O Básico sobre Matplotlib

1 - Inline vs. notebook

In [1]:
```
#matplotlib inline

%matplotlib notebook
```

2 - Acessando a camada backend

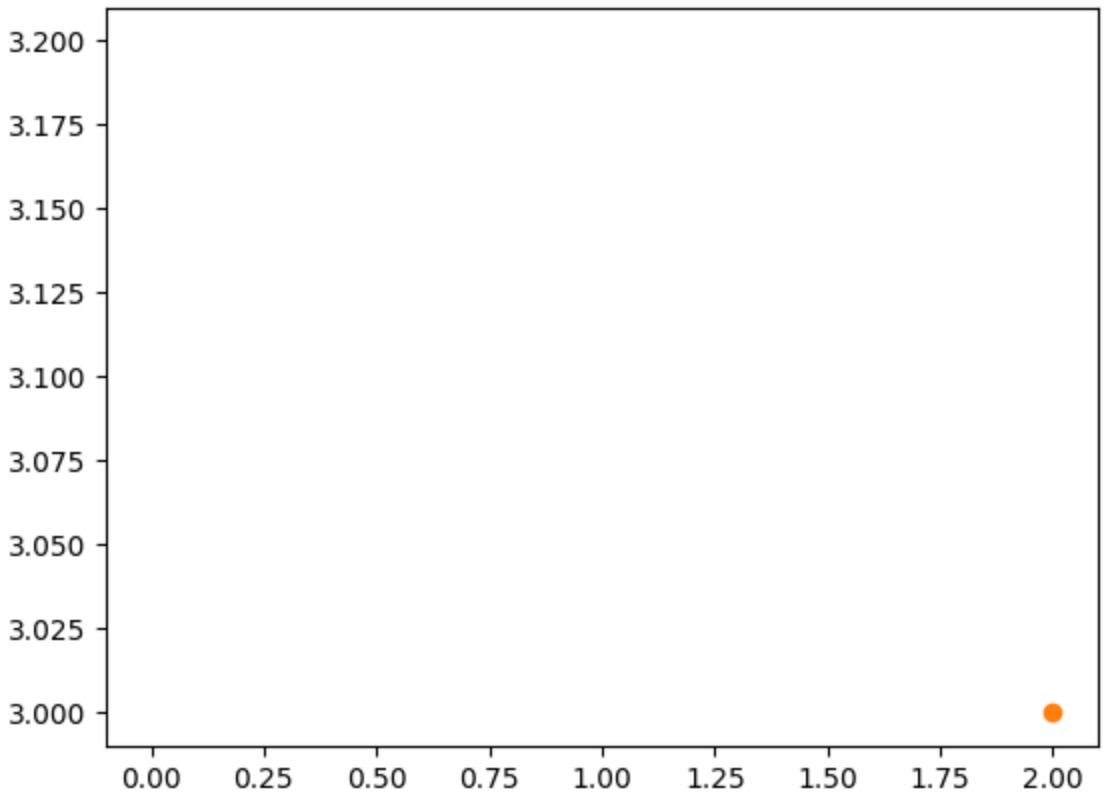
In [2]:
```
import matplotlib as mpl
print(mpl.get_backend())
```

```
nbAgg
```

3 - Importar Pyplot (camada de script)

In [3]:
```
import matplotlib.pyplot as plt
```

In [4]:
```
plt.plot(3.2)
```



Out[4]:
```
[<matplotlib.lines.Line2D at 0x7ffe318904f0>]
```

In [5]:
```
plt.plot(2,3,'o')
```

```
[<matplotlib.lines.Line2D at 0x7ffe31890a60>]
```

Out[5]:

4 - Trabalhando direto na camada do artista

In [6]:

```
from matplotlib.backends.backend_agg import FigureCanvasAgg
from matplotlib.figure import Figure

# Cria nova figura
fig = Figure()

# associa a figura ao backend
canvas = FigureCanvasAgg(fig)

# adiciona um subplot à figura
ax = fig.add_subplot(111)

# plota o ponto
ax.plot(3, 2, '.')

#Salva a figura
canvas.print_png('test.png')
```

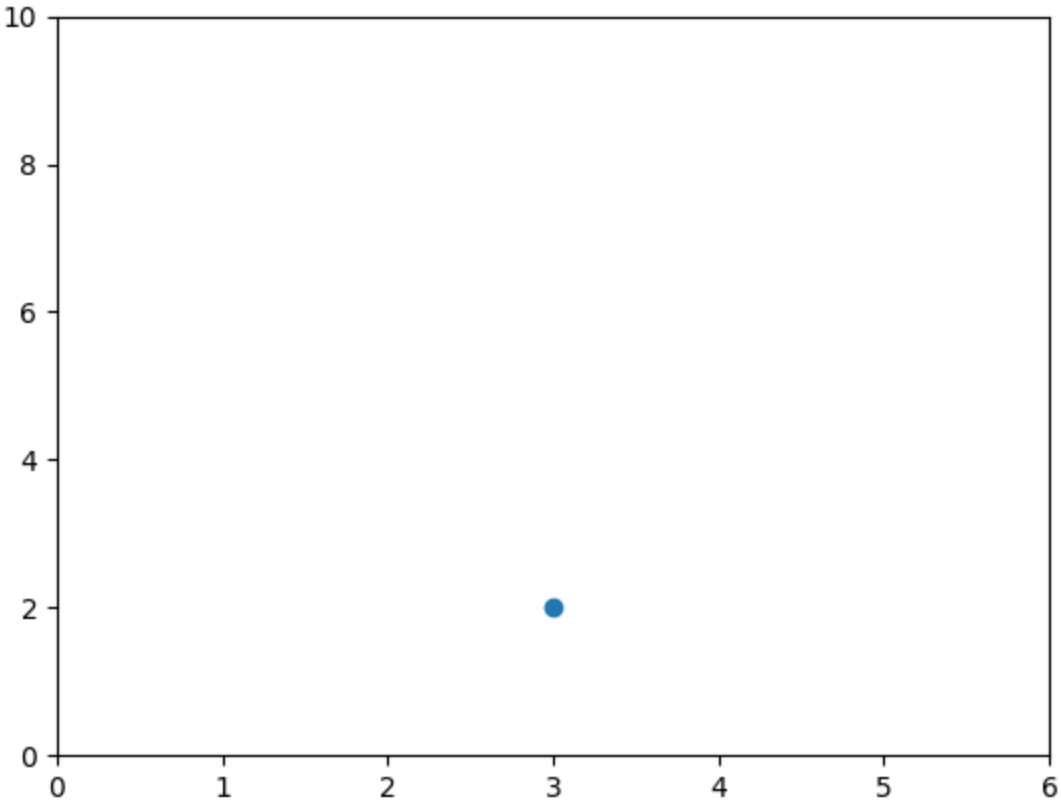
In [7]:

```
%%html
<img src='test.png' />
```

5 - Voltando à camada de scripting

In [8]:

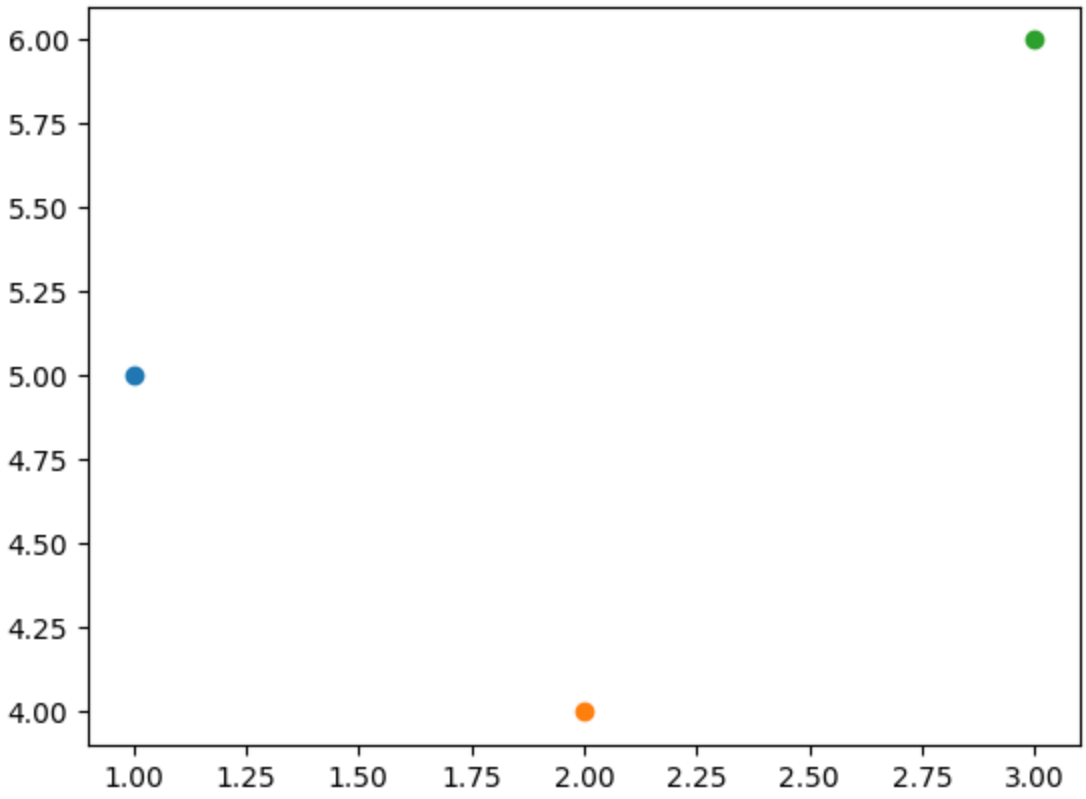
```
# cria uma nova figura
plt.figure()
# plota o ponto 3,2 usando o marcador 'o'
plt.plot(3,2,'o')
# pega ambos os eixos (get the current axes) e atribui à variável ax
ax = plt.gca()
# configura limites nos eixos [xmin, xmax, ymin, ymax]
ax.axis([0,6,0,10])
```



Out[8]: (0.0, 6.0, 0.0, 10.0)

6 - Adicionando mais dados à figura

In [9]:
```
# cria nova figura
plt.figure()
plt.plot(1,5,'o')
plt.plot(2,4,'o')
plt.plot(3,6,'o')
```



Out[9]:
```
[<matplotlib.lines.Line2D at 0x7ffe31b639d0>]
```

7 - Levantamento dos objetos de uma figura

In [10]:
```
ax = plt.gca()

ax.get_children()
```

Out[10]:
```
[<matplotlib.lines.Line2D at 0x7ffe31b632b0>,
 <matplotlib.lines.Line2D at 0x7ffe31b63640>,
 <matplotlib.lines.Line2D at 0x7ffe31b639d0>,
 <matplotlib.spines.Spine at 0x7ffe31b13a30>,
 <matplotlib.spines.Spine at 0x7ffe31890880>,
 <matplotlib.spines.Spine at 0x7ffe31b13c40>,
 <matplotlib.spines.Spine at 0x7ffe31b13d60>,
 <matplotlib.axis.XAxis at 0x7ffe31b139d0>,
 <matplotlib.axis.YAxis at 0x7ffe31b1c280>,
 Text(0.5, 1.0, ''),
 Text(0.0, 1.0, ''),
 Text(1.0, 1.0, ''),
 <matplotlib.patches.Rectangle at 0x7ffe31b2aa00>]
```

Plots de dispersão - Scatter plots

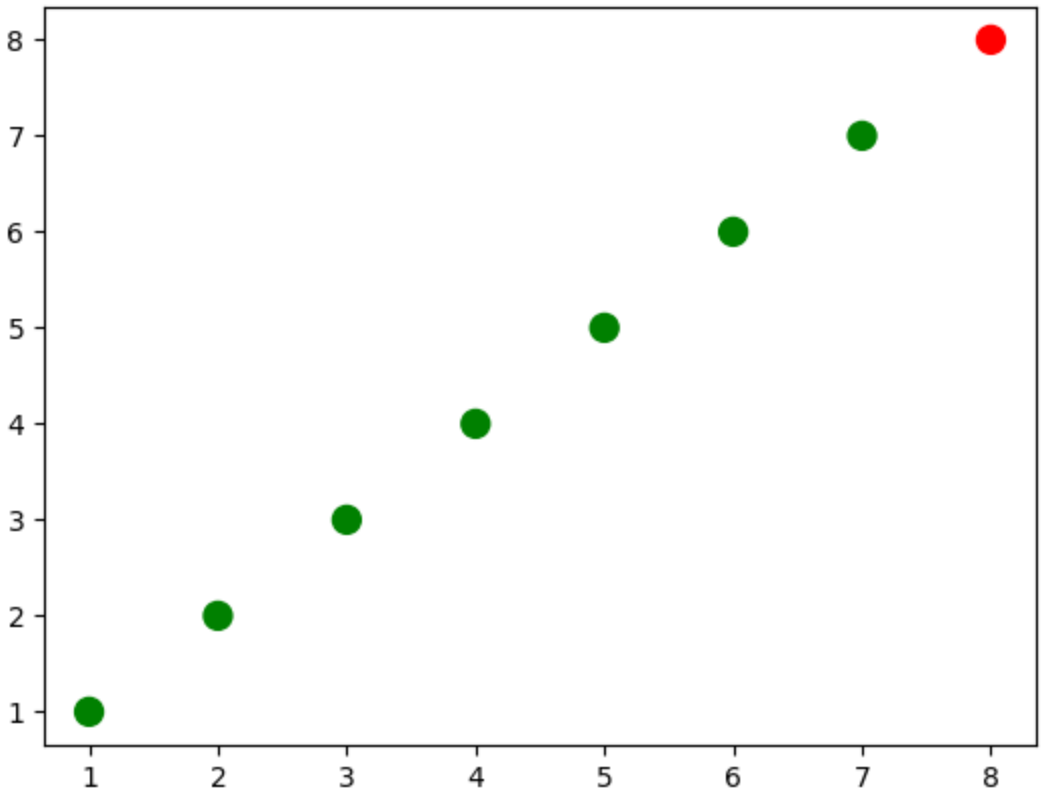
8 - Se os dois argumentos têm mesmo valor, temos uma diagonal.

In [11]:
```
import numpy as np

x = np.array([1,2,3,4,5,6,7,8])
y = x
```

```
plt.figure()
plt.scatter(x,y)

plt.gca().get_children()
# similar ao plt.plot(x, y, '.'), porém os objetos filhos não são Line2D
# e sim PathCollection
```



Out[11]:
```
[<matplotlib.collections.PathCollection at 0x7ffe31bba040>,
 <matplotlib.spines.Spine at 0x7ffe31b7db80>,
 <matplotlib.spines.Spine at 0x7ffe31b7dca0>,
 <matplotlib.spines.Spine at 0x7ffe31b7ddc0>,
 <matplotlib.spines.Spine at 0x7ffe31b7dee0>,
 <matplotlib.axis.XAxis at 0x7ffe31b7db20>,
 <matplotlib.axis.YAxis at 0x7ffe31b83400>,
 Text(0.5, 1.0, ''),
 Text(0.0, 1.0, ''),
 Text(1.0, 1.0, ''),
 <matplotlib.patches.Rectangle at 0x7ffe31ba4b80>]
```

9 - Atribuição de cores dentro da mesma coleção

In [12]:
```
# criar uma lista de cores verdes...
colors = ['green']*(len(x)-1)
# com o último elemento vermelho
colors.append('red')


plt.scatter(x,y, s=100, c=colors)


# plotar os pontos com tamanho 100 e as cores selecionadas
```

Out[12]:
```
<matplotlib.collections.PathCollection at 0x7ffe31bc8430>
```

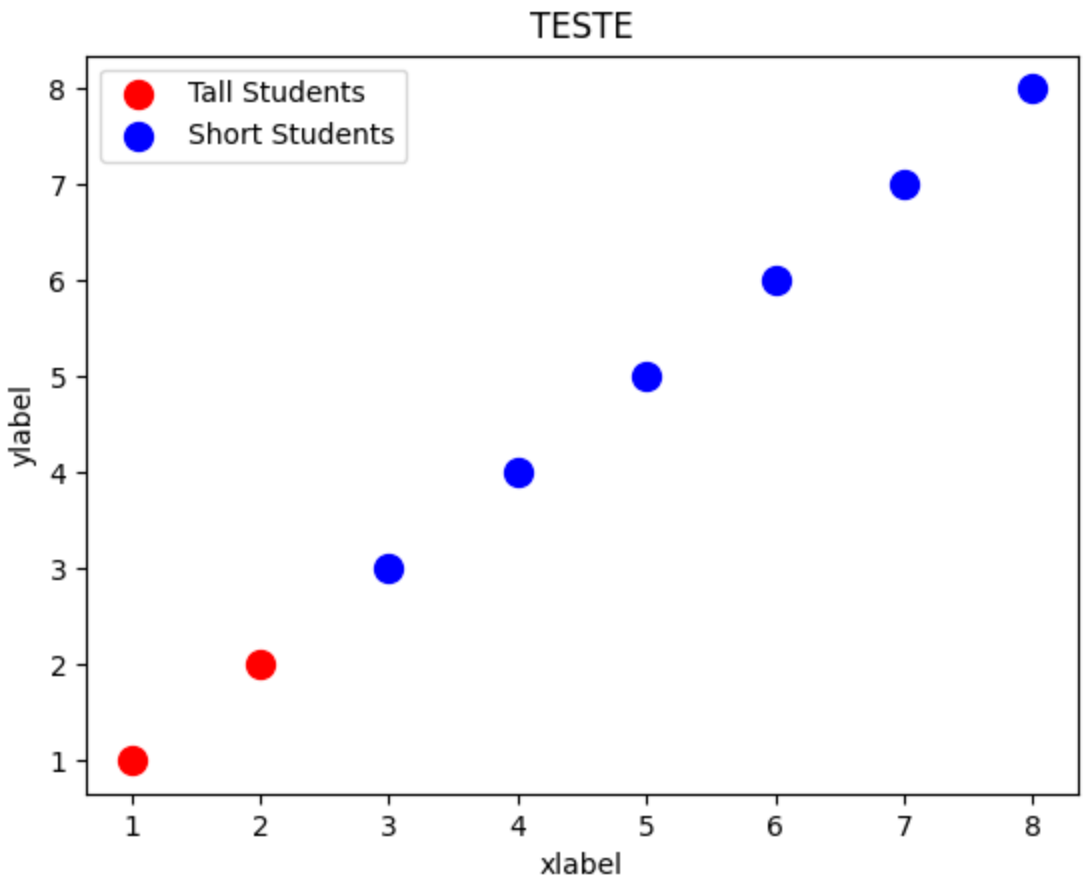
10 - Plotando coleções com cores diferentes

In [13]:
```
plt.figure()

# plotar 'Tall students' em vermelho usando os dois primeiros elementos
plt.scatter(x[:2], y[:2], s=100, c='red', label='Tall Students')
# plotar 'Short students' em azul usando o restante dos elementos
plt.scatter(x[2:], y[2:], s=100, c='blue', label='Short Students')



#plt.gcf().get_children()
#plt.gca().get_children()
```



Out[13]:
```
<matplotlib.collections.PathCollection at 0x7ffe2e8b2790>
```

11 - Adicionar labels no eixos e o título do plot.

In [14]:
```
# adicionar label no eixo x
plt.xlabel('xlabel')
# adicionar label no eixo y
plt.ylabel('ylabel')
# adicionar título
plt.title('TESTE')
```

Out[14]:
```
Text(0.5, 1.0, 'TESTE')
```

12 - Adicionar legendas

In [15]:
```
# adicionar legenda
plt.legend()
```

Out[15]:
```
<matplotlib.legend.Legend at 0x7ffe31b63ac0>
```

13 - Configurar legendas

In [16]:
```
# reposicionar legenda e tirar quadro
plt.legend(loc=4, frameon=False, title='Legend')
```

Out[16]:
```
<matplotlib.legend.Legend at 0x7ffe2e8c6c40>
```

14 - Verificar objeto legenda

In [17]:
```
# imprimir os objetos filhos dos eixos correntes
plt.gca().get_children()
```

Out[17]:
```
[<matplotlib.collections.PathCollection at 0x7ffe2e8b2370>,
 <matplotlib.collections.PathCollection at 0x7ffe2e8b2790>,
 <matplotlib.spines.Spine at 0x7ffe31bdac40>,
 <matplotlib.spines.Spine at 0x7ffe31b63c40>,
 <matplotlib.spines.Spine at 0x7ffe31bdaf10>,
 <matplotlib.spines.Spine at 0x7ffe2e881070>,
 <matplotlib.axis.XAxis at 0x7ffe31bdaca0>,
 <matplotlib.axis.YAxis at 0x7ffe2e881550>,
 Text(0.5, 1.0, 'TESTE'),
 Text(0.0, 1.0, ''),
 Text(1.0, 1.0, ''),
 <matplotlib.legend.Legend at 0x7ffe2e8c6c40>,
 <matplotlib.patches.Rectangle at 0x7ffe2e88eca0>]
```

15 - Navegando pelos objetos da Legenda (acessando a camada artist)

In [18]:
```
# pegar a legenda dos eixos correntes
legend = plt.gca().get_children()[-2]
```

In [19]:
```
# podemos usar get_children para navegar pelas classes artistas
legend.get_children()[0].get_children()[1].get_children()[0].get_children()
```

Out[19]:
```
[<matplotlib.offsetbox.HPacker at 0x7ffe2e897220>,
 <matplotlib.offsetbox.HPacker at 0x7ffe31b7d610>]
```

In [20]:
```
# importa a classe artist do matplotlib
from matplotlib.artist import Artist

def rec_gc(art, depth=0):
    if isinstance(art, Artist):
        # aumentar a profundidade para impressão bonita
        print("  " * depth + str(art))
        for child in art.get_children():
            rec_gc(child, depth+2)

# Chame essa função no objeto legend para ver como ele é composta
rec_gc(plt.legend())
```

```
Legend
    <matplotlib.offsetbox.VPacker object at 0x7ffe2e8e1e50>
        <matplotlib.offsetbox.TextArea object at 0x7ffe2e8e1c70>
            Text(0, 0, '')
```

```
        <matplotlib.offsetbox.HPacker object at 0x7ffe2e8e1b80>
            <matplotlib.offsetbox.VPacker object at 0x7ffe2e8e1a30>
                <matplotlib.offsetbox.HPacker object at 0x7ffe2e8e1a90>
                    <matplotlib.offsetbox.DrawingArea object at 0x7ffe2e8e12e0>
                        <matplotlib.collections.PathCollection object at 0x7ffe2e8e1460>
                    <matplotlib.offsetbox.TextArea object at 0x7ffe2e8e1070>
                        Text(0, 0, 'Tall Students')
                <matplotlib.offsetbox.HPacker object at 0x7ffe2e8e1ac0>
                    <matplotlib.offsetbox.DrawingArea object at 0x7ffe2e8e1820>
                        <matplotlib.collections.PathCollection object at 0x7ffe2e8e19a0>
                    <matplotlib.offsetbox.TextArea object at 0x7ffe2e8e1520>
                        Text(0, 0, 'Short Students')
    FancyBboxPatch((0, 0), width=1, height=1)
```

Plotagem linear

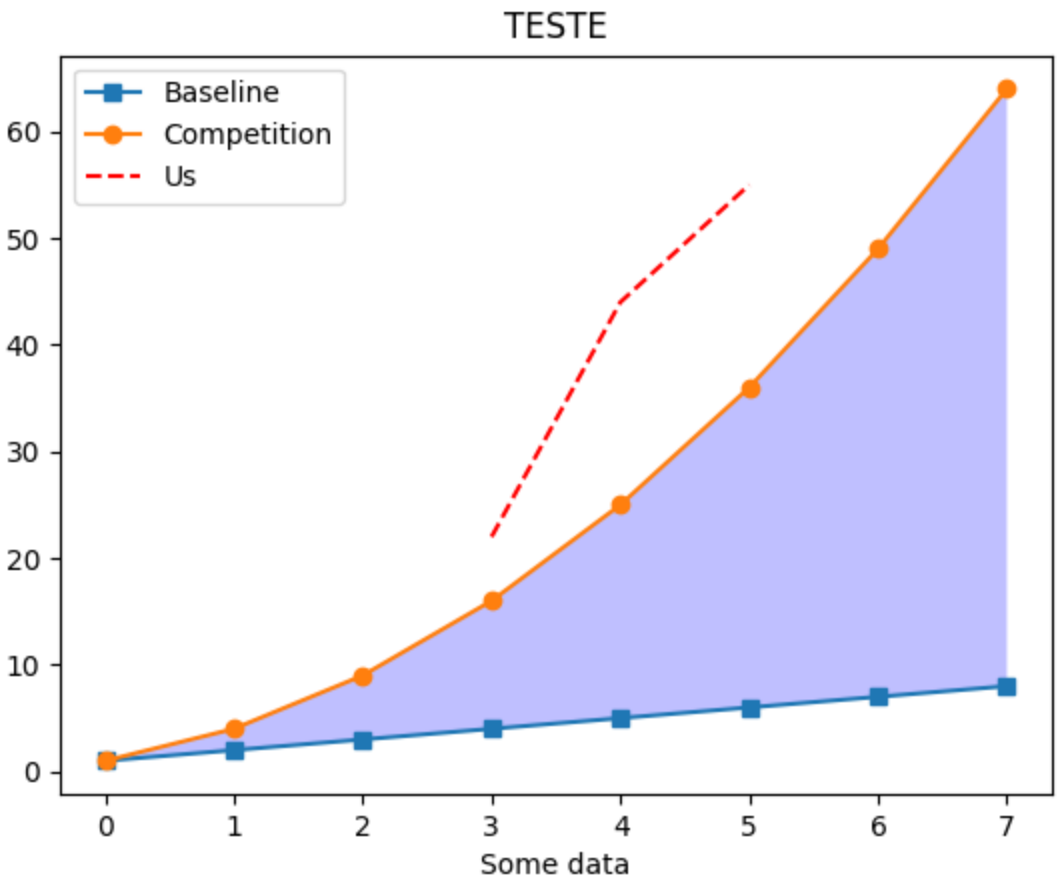
16 - Exemplo de plot linear

In [21]:

```
linear = np.array([1,2,3,4,5,6,7,8])
exponential = linear**2

plt.figure()

plt.plot(linear,'-s', exponential, '-o')
```



Out[21]:

```
[<matplotlib.lines.Line2D at 0x7ffe31c1ebb0>,
 <matplotlib.lines.Line2D at 0x7ffe31c1eaf0>]
```

17 - Outro exemplo

In [22]:

```
plt.plot([3,4,5],[22,44,55], '--r')
```

Out[22]:
```
[<matplotlib.lines.Line2D at 0x7ffe2e8e5d60>]
```

18 - Adiciona labels, título e legenda

In [23]:
```
plt.xlabel('Some data')
plt.title('TESTE')
plt.legend(['Baseline', 'Competition', 'Us'])
```

Out[23]:
```
<matplotlib.legend.Legend at 0x7ffe31c2d9d0>
```

19 - Preenche a área entre os dados lineares e exponenciais

In [24]:
```
#fill_between
plt.gca().fill_between(range(len(linear)),
                       linear, exponential,
                       facecolor='blue',
                       alpha=0.25)
```

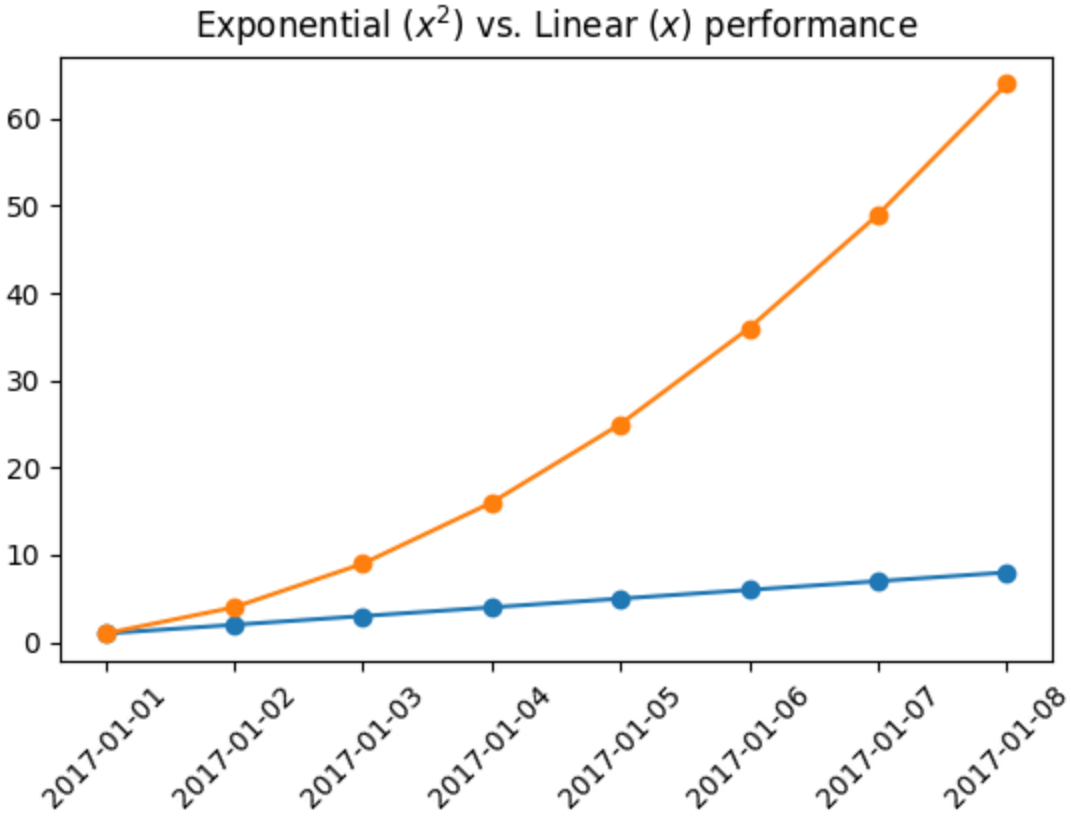
Out[24]:
```
<matplotlib.collections.PolyCollection at 0x7ffe31c40a30>
```

20 - Agora vamos colocar datas nos ticks do eixo x

In [25]:
```
plt.figure()

observation_dates = np.arange('2017-01-01', '2017-01-09', dtype='datetime64[D]')

plt.plot(observation_dates, linear, '-o',  observation_dates, exponential, '-o')
```



Out[25]:
```
[<matplotlib.lines.Line2D at 0x7ffe315a3760>,
 <matplotlib.lines.Line2D at 0x7ffe315d6580>]
```

21 - Rodando os labels dos ticks do eixo x (acessando o modo artista)

In [26]:
```
x = plt.gca().xaxis

#rec_gc(x)

for item in x.get_ticklabels():
    item.set_rotation(45)
```

22 - Ajustando subplots

In [27]:
```
plt.subplots_adjust(bottom=0.25)
```

23 - Rótulos dos eixos x e y + título do plot

In [28]:
```
ax = plt.gca()
```

24 - Compatibilidade com Latex

In [29]:
```
ax.set_title("Exponential ($x^2$) vs. Linear ($x$) performance")
```

Out[29]:
```
Text(0.5, 1.0, 'Exponential ($x^2$) vs. Linear ($x$) performance')
```

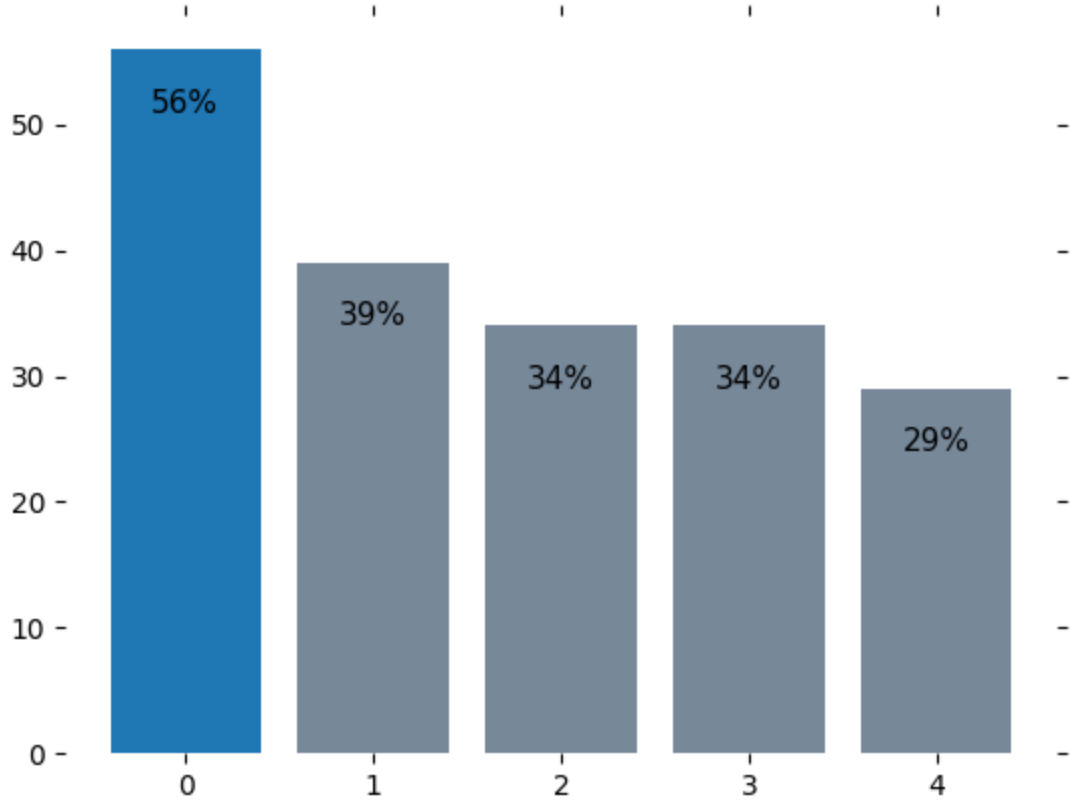
Barras

25 - Exemplo de um chart em barras

In [30]:
```
plt.figure()

languages =['Python', 'SQL', 'Java', 'C++', 'JavaScript']
popularity = [56, 39, 34, 34, 29]

xvals = range(len(languages))
plt.bar(xvals, popularity, width = 0.5)
```



Out[30]: <BarContainer object of 5 artists>

26 - Adicionando o valor na barra

In [31]:
```
pos = np.arange(len(languages))

bars = plt.bar(pos, popularity, align='center', linewidth=0, color="lightslategrey")
bars[0].set_color('#1F77B4')

for bar in bars:
    plt.gca().text(bar.get_x() + bar.get_width()/2, bar.get_height() - 5, str(int(bar.get_
                   ha='center', fontsize=11)
```

27 - Limpando parâmetros dos "ticks"

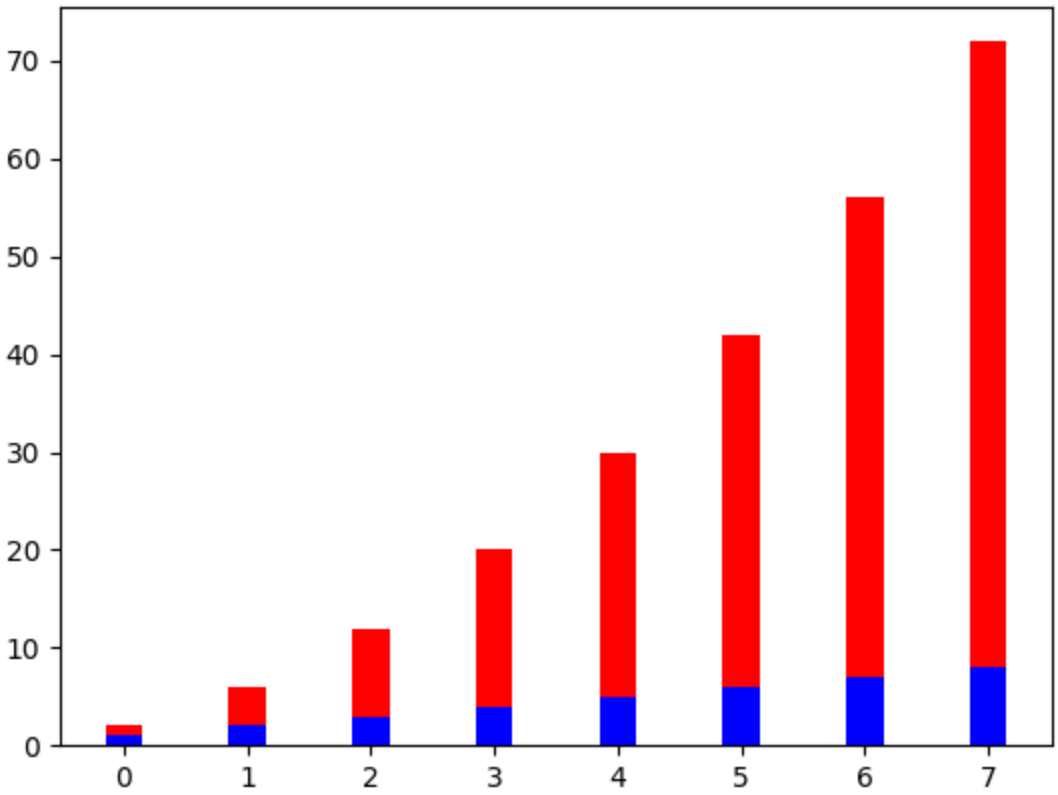
In [32]:
```
plt.tick_params(top='off', bottom='off', left='off', right='off', labelleft='off', labelbo
```

28 - Tirando o quadro em volta do plot

In [33]:
```
for spine in plt.gca().spines.values():
    spine.set_visible(False)
```

29 - Empilhamento de barras

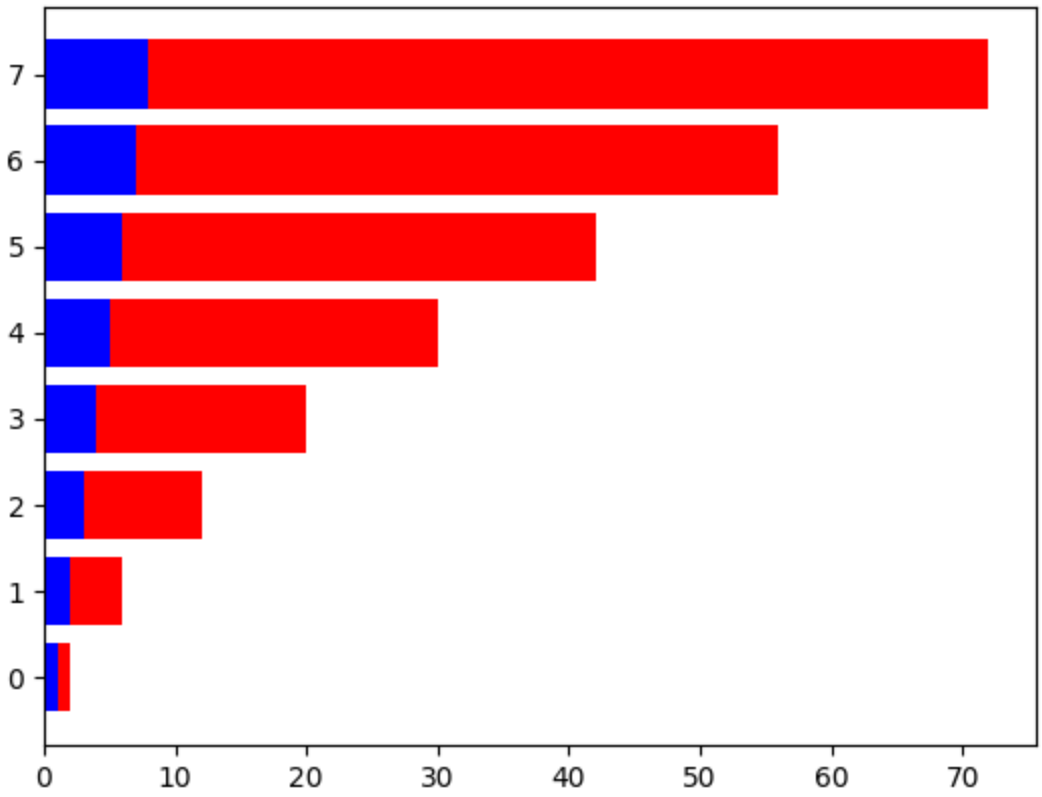
In [34]:
```
plt.figure()
xvals = range(len(linear))
plt.bar(xvals, linear, width = 0.3, color='b')
plt.bar(xvals, exponential, width = 0.3, bottom=linear, color='r')
```



Out[34]: <BarContainer object of 8 artists>

30 - Barras horizontais

In [35]:
```
plt.figure()
xvals = range(len(linear))
plt.barh(xvals, linear, color='b')
plt.barh(xvals, exponential, left=linear, color='r')
```



Out[35]: <BarContainer object of 8 artists>