Introduction to Computer Programming

Week 9.1: Matplotlib - Plotting

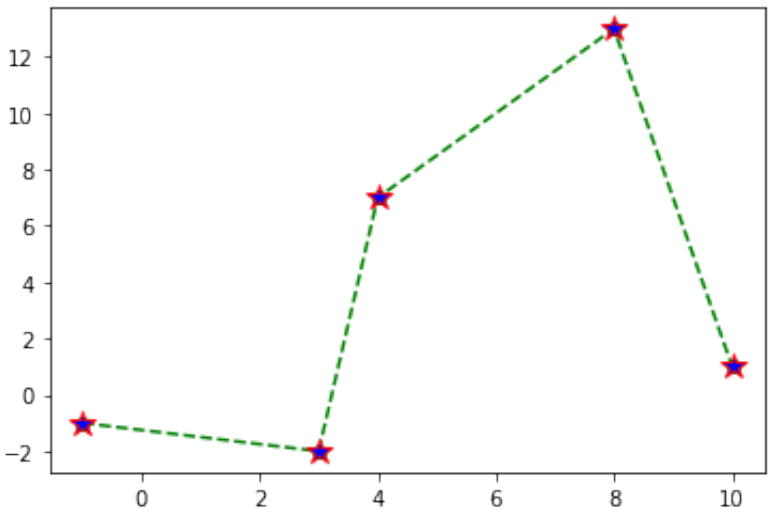
In-class Demos

In [5]:
```
import matplotlib.pyplot as plt
%matplotlib inline
import numpy as np

```

Example 1: Use the format string to change the appearance of the plot of f against x.

In [8]:
```
x = [-1, 3, 4, 8, 10]
f = [-1, -2, 7, 13 , 1]
```

In [9]:
```
plt.plot(x, f, '--og')

#plt.plot(x, f, 'k.')

#plt.plot(x, f, 'ro')

plt.plot(x, f, 'r*', markerfacecolor='blue', markersize=12)

plt.show()
```



Example 2:

Display:

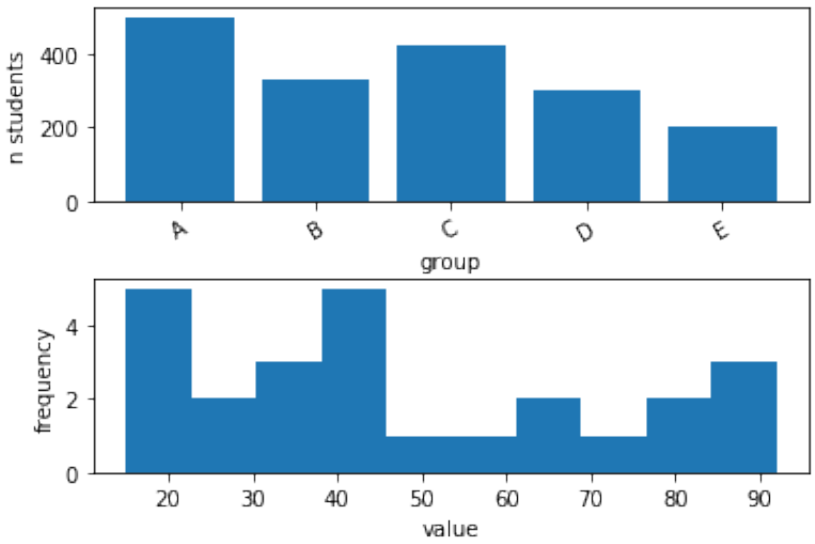
- the bar chart of the students in each group
- the histogram of the frequency distribution of z

as two subplots on the same figure.

`subplots_adjust` can be used to adjust the spacing between plots
https://matplotlib.org/stable/api/_as_gen/matplotlib.pyplot.subplots_adjust.html
(https://matplotlib.org/stable/api/_as_gen/matplotlib.pyplot.subplots_adjust.html)

In [10]:
```
#sample data
groups = ('A', 'B', 'C', 'D', 'E')
num_students = (500, 332, 425, 300, 200)
z = np.random.randint(low=0, high=100, size=25)
```

In [11]:
```
plt.subplot(211)                          # 2 rows, 1 column, ind
x_pos = np.arange(len(groups))            # array with element fo
plt.bar(x_pos, num_students)              # bar chart
plt.xticks(x_pos, groups, rotation=30)    # replace labels
plt.xlabel('group')
plt.ylabel('n students')

plt.subplot(212)                          # 2 rows, 1 column, ind
plt.hist(z, bins=10)                      # histogram of data and
plt.xlabel('value')
plt.ylabel('frequency')


plt.subplots_adjust(hspace = 0.4)      # adjust spacing

plt.show()
```



Example 3:
Import height and weight data from `sample_data/sample_student_data.txt` and plot a scatter plot of the data.

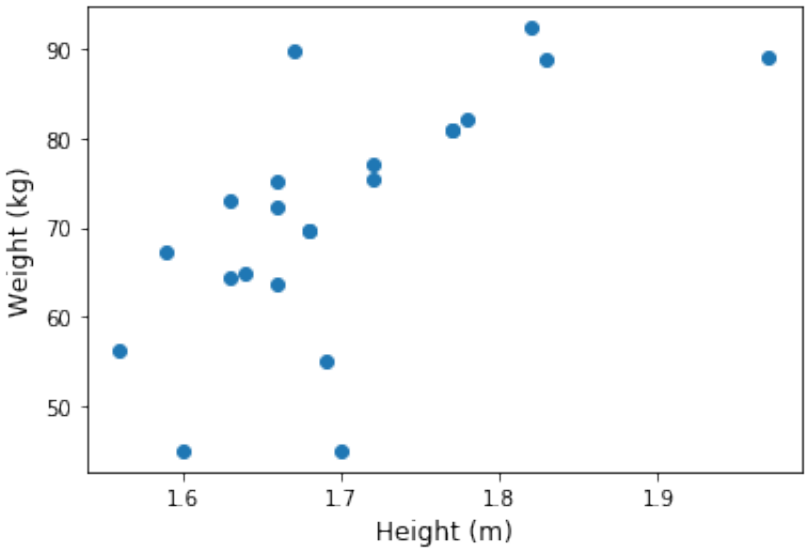
How can we change the colour of the markers in the plot?

In [17]:
```
import matplotlib.pyplot as plt
import numpy as np

students = np.loadtxt('sample_data/sample_student_data.txt',
                      skiprows=2,
                      usecols=(3,4))


print(students[:2,:]) # have a look at the data
```

```
[[ 1.82 92.4 ]
 [ 1.77 80.9 ]]
```

In [18]:
```
# Plot column 1 against column 0
plt.plot(students[:, 0], students[:, 1], 'o')

# change colour
# plt.plot(students[:, 0], students[:, 1], 'ko', markerfacecolo

# Axes labels
plt.xlabel('Height (m)')
plt.ylabel('Weight (kg)')
```

Out[18]: `Text(0, 0.5, 'Weight (kg)')`



Example 4: (Extra)

Import height and weight data from `sample_data/sample_student_data.txt` .

Display the plots:

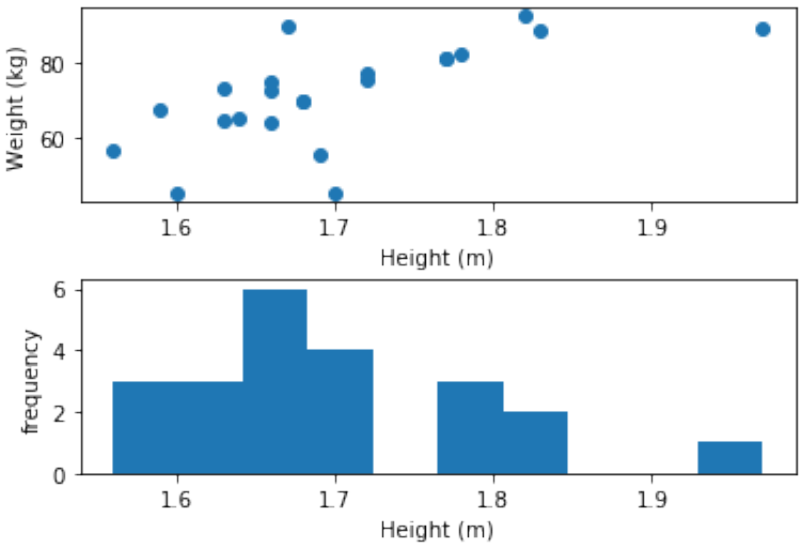
- scatter graph of height(horizontal axis) vs weight (vertical axis)
- frequency distribution of the height of each student

as two subplots of the same figure.

Format the subplots so that they share the same x axis lables(s).

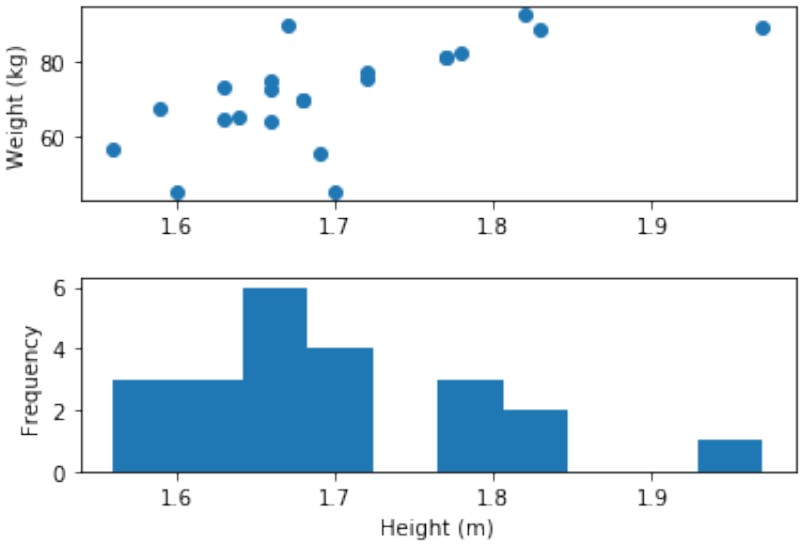
In [19]:

```
students = np.loadtxt('sample_data/sample_student_data.txt',
                      skiprows=2,
                      dtype=str)

height = students[:, 3].astype(float)
weight = students[:, 4].astype(float)

plt.subplot(211)
plt.plot(height, weight, 'o')
plt.xlabel('Height (m)')
plt.ylabel('Weight (kg)')

plt.subplot(212)
plt.hist(height, bins=10);
plt.xlabel('Height (m)')
plt.ylabel('frequency')

plt.subplots_adjust(hspace = 0.4)
```



In [20]:
```
fig, ax = plt.subplots(nrows=2)  # 2 rows, 1 column
#fig, ax = plt.subplots(nrows=2, sharex=True)  # 2 rows, 1 colu
#fig, ax = plt.subplots(2,1)  # 2 rows, 1 column

height = students[:, 3].astype(float)
weight = students[:, 4].astype(float)

ax[0].plot(height, weight, 'o') # 1st row
ax[0].set(ylabel="Weight (kg)")


ax[1].hist(height, bins=10)
ax[1].set(xlabel="Height (m)",ylabel="Frequency")


plt.subplots_adjust(hspace = 0.4)   # the amount of height rese


fig.show()
```

```
/Users/hp12384/opt/anaconda3/lib/python3.7/site-packages/ipykernel
_launcher.py:19: UserWarning: Matplotlib is currently using module
://ipykernel.pylab.backend_inline, which is a non-GUI backend, so
cannot show the figure.
```



https://matplotlib.org/3.1.1/gallery/subplots_axes_and_figures/subplots_demo.html (https://matplotlib.org/3.1.1/gallery/subplots_axes_and_figures/subplots_demo.html)

In [ ]:

In [ ]:

In [ ]:

In [ ]:
```
1
```