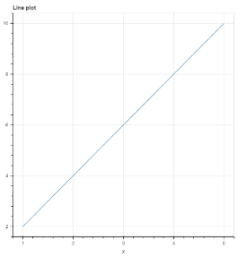
8. Write a Python program to explain working with bokeh line graph using Annotations and Legends.

a) Write a Python program for plotting different types of plots using Bokeh.

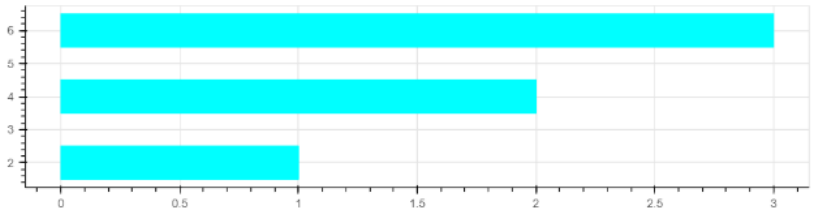
case i) line plot

```
from bokeh.plotting import figure, output_file, show
x = [1, 2, 3, 4, 5]
y = [2, 4, 6, 8, 10]
output_file('line.html')
fig= figure(title= 'Line plot', x_axis_label='x', y_axis_label='y')
fig.line(x, y)
show(fig)
```



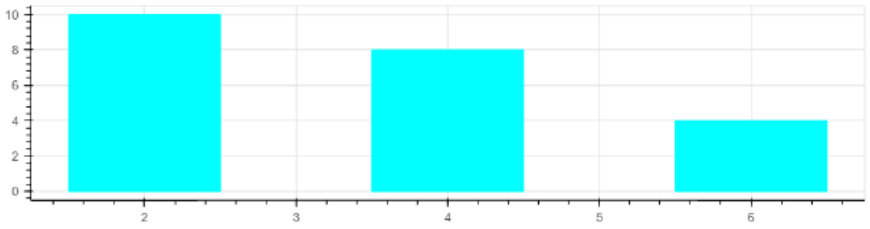
case ii) horizontal bar plot

```
from bokeh.plotting import figure, output_file, show
fig = figure(plot_width = 800, plot_height = 200)
fig.hbar(y=[2,4,6], height = 1, left = 0, right = [1, 2, 3], color = 'Cyan' )
output_file('bar.html')
show(fig)
```



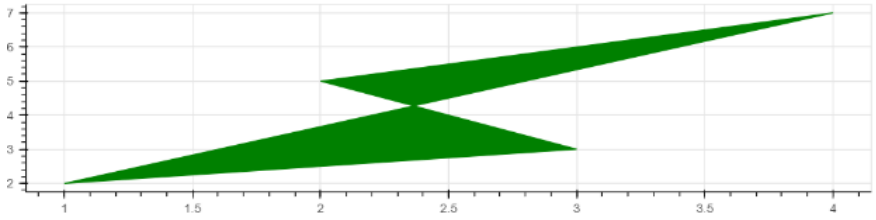
case iii) vertical bar plot

```
from bokeh.plotting import figure, output_file, show
fig = figure(plot_width = 800, plot_height = 200)
fig.vbar(x=[2,4,6], width = 1, bottom = 0, top = [10, 8, 4], color = 'Cyan' )
output_file('vbar.html')
show(fig)
```



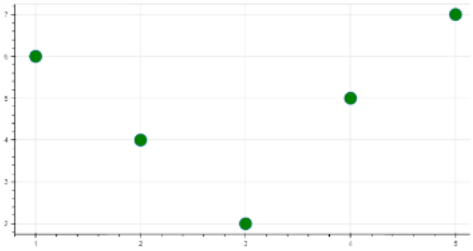
case iv) Patch plot

```
from bokeh.plotting import figure, output_file, show
p = figure(plot_width = 800, plot_height = 200)
p.patch(x=[1,3,2,4], y=[2,3,5,7], color='green')
output_file('patch.html')
show(p)
```



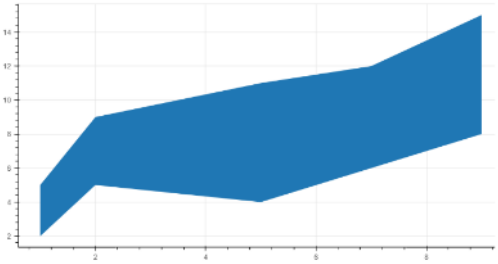
case v) Scatter plot

```
from bokeh.plotting import figure, output_file, show
p=figure(plot_width = 800, plot_height = 400)
p.scatter([1, 4, 3, 2, 5], [6, 5, 2, 4, 7], marker = 'circle', size = 20, fill_color='Green')
output_file('scatter.html')
show(p)
```



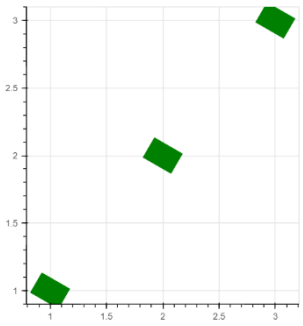
case vi) Area plot

```
from bokeh.plotting import figure, output_file, show
p=figure(plot_width = 800, plot_height = 400)
x = [1, 2, 5, 7, 9]
y1= [2, 5, 4, 6, 8]
y2= [5, 9, 11, 12, 15]
p.varea(x=x, y1=y1,y2=y2)
output_file('area.html')
show(p)
```



case vii) rectangle plot

```
from bokeh.plotting import figure, output_file, show
from math import pi
p=figure(plot_width = 400, plot_height = 400)
p.rect(x=[1,2, 3], y=[1,2,3], width=0.2, height=40, color='Green', angle=pi/3,
height_units='screen')
output_file('Rectangle.html')
show(p)
```



case viii) plot with legend

```
import numpy as np
from bokeh.plotting import figure, output_file, show
from math import pi
x=np.linspace(0, 4*np.pi, 100)
y=np.sin(x)
p=figure()
p.circle(x,y, legend_label="sin(x)")
p.line(x,y, legend_label="sin(x)")
p.line(x, 2*y, legend_label="2*sin(x)", line_dash=[10,5], line_color='orange', line_width= 2)
p.square(x, 3*y, legend_label="3*sin(x)",fill_color=None, line_color= 'Green')
p.line(x, 3*y, legend_label="3*sin(x)",line_color = 'green')
p.legend.location = 'bottom_left'
output_file('Rectangle.html')
show(p)
```