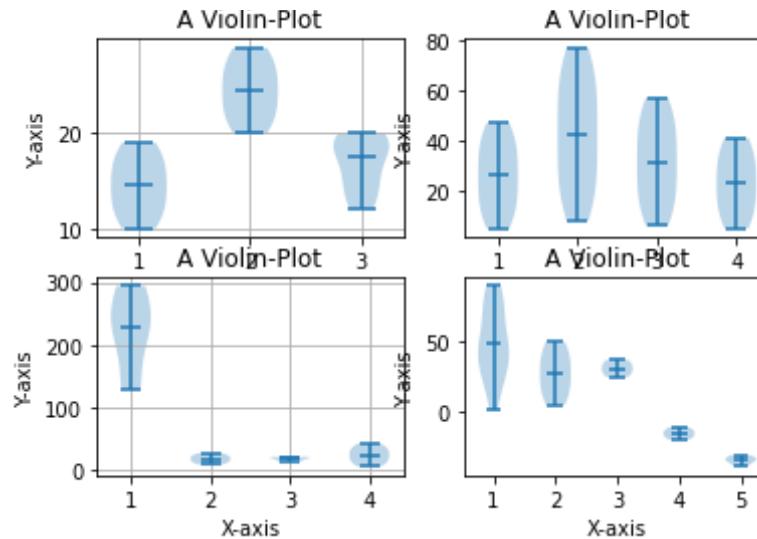
In [288]: #Example-02:

In [289]: data1,data2,data3,data4

Out[289]: ((array([10, 11, 12, 13, 14, 15, 16, 17, 18, 19]),  
array([20, 21, 22, 23, 24, 25, 26, 27, 28, 29]),  
[12, 13, 14, 15, 16, 17, 18, 19, 19, 19, 20, 20]),  
(array([ 5, 8, 11, 14, 17, 20, 23, 26, 29, 32, 35, 38, 41, 44, 47]),  
array([ 8, 11, 14, 17, 20, 23, 26, 29, 32, 35, 38, 41, 44, 47, 50, 5  
3, 56,  
59, 62, 65, 68, 71, 74, 77]),  
array([ 6, 9, 12, 15, 18, 21, 24, 27, 30, 33, 36, 39, 42, 45, 48, 5  
1, 54,  
57]),  
array([ 5, 9, 13, 17, 21, 25, 29, 33, 37, 41])),  
(array([128, 232, 256, 129, 294, 290, 221, 215]),  
array([ 8, 10, 12, 14, 16, 18, 20, 22, 24, 26]),  
[12, 13, 14, 15, 16, 17, 18, 19, 19, 19, 20, 20],  
array([ 5, 9, 13, 17, 21, 25, 29, 33, 37, 41])),  
([1, 20, 30, 40, 50, 60, 70, 80, 90, 80, 80, 50, 40, 50, 40, 30, 20],  
[5, 10, 15, 20, 25, 30, 35, 40, 45, 50],  
array([25, 29, 33, 37])),

```
array([-20, -19, -18, -17, -16, -15, -14, -13, -12, -11]),  
array([-35, -31, -37, -34, -32, -34, -39]))
```

```
In [290]: plt.subplot(2,2,1)  
plt.violinplot(data1,showmedians=True)  
plt.title('A Violin-Plot')  
plt.xlabel('X-axis')  
plt.ylabel("Y-axis")  
plt.grid(True)  
plt.subplot(2,2,2)  
plt.violinplot(data2,showmeans=True)  
plt.title('A Violin-Plot')  
plt.xlabel('X-axis')  
plt.ylabel("Y-axis")  
plt.grid(False)  
plt.subplot(2,2,3)  
plt.violinplot(data3,showmedians=True)  
plt.title('A Violin-Plot')  
plt.xlabel('X-axis')  
plt.ylabel("Y-axis")  
plt.grid(True)  
plt.subplot(2,2,4)  
plt.violinplot(data4,showmeans=True)  
plt.title('A Violin-Plot')  
plt.xlabel('X-axis')  
plt.ylabel("Y-axis")  
plt.grid(False)  
plt.show()
```



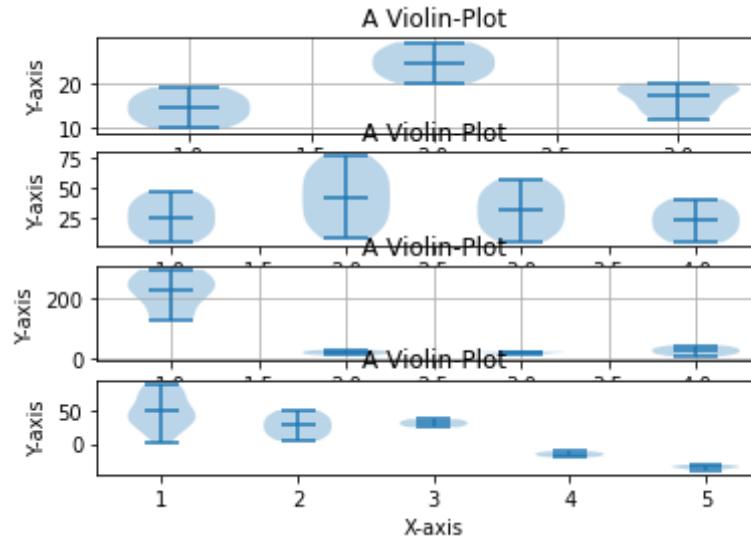
```
In [291]: #Example-03:
```

```
In [292]: data1,data2,data3,data4
```

```
Out[292]: ((array([10, 11, 12, 13, 14, 15, 16, 17, 18, 19]),
  array([20, 21, 22, 23, 24, 25, 26, 27, 28, 29]),
  [12, 13, 14, 15, 16, 17, 18, 19, 19, 19, 20, 20]),
 (array([ 5,  8, 11, 14, 17, 20, 23, 26, 29, 32, 35, 38, 41, 44, 47]),
  array([ 8, 11, 14, 17, 20, 23, 26, 29, 32, 35, 38, 41, 44, 47, 50,
  53, 56,
  59, 62, 65, 68, 71, 74, 77]),
  array([ 6,  9, 12, 15, 18, 21, 24, 27, 30, 33, 36, 39, 42, 45, 48, 51,
  54,
  57]),
  array([ 5,  9, 13, 17, 21, 25, 29, 33, 37, 41])),
 (array([128, 232, 256, 129, 294, 290, 221, 215]),
  array([ 8, 10, 12, 14, 16, 18, 20, 22, 24, 26]),
  [12, 13, 14, 15, 16, 17, 18, 19, 19, 19, 20, 20]),
  array([ 5,  9, 13, 17, 21, 25, 29, 33, 37, 41])),
 ([1, 20, 30, 40, 50, 60, 70, 80, 90, 80, 80, 50, 40, 50, 40, 30, 20],
  [5, 10, 15, 20, 25, 30, 35, 40, 45, 50],
  array([25, 29, 33, 37])),
```

```
array([-20, -19, -18, -17, -16, -15, -14, -13, -12, -11]),  
array([-35, -31, -37, -34, -32, -34, -39]))
```

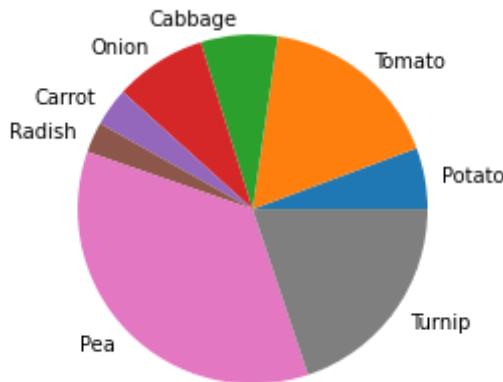
```
In [293]: plt.subplot(4,1,1)  
plt.violinplot(data1,showmedians=True)  
plt.title('A Violin-Plot')  
plt.xlabel('X-axis')  
plt.ylabel("Y-axis")  
plt.grid(True)  
plt.subplot(4,1,2)  
plt.violinplot(data2,showmeans=True)  
plt.title('A Violin-Plot')  
plt.xlabel('X-axis')  
plt.ylabel("Y-axis")  
plt.grid(False)  
plt.subplot(4,1,3)  
plt.violinplot(data3,showmedians=True)  
plt.title('A Violin-Plot')  
plt.xlabel('X-axis')  
plt.ylabel("Y-axis")  
plt.grid(True)  
plt.subplot(4,1,4)  
plt.violinplot(data4,showmeans=True)  
plt.title('A Violin-Plot')  
plt.xlabel('X-axis')  
plt.ylabel("Y-axis")  
plt.grid(False)  
plt.show()
```



```
In [294]: #g. Pie-Chart:
```

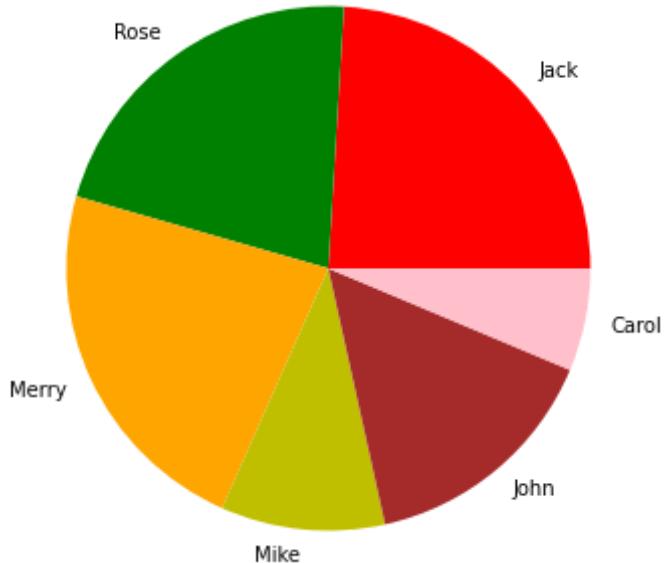
```
In [295]: #Example-01:
```

```
In [296]: vegetables = ['Potato','Tomato','Cabbage','Onion','Carrot','Radish','Pea','Turnip']
price = [40,120,50,60,25,20,250,140]
plt.pie(price,labels=vegetables)
plt.show()
```



```
In [297]: #Example-02:
```

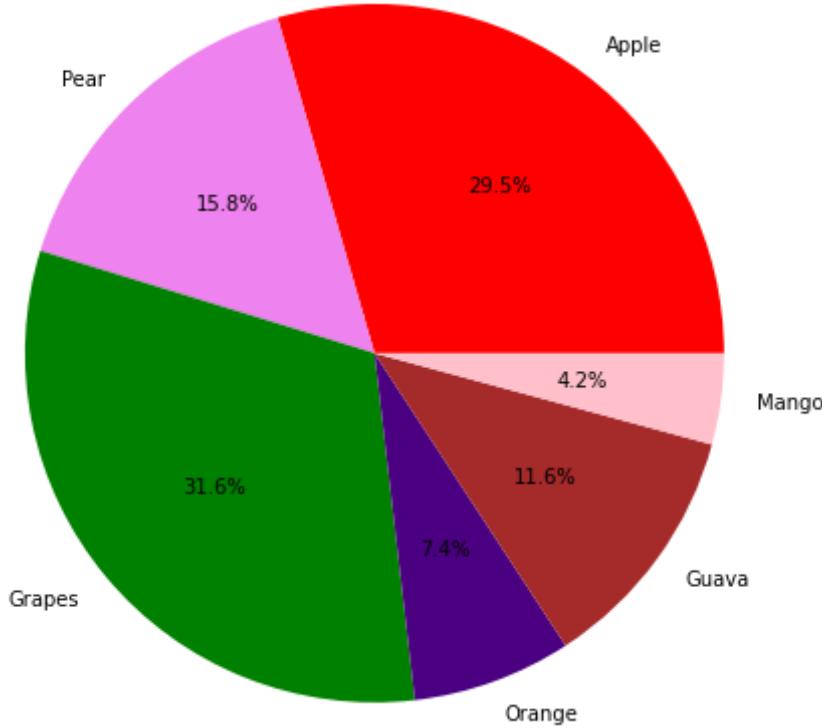
```
In [298]: students = ['Jack', 'Rose', 'Merry', 'Mike', 'John', 'Carol']
marks = [19,17,18,8,12,5]
plt.pie(marks,labels=students,colors=['r','g','orange','y','brown','pink'],
radius=1.5)
plt.show()
```



```
In [299]: #Example-03:
```

```
In [300]: fruits = ['Apple', 'Pear', 'Grapes', 'Orange', 'Guava', 'Mango']
cost = [280,150,300,70,110,40]
```

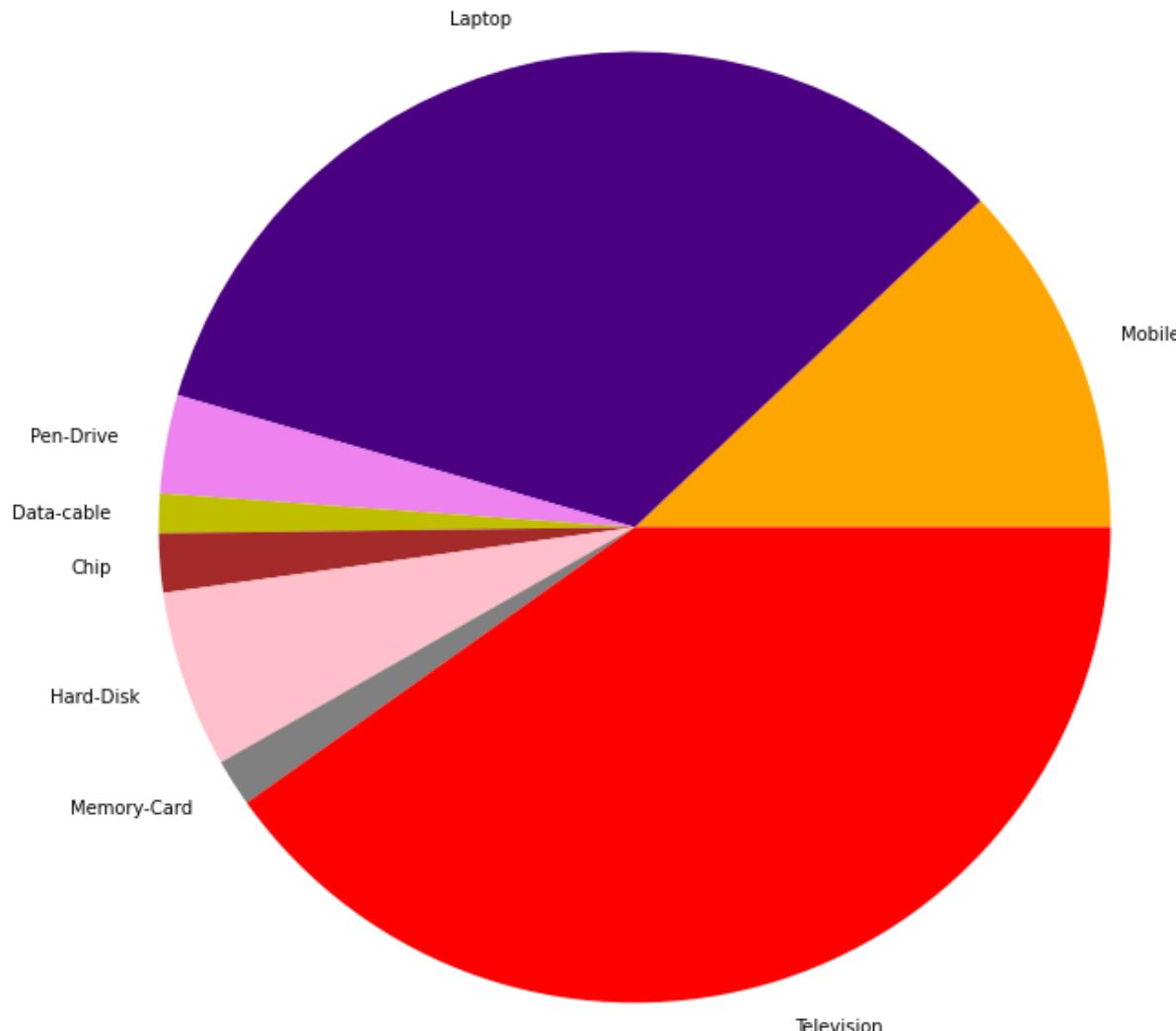
```
In [301]: plt.pie(cost,labels=fruits,colors=['r','violet','green','indigo','brown','pink'],radius=2,autopct = '%0.1f%')
plt.show()
```



```
In [302]: #Example-04:
```

```
In [303]: devices = ['Mobile','Laptop','Pen-Drive','Data-cable','Chip','Hard-Dis  
k','Memory-Card','Television']  
charges = [9000,25000,2500,1000,1500,4500,1200,30000]
```

```
In [304]: plt.pie(charges,labels=devices,colors=['orange','indigo','violet','y',  
'brown','pink','grey','red'],radius=3)  
plt.show()
```



```
In [305]: #g.(i). Adding subplots:
```

```
In [306]: #Example-01:
```

```
In [307]: vegetables = ['Potato', 'Tomato', 'Cabbage', 'Onion', 'Carrot', 'Radish', 'Pe  
a', 'Turnip']
```

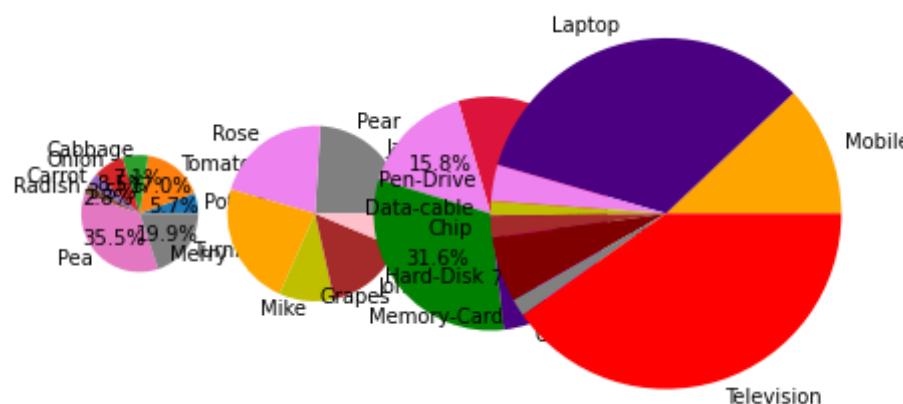
```
price = [40,120,50,60,25,20,250,140]
```

```
In [308]: students = ['Jack', 'Rose', 'Merry', 'Mike', 'John', 'Carol']
marks = [19,17,18,8,12,5]
```

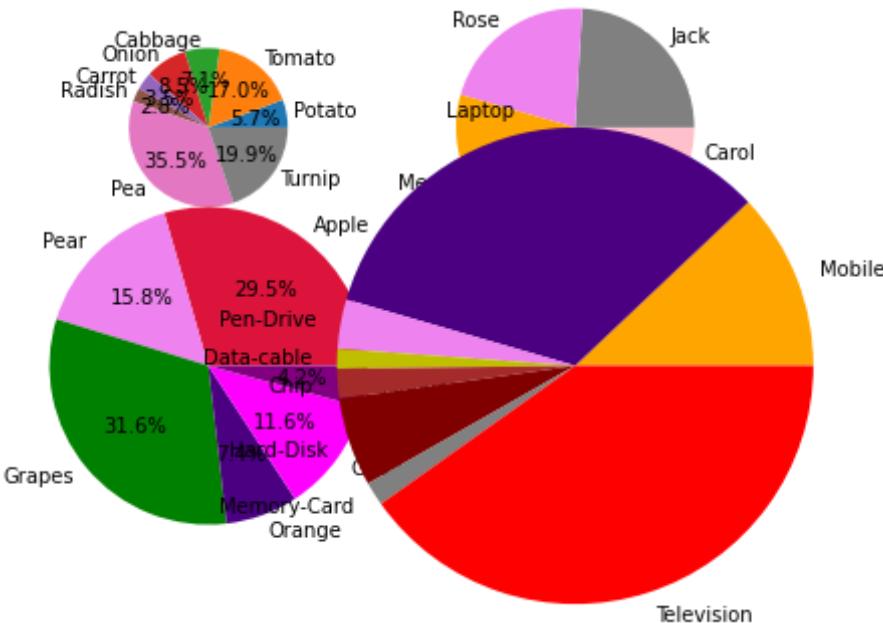
```
In [309]: fruits = ['Apple', 'Pear', 'Grapes', 'Orange', 'Guava', 'Mango']
cost = [280,150,300,70,110,40]
```

```
In [310]: devices = ['Mobile', 'Laptop', 'Pen-Drive', 'Data-cable', 'Chip', 'Hard-Disk',
                 'Memory-Card', 'Television']
charges = [9000,25000,2500,1000,1500,4500,1200,30000]
```

```
In [311]: plt.subplot(1,4,1)
plt.pie(price,labels=vegetables,radius=1,autopct='%.1f%%')
plt.subplot(1,4,2)
plt.pie(marks,labels=students,colors=['grey','violet','orange','y','brown','pink'],radius=1.5)
plt.subplot(1,4,3)
plt.pie(cost,labels=fruits,colors=['crimson','violet','green','indigo','magenta','purple'],radius=2,autopct ='%.1f%%')
plt.subplot(1,4,4)
plt.pie(charges,labels=devices,colors=['orange','indigo','violet','y','brown','maroon','grey','red'],radius=3)
plt.show()
```



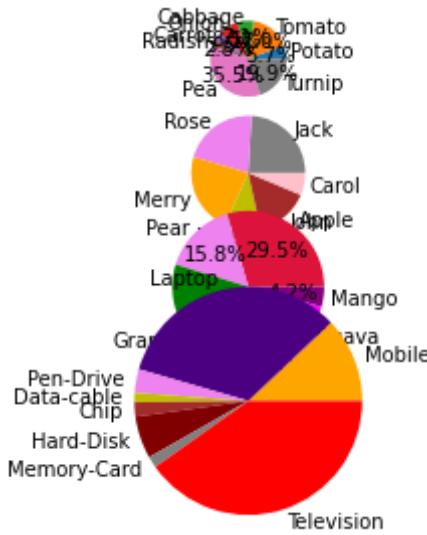
```
In [312]: #Example-02:  
  
In [313]: vegetables = ['Potato','Tomato','Cabbage','Onion','Carrot','Radish','Pe  
a','Turnip']  
price = [40,120,50,60,25,20,250,140]  
  
In [314]: students = ['Jack','Rose','Merry','Mike','John','Carol']  
marks = [19,17,18,8,12,5]  
  
In [315]: fruits = ['Apple','Pear','Grapes','Orange','Guava','Mango']  
cost = [280,150,300,70,110,40]  
  
In [316]: devices = ['Mobile','Laptop','Pen-Drive','Data-cable','Chip','Hard-Dis  
k','Memory-Card','Television']  
charges = [9000,25000,2500,1000,1500,4500,1200,30000]  
  
In [317]: plt.subplot(2,2,1)  
plt.pie(price,labels=vegetables, radius=1, autopct='%.1f%%')  
plt.subplot(2,2,2)  
plt.pie(marks,labels=students,colors=['grey','violet','orange','yellow','brown','pink'],radius=1.5)  
plt.subplot(2,2,3)  
plt.pie(cost,labels=fruits,colors=['crimson','violet','green','indigo','magenta','purple'],radius=2,autopct ='%.1f%%')  
plt.subplot(2,2,4)  
plt.pie(charges,labels=devices,colors=['orange','indigo','violet','yellow','brown','maroon','grey','red'],radius=3)  
plt.show()
```



In [318]: #Example-03:

```
vegetables = ['Potato','Tomato','Cabbage','Onion','Carrot','Radish','Pea','Turnip']
price = [40,120,50,60,25,20,250,140]
students = ['Jack','Rose','Merry','Mike','John','Carol']
marks = [19,17,18,8,12,5]
fruits = ['Apple','Pear','Grapes','Orange','Guava','Mango']
cost = [280,150,300,70,110,40]
devices = ['Mobile','Laptop','Pen-Drive','Data-cable','Chip','Hard-Disk','Memory-Card','Television']
charges = [9000,25000,2500,1000,1500,4500,1200,30000]
plt.subplot(4,1,1)
plt.pie(price,labels=vegetables,radius=1,autopct='%.1f%%')
plt.subplot(4,1,2)
plt.pie(marks,labels=students,colors=['grey','violet','orange','y','brown','pink'],radius=1.5)
plt.subplot(4,1,3)
plt.pie(cost,labels=fruits,colors=['crimson','violet','green','indigo','blue','yellow','purple','brown'])
```

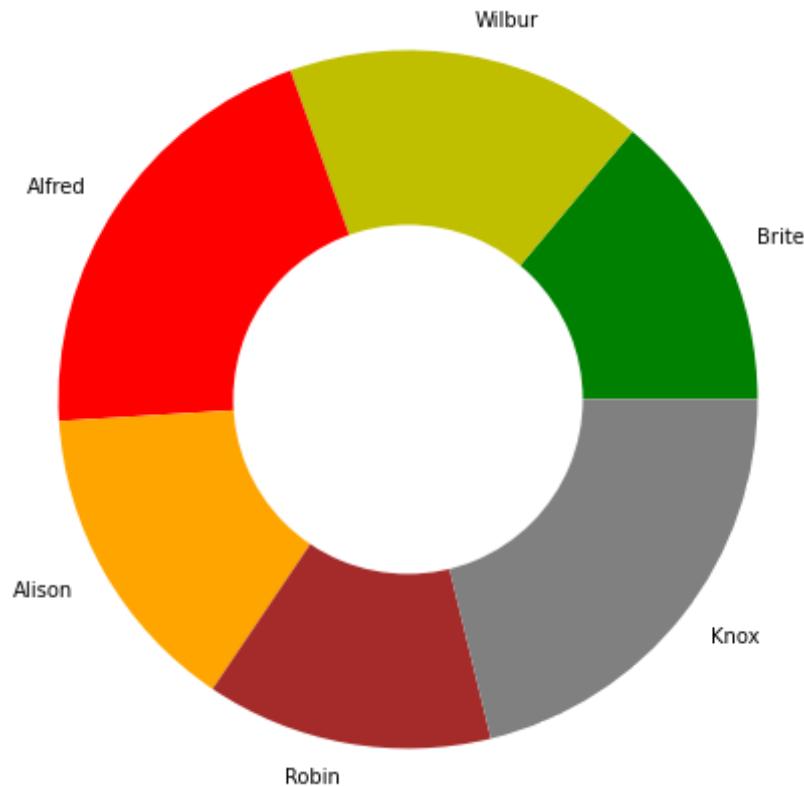
```
'magenta','purple'],radius=2,autopct = '%0.1f%%')
plt.subplot(4,1,4)
plt.pie(charges,labels=devices,colors=['orange','indigo','violet','y',
'brown','maroon','grey','red'],radius=3)
plt.show()
```



In [320]: #h. Donought Chart:

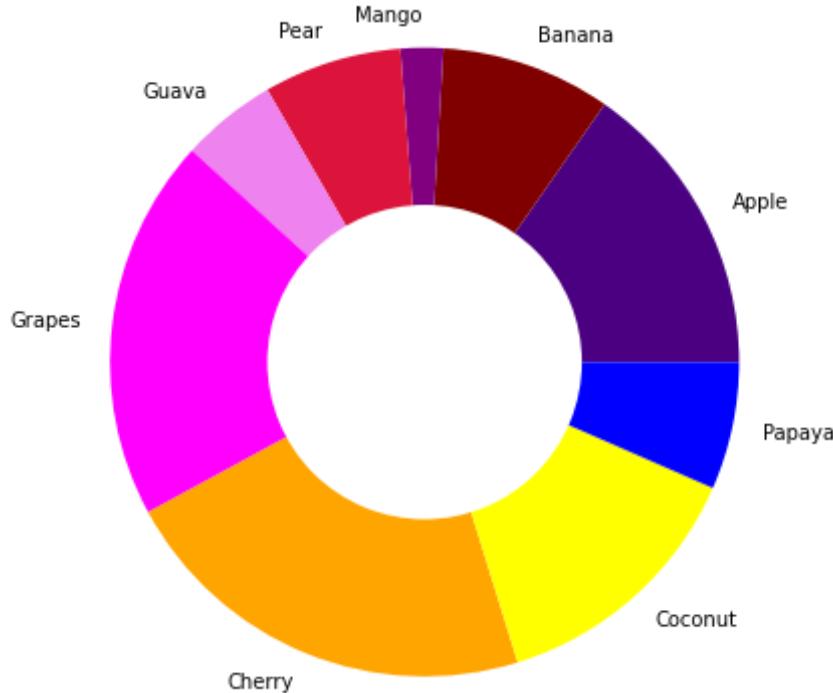
In [321]: #Example-01:

```
In [324]: name = ['Brite', 'Wilbur', 'Alfred', 'Alison', 'Robin', 'Knox']
age = [21,25,31,22,20,32]
plt.pie(age, labels=name, colors=['g', 'y', 'r', 'orange', 'brown', 'grey'], radius=2)
plt.pie([100], colors=['w'], radius=1)
plt.show()
```



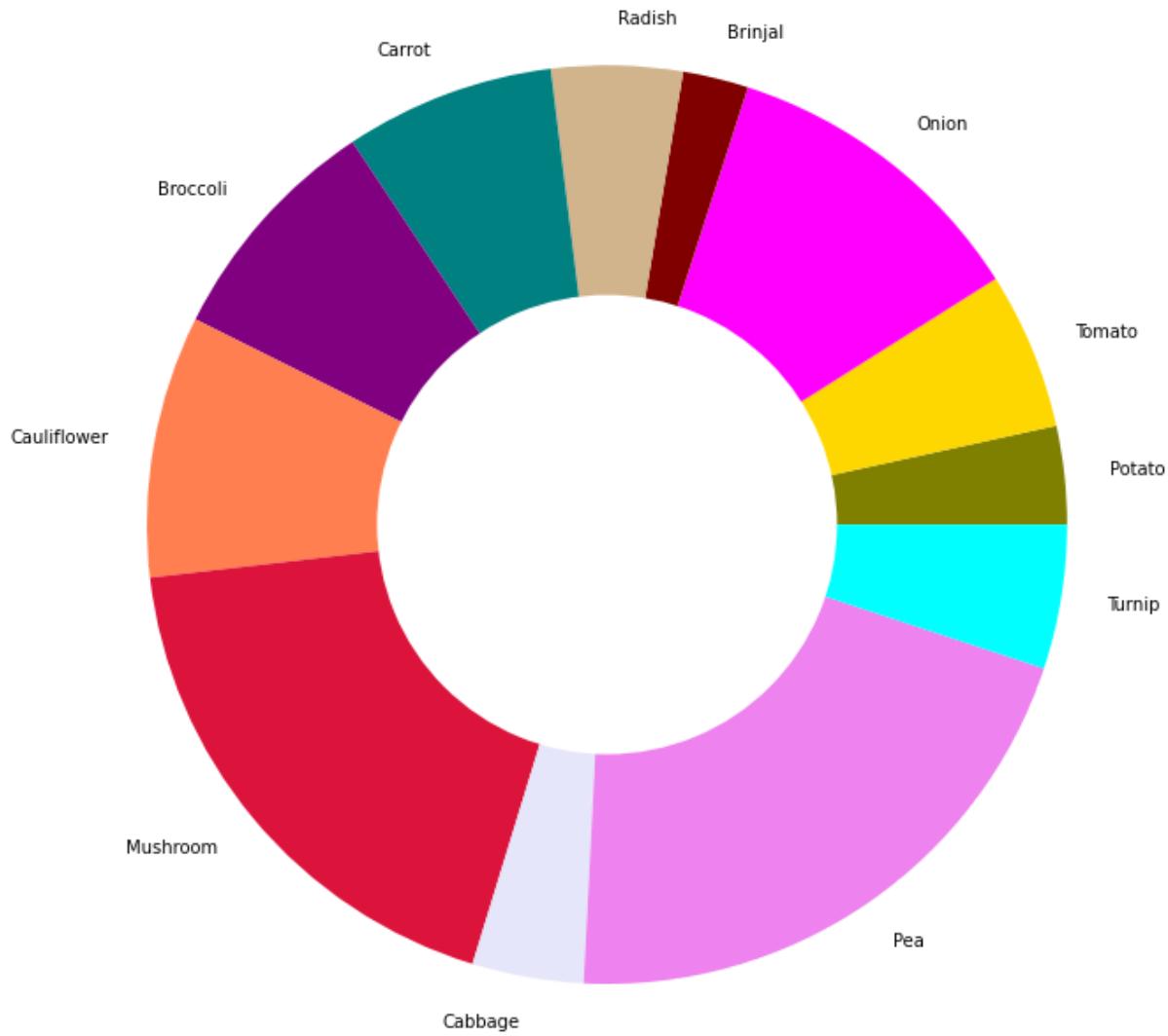
```
In [325]: #Example-02:
```

```
In [327]: fruits = ['Apple', "Banana", 'Mango', 'Pear', 'Guava', 'Grapes', 'Cherry', 'Coconut', 'Papaya']
price = [280,160,40,130,90,360,400,250,120]
plt.pie(price,labels=fruits,colors=['indigo','maroon','purple','crimson','violet','magenta','orange','yellow','blue'],radius=1.8)
plt.pie([1],colors=['w'],radius=0.9)
plt.show()
```



In [328]: #Example-03:

```
In [339]: veg = ['Potato', 'Tomato', 'Onion', 'Brinjal', 'Radish', 'Carrot', 'Broccoli',  
          'Cauliflower', 'Mushroom', 'Cabbage', 'Pea', 'Turnip']  
cost = [75, 120, 240, 50, 100, 160, 180, 200, 400, 85, 450, 110]  
plt.pie(cost, labels=veg, colors=['olive', 'gold', 'magenta', 'maroon', 'tan',  
          'teal', 'purple', 'coral', 'crimson', 'lavender', 'violet', 'cyan'], radius=3)  
plt.pie([100], colors=['w'], radius=1.5)  
plt.show()
```

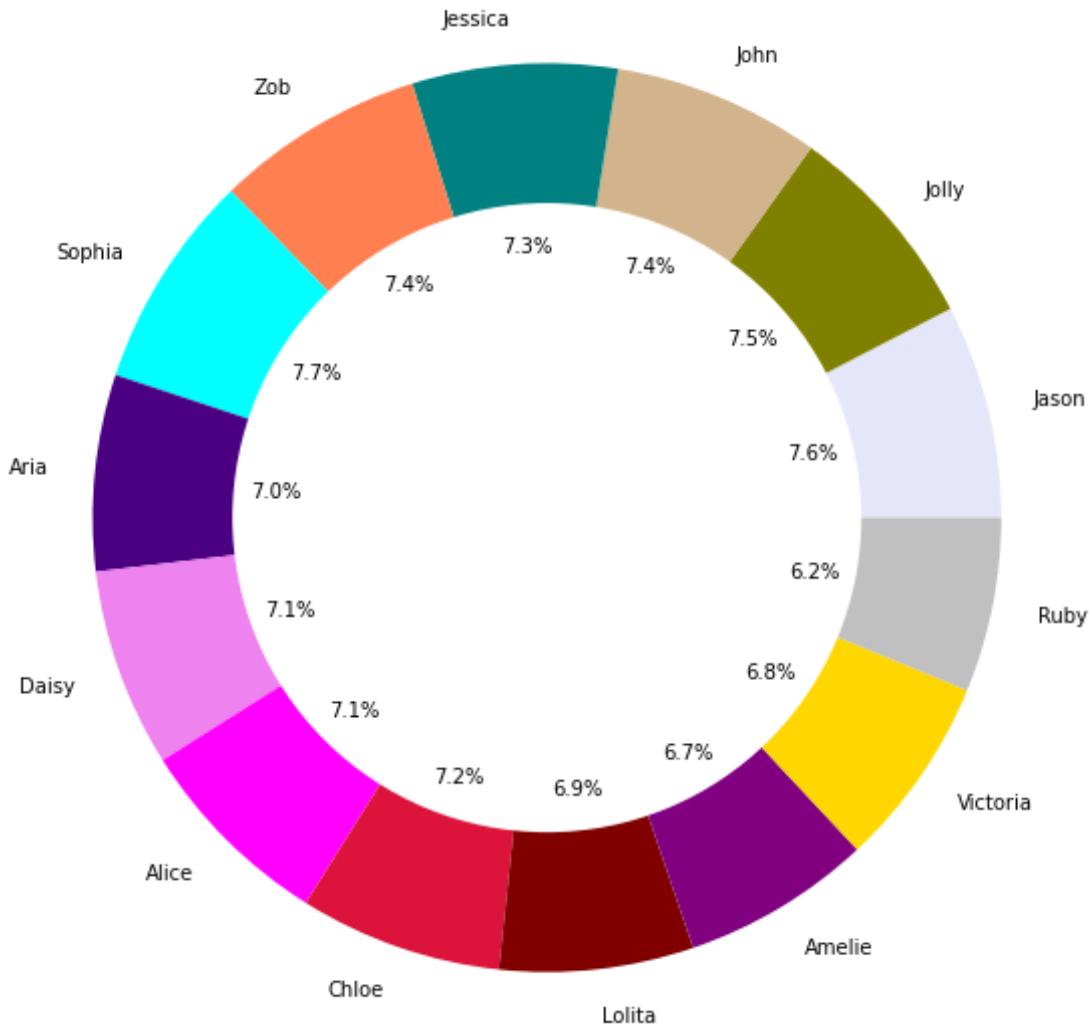


In [340]: #Example-04:

In [341]: 

```
student = ['Jason', 'Jolly', 'John', 'Jessica', 'Zob', 'Sophia', 'Aria', 'Daisy', 'Alice', 'Chloe', 'Lolita', 'Amelie', 'Victoria', 'Ruby']
mark = [98, 97, 95, 94, 96, 99, 90, 91, 92, 93, 89, 87, 88, 80]
```

```
plt.pie(mark,labels=student,colors=['lavender','olive','tan','teal','coral','cyan','indigo','violet','magenta','crimson','maroon','purple','gold','silver'],radius=2.6,autopct='%.1f%%')
plt.pie([2],colors=['w'],radius=1.8)
plt.show()
```

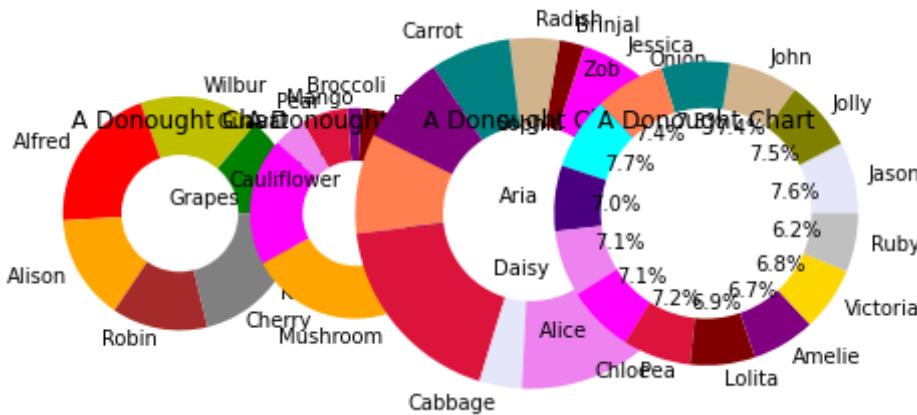


In [342]: *#h.(i). Adding subplots to donought chart:*

```
In [343]: #Example-01:
```

```
In [345]: name = ['Brite','Wilbur','Alfred','Alison','Robin','Knox']
age = [21,25,31,22,20,32]
fruits = ['Apple', "Banana", 'Mango', 'Pear', 'Guava', 'Grapes', 'Cherry', 'Coconut', 'Papaya']
price = [280,160,40,130,90,360,400,250,120]
veg = ['Potato', 'Tomato', 'Onion', 'Brinjal', 'Radish', 'Carrot', 'Broccoli', 'Cauliflower', 'Mushroom', 'Cabbage', 'Pea', 'Turnip']
cost = [75,120,240,50,100,160,180,200,400,85,450,110]
student = ['Jason', 'Jolly', 'John', 'Jessica', 'Zob', 'Sophia', 'Aria', 'Daisy', 'Alice', 'Chloe', 'Lolita', 'Amelie', 'Victoria', 'Ruby']
mark = [98,97,95,94,96,99,90,91,92,93,89,87,88,80]
plt.subplot(1,4,1)
plt.pie(age,labels=name,colors=['g','y','r','orange','brown','grey'],radius=2)
plt.pie([100],colors=['w'],radius=1)
plt.title("A Donought Chart")
plt.grid(True)
plt.subplot(1,4,2)
plt.pie(price,labels=fruits,colors=['indigo','maroon','purple','crimson','violet','magenta','orange','yellow','blue'],radius=1.8)
plt.pie([1],colors=['w'],radius=0.9)
plt.title("A Donought Chart")
plt.grid(False)
plt.subplot(1,4,3)
plt.pie(cost,labels=veg,colors=['olive','gold','magenta','maroon','tan','teal','purple','coral','crimson','lavender','violet','cyan'],radius=3)
plt.pie([100],colors=['w'],radius=1.5)
plt.title("A Donought Chart")
plt.grid()
plt.subplot(1,4,4)
plt.pie(mark,labels=student,colors=['lavender','olive','tan','teal','coral','cyan','indigo','violet','magenta','crimson','maroon','purple','gold','silver'],radius=2.6,autopct='%.1f%%')
plt.pie([2],colors=['w'],radius=1.8)
plt.title("A Donought Chart")
```

```
plt.grid(False)  
plt.show()
```



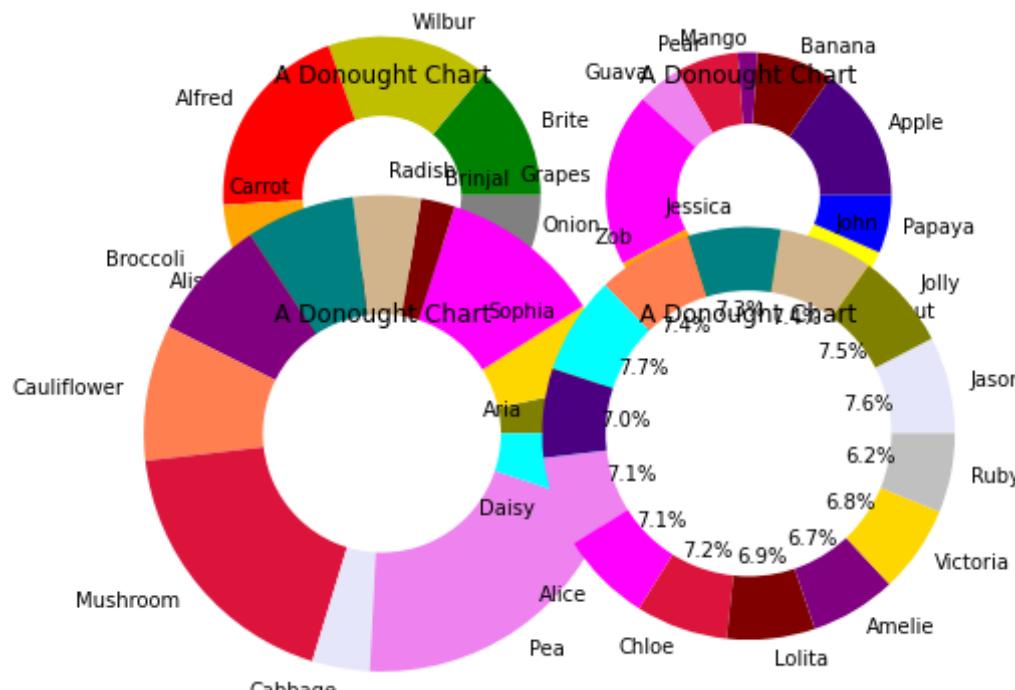
In [346]: #Example-02:

```
name = ['Brite','Wilbur','Alfred','Alison','Robin','Knox']  
age = [21,25,31,22,20,32]  
fruits = ['Apple',"Banana",'Mango','Pear','Guava','Grapes','Cherry','Co  
conut','Papaya']  
price = [280,160,40,130,90,360,400,250,120]  
veg = ['Potato','Tomato','Onion','Brinjal','Radish','Carrot','Broccoli'  
, 'Cauliflower','Mushroom','Cabbage','Pea','Turnip']  
cost = [75,120,240,50,100,160,180,200,400,85,450,110]  
student = ['Jason','Jolly','John','Jessica','Zob','Sophia','Aria','Dais  
y','Alice','Chloe','Lolita','Amelie','Victoria','Ruby']  
mark = [98,97,95,94,96,99,90,91,92,93,89,87,88,80]  
plt.subplot(2,2,1)  
plt.pie(age,labels=name,colors=['g','y','r','orange','brown','grey'],ra  
dius=2)  
plt.pie([100],colors=['w'],radius=1)  
plt.title("A Donought Chart")  
plt.grid(True)  
plt.subplot(2,2,2)  
plt.pie(price,labels=fruits,colors=['indigo','maroon','purple','crimso
```

```

'n','violet','magenta','orange','yellow','blue'],radius=1.8)
plt.pie([1],colors=['w'],radius=0.9)
plt.title("A Donought Chart")
plt.grid(False)
plt.subplot(2,2,3)
plt.pie(cost,labels=veg,colors=['olive','gold','magenta','maroon','tan'
,'teal','purple','coral','crimson','lavender','violet','cyan'],radius=3
)
plt.pie([100],colors=['w'],radius=1.5)
plt.title("A Donought Chart")
plt.grid()
plt.subplot(2,2,4)
plt.pie(mark,labels=student,colors=['lavender','olive','tan','teal','co
ral','cyan','indigo','violet','magenta','crimson','maroon','purple','go
ld','silver'],radius=2.6,autopct='%.1f%%')
plt.pie([2],colors=['w'],radius=1.8)
plt.title("A Donought Chart")
plt.grid(False)
plt.show()

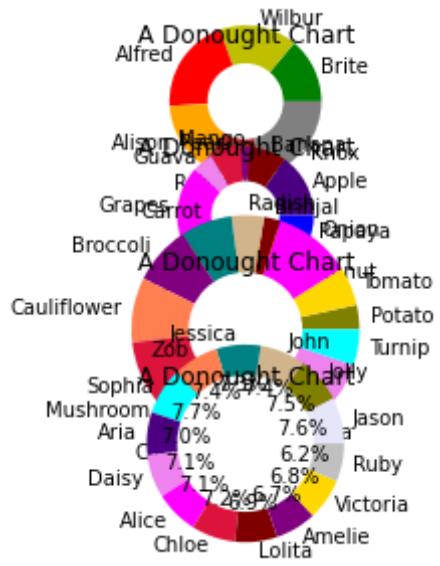
```



```
In [348]: #Example-03:
```

```
In [350]: name = ['Brite','Wilbur','Alfred','Alison','Robin','Knox']
age = [21,25,31,22,20,32]
fruits = ['Apple','Banana','Mango','Pear','Guava','Grapes','Cherry','Coconut','Papaya']
price = [280,160,40,130,90,360,400,250,120]
veg = ['Potato','Tomato','Onion','Brinjal','Radish','Carrot','Broccoli','Cauliflower','Mushroom','Cabbage','Pea','Turnip']
cost = [75,120,240,50,100,160,180,200,400,85,450,110]
student = ['Jason','Jolly','John','Jessica','Zob','Sophia','Aria','Daisy','Alice','Chloe','Lolita','Amelie','Victoria','Ruby']
mark = [98,97,95,94,96,99,90,91,92,93,89,87,88,80]
plt.subplot(4,1,1)
plt.pie(age,labels=name,colors=['g','y','r','orange','brown','grey'],radius=2)
plt.pie([100],colors=['w'],radius=1)
plt.title("A Donought Chart")
plt.grid(True)
plt.subplot(4,1,2)
plt.pie(price,labels=fruits,colors=['indigo','maroon','purple','crimson','violet','magenta','orange','yellow','blue'],radius=1.8)
plt.pie([1],colors=['w'],radius=0.9)
plt.title("A Donought Chart")
plt.grid(False)
plt.subplot(4,1,3)
plt.pie(cost,labels=veg,colors=['olive','gold','magenta','maroon','tan','teal','purple','coral','crimson','lavender','violet','cyan'],radius=3)
plt.pie([100],colors=['w'],radius=1.5)
plt.title("A Donought Chart")
plt.grid()
plt.subplot(4,1,4)
plt.pie(mark,labels=student,colors=['lavender','olive','tan','teal','coral','cyan','indigo','violet','magenta','crimson','maroon','purple','gold','silver'],radius=2.6,autopct='%0.1f%%')
plt.pie([2],colors=['w'],radius=1.8)
```

```
plt.title("A Donought Chart")
plt.grid(False)
plt.show()
```



In [ ]: