

In [2]:

```
import numpy as np
import pandas as pd
import scipy as sp
```

In [3]:

```
%matplotlib inline
import matplotlib.pyplot as plt
plt.style.use('ggplot')
```

In [4]:

```
%%file hw_data.csv
id,sex,height
1,M,190,77
2,F,120,70
3,F,110,68
4,M,150,72
5,O,120,66
6,M,120,60
7,F,140,70
```

Overwriting hw_data.csv

Python

1. Finish creating the following function that takes a list and returns the average value.

In [1]:

```
def average(my_list):
    total = 0
    for item in my_list:
        #do something with item!

    return 0

average([1,2,1,4,3,2,5,9])
```

Out[1]:

0

2. Using a Dictionary keep track of the count of numbers (or items) from a list

In []:

```
def counts(my_list):
    counts = dict()
    for item in my_list:
        #do something with item!

    return counts

counts([1,2,1,4,3,2,5,9])
```

3. Using the counts() function and the .split() function, return a dictionary

of most occurring words from the following paragraph. Bonus, remove punctuation from words.

In [13]:

```
paragraph_text = '''
For a minute or two she stood looking at the house, and wondering what to do next, when suddenly a
footman in livery came running out of the wood—(she considered him to be a footman because he was
in livery: otherwise, judging by his face only, she would have called him a fish)—and rapped loudly
at the door with his knuckles. It was opened by another footman in livery, with a round face, and
large eyes like a frog; and both footmen, Alice noticed, had powdered hair that curled all over
their heads. She felt very curious to know what it was all about, and crept a little way out of the
wood to listen.
The Fish-Footman began by producing from under his arm a great letter, nearly as large as himself,
and this he handed over to the other, saying, in a solemn tone, 'For the Duchess. An invitation from
the Queen to play croquet.' The Frog-Footman repeated, in the same solemn tone, only changing the
order of the words a little, 'From the Queen. An invitation for the Duchess to play croquet.'
Then they both bowed low, and their curls got entangled together.
Alice laughed so much at this, that she had to run back into the wood for fear of their hearing her;
and when she next peeped out the Fish-Footman was gone, and the other was sitting on the ground near
the door, staring stupidly up into the sky.
Alice went timidly up to the door, and knocked.
'There's no sort of use in knocking,' said the Footman, 'and that for two reasons. First, because
I'm on the same side of the door as you are; secondly, because they're making such a noise inside,
no one could possibly hear you.' And certainly there was a most extraordinary noise going on within—a
constant howling and sneezing, and every now and then a great crash, as if a dish or kettle had
been broken to pieces.
'Please, then,' said Alice, 'how am I to get in?'
'There might be some sense in your knocking,' the Footman went on without attending to her, 'if we
had the door between us. For instance, if you were inside, you might knock, and I could let you out,
you know.' He was looking up into the sky all the time he was speaking, and this Alice thought
decidedly uncivil. 'But perhaps he can't help it,' she said to herself; 'his eyes are so very nearly
at the top of his head. But at any rate he might answer questions.—How am I to get in?' she repeated,
aloud.
'I shall sit here,' the Footman remarked, 'till tomorrow—'
At this moment the door of the house opened, and a large plate came skimming out, straight at the
Footman's head: it just grazed his nose, and broke to pieces against one of the trees behind him.'
''
```

In [23]:

```
# remove punctuation
for char in ',?\'-)(.!:\\n':
    paragraph_text=paragraph_text.replace(char, ' ')
# remove upper case
paragraph_text=paragraph_text.lower()
```

In [24]:

```
print(paragraph_text)
```

for a minute or two she stood looking at the house and wondering what to do next when suddenly a footman in livery came running out of the wood she considered him to be a footman because he was in livery otherwise judging by his face only she would have called him a fish and rapped loudly at the door with his knuckles it was opened by another footman in livery with a round face and large eyes like a frog and both footmen alice noticed had powdered hair that curled all over their heads she felt very curious to know what it was all about and crept a little way out of the wood to listen the fish-footman began by producing from under his arm a great letter nearly as large as himself and this he handed over to the other saying in a solemn tone for the duchess an invitation from the queen to play croquet the frog-footman repeated in the same solemn tone only changing the order of the words a little from the queen an invitation for the duchess to play croquet then they both bowed low and their curls got entangled together alice laughed so much at this that she had to run back into the wood for fear of their hearing her and when she next peeped out the fish-footman was gone and the other was sitting on the ground near the door staring stupidly up into the sky alice went timidly up to the door and knocked there s no sort of use in knocking said the footman and that for two reasons first because i m on the same side of the door as you are secondly because they re making such a noise inside no one could possibly hear you and certainly there was a most extraordinary noise going on within a constant howling and sneezing and every now and then a great crash as if a dish or kettle had been broken to pieces please then said alice how am i to get in there might be some sense in your knocking the footman went on without attending to her if we had the door between us for instance if you were inside you might knock and i could let you out you know he was looking up into the sky all the time he was speaking and this alice thought decidedly uncivil but perhaps he can t help it she said to herself his eyes are so very nearly at the top of his head but

at any rate he might answer questions how am i to get in she repeated aloud i shall sit here the footman remarked till tomorrow at this moment the door of the house opened and a large plate came skimming out straight at the footman's head it just grazed his nose and broke to pieces against one of the trees behind him

In [26]:

```
#convert text to string
word_list = paragraph_text.split()
print(word_list)
```

```
['for', 'a', 'minute', 'or', 'two', 'she', 'stood', 'looking', 'at', 'the', 'house', 'and', 'wondering', 'what', 'to', 'do', 'next', 'when', 'suddenly', 'a', 'footman', 'in', 'livery', 'came', 'running', 'out', 'of', 'the', 'wood', 'she', 'considered', 'him', 'to', 'be', 'a', 'footman', 'because', 'he', 'was', 'in', 'livery', 'otherwise', 'judging', 'by', 'his', 'face', 'only', 'she', 'would', 'have', 'called', 'him', 'a', 'fish', 'and', 'rapped', 'loudly', 'at', 'the', 'door', 'with', 'his', 'knuckles', 'it', 'was', 'opened', 'by', 'another', 'footman', 'in', 'livery', 'with', 'a', 'round', 'face', 'and', 'large', 'eyes', 'like', 'a', 'frog', 'and', 'both', 'footmen', 'alice', 'noticed', 'had', 'powdered', 'hair', 'that', 'curled', 'all', 'over', 'their', 'heads', 'she', 'felt', 'very', 'curious', 'to', 'know', 'what', 'it', 'was', 'all', 'about', 'and', 'crept', 'a', 'little', 'way', 'out', 'of', 'the', 'wood', 'to', 'listen', 'the', 'fish-footman', 'began', 'by', 'producing', 'from', 'under', 'his', 'arm', 'a', 'great', 'letter', 'nearly', 'as', 'large', 'as', 'himself', 'and', 'this', 'he', 'handed', 'over', 'to', 'the', 'other', 'saying', 'in', 'a', 'solemn', 'tone', 'for', 'the', 'duchess', 'an', 'invitation', 'from', 'the', 'queen', 'to', 'play', 'croquet', 'the', 'frog-footman', 'repeated', 'in', 'the', 'same', 'solemn', 'tone', 'only', 'changing', 'the', 'order', 'of', 'the', 'words', 'a', 'little', 'from', 'the', 'queen', 'an', 'invitation', 'for', 'the', 'duchess', 'to', 'play', 'croquet', 'then', 'they', 'both', 'bowed', 'low', 'and', 'their', 'curls', 'got', 'entangled', 'together', 'alice', 'laughed', 'so', 'much', 'at', 'this', 'that', 'she', 'had', 'to', 'run', 'back', 'into', 'the', 'wood', 'for', 'fear', 'of', 'their', 'hearing', 'her', 'and', 'when', 'she', 'next', 'peeped', 'out', 'the', 'fish-footman', 'was', 'gone', 'and', 'the', 'other', 'was', 'sitting', 'on', 'the', 'ground', 'near', 'the', 'door', 'staring', 'stupidly', 'up', 'into', 'the', 'sky', 'alice', 'went', 'timidly', 'up', 'to', 'the', 'door', 'and', 'knocked', 'there', 's', 'no', 'sort', 'of', 'use', 'in', 'knocking', 'said', 'the', 'footman', 'and', 'that', 'for', 'two', 'reasons', 'first', 'because', 'i', 'm', 'on', 'the', 'same', 'side', 'of', 'the', 'door', 'as', 'you', 'are', 'secondly', 'because', 'they', 're', 'making', 'such', 'a', 'noise', 'inside', 'no', 'one', 'could', 'possibly', 'hear', 'you', 'and', 'certainly', 'there', 'was', 'a', 'most', 'extraordinary', 'noise', 'going', 'on', 'within', 'a', 'constant', 'howling', 'and', 'sneezing', 'and', 'every', 'now', 'and', 'then', 'a', 'great', 'crash', 'as', 'if', 'a', 'dish', 'or', 'kettle', 'had', 'been', 'broken', 'to', 'pieces', 'please', 'then', 'said', 'alice', 'how', 'am', 'i', 'to', 'get', 'in', 'there', 'might', 'be', 'some', 'sense', 'in', 'your', 'knocking', 'the', 'footman', 'went', 'on', 'without', 'attending', 'to', 'her', 'if', 'we', 'had', 'the', 'door', 'between', 'us', 'for', 'instance', 'if', 'you', 'were', 'inside', 'you', 'might', 'knock', 'and', 'i', 'could', 'let', 'you', 'out', 'you', 'know', 'he', 'was', 'looking', 'up', 'into', 'the', 'sky', 'all', 'the', 'time', 'he', 'was', 'speaking', 'and', 'this', 'alice', 'thought', 'decidedly', 'uncivil', 'but', 'perhaps', 'he', 'can', 't', 'help', 'it', 'she', 'said', 'to', 'herself', 'his', 'eyes', 'are', 'so', 'very', 'nearly', 'at', 'the', 'top', 'of', 'his', 'head', 'but', 'at', 'any', 'rate', 'he', 'might', 'answer', 'questions', 'how', 'am', 'i', 'to', 'get', 'in', 'she', 'repeated', 'aloud', 'i', 'shall', 'sit', 'here', 'the', 'footman', 'remarked', 'till', 'tomorrow', 'at', 'this', 'moment', 'the', 'door', 'of', 'the', 'house', 'opened', 'and', 'a', 'large', 'plate', 'came', 'skimming', 'out', 'straight', 'at', 'the', 'footman', 's', 'head', 'it', 'just', 'grazed', 'his', 'nose', 'and', 'broke', 'to', 'pieces', 'against', 'one', 'of', 'the', 'trees', 'behind', 'him']
```

In [167]:

```
#count the frequency of words (use a dictionary) I couldn't figure out how to use the counts() function

# Initializing Dictionary
d = {}

#counting number of times each word comes up in the list of words (in dictionary)
for word in paragraph_text:
```

4. Read in a file and write each line from the file to a new file Title-ized

This is the first line-> This Is The First Line

Hint: There's a function to do this

```
In [42]:
```

```
#make file
file = open("testfile.txt","w")

file.write("this is the first line")

file.close()
```

```
In [43]:
```

```
#rewrite file in Title-ized
file = open("testfile.txt","w")

file.write("This Is The First Line")

file.close()
```

Numpy

1. Given a list, find the average using a numpy function.

```
In [28]:
```

```
simple_list = [1,2,1,4,3,2,5,9]
np.average(simple_list)
```

```
Out[28]:
```

```
3.375
```

2. Given two lists of Heights and Weights of individual, calculate the BMI of those individuals, without writing a for-loop

```
In [160]:
```

```
heights = [174, 173, 173, 175, 171]
weights = [88, 83, 92, 74, 77]

np_heights=np.array(heights)
np_weights=np.array(weights)
BMI=np_heights /np_weights **2
print(BMI)
```

```
[0.02246901 0.0251125  0.02043951 0.03195763 0.02884129]
```

3. Create an array of length 20 filled with random values (between 0 to 1)

```
In [9]:
```

```
np.random.rand(20)
```

```
Out[9]:
```

```
array([0.50684296, 0.71319728, 0.301921  , 0.13824225, 0.55735568,
        0.11046971, 0.11230067, 0.71216536, 0.66005042, 0.2677864 ,
        0.06295185, 0.20113545, 0.4364142 , 0.01085732, 0.90237929,
        0.26397335, 0.07652446, 0.05286261, 0.43982814, 0.98110206])
```

Bonus. 1. Create an array with a large (>1000) length filled with random numbers from different distributions (normal, uniform, etc.). 2. Then, plot a histogram of these values.

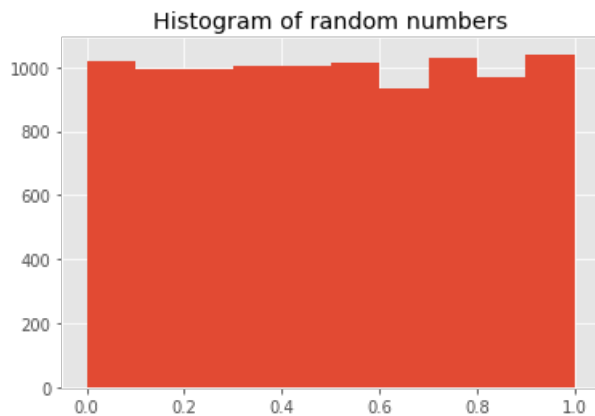
In [10]:

```
a = np.array(np.random.rand(10000))
np.histogram(a,bins = [0,0.25,0.5,0.75,1])
hist,bins = np.histogram(a,bins = [0,0.25,0.5,0.75,1])
print (hist)
print (bins)
plt.hist(a)
plt.title("Histogram of random numbers")
```

```
[2511 2502 2417 2570]
[0.   0.25 0.5  0.75 1.   ]
```

Out[10]:

Text(0.5,1,'Histogram of random numbers')



Pandas

1. Read in a CSV () and display all the columns and their respective data types

In [165]:

```
#read CSV and display columns
data = pd.read_csv("hw_data.csv")
data
```

Out[165]:

	id	sex	weight	height
0	1	M	190	77
1	2	F	120	70
2	3	F	110	68
3	4	M	150	72
4	5	O	120	66
5	6	M	120	60
6	7	F	140	70

In [140]:

```
#display data types
data.dtypes
```

Out[140]:

```
id          int64
```

```
sex          object
weight       int64
height       int64
dtype: object
```

2. Find the average weight

In [141]:

```
#find average weight
data['weight'].mean()
```

Out[141]:

```
135.71428571428572
```

3. Find the Value Counts on column sex

In [142]:

```
#find value counts on column sex
data.sex.value_counts()
```

Out[142]:

```
M      3
F      3
O      1
Name: sex, dtype: int64
```

4. Plot Height vs. Weight

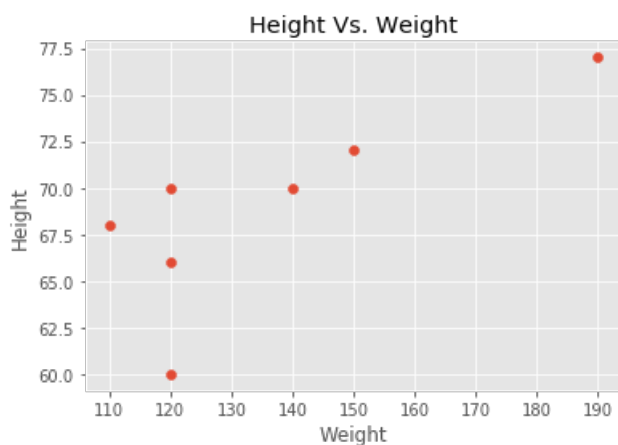
In [157]:

```
x = data['weight']
y = data['height']

plt.scatter(x,y);
plt.title('Height Vs. Weight')
plt.xlabel('Weight')
plt.ylabel('Height')
```

Out[157]:

```
Text(0,0.5,'Height')
```



5. Calculate BMI and save as a new column

In [188]:

```
#Calculate BMI
data
data['BMI'] = data['weight'].divide(data['height'] ** 2)
data
```

Out[188]:

	id	sex	weight	height	BMI
0	1	M	190	77	0.032046
1	2	F	120	70	0.024490
2	3	F	110	68	0.023789
3	4	M	150	72	0.028935
4	5	O	120	66	0.027548
5	6	M	120	60	0.033333
6	7	F	140	70	0.028571

6. Save sheet as a new CSV file hw_dataB.csv

In [192]:

```
data.to_csv('hw_dataB.csv')
```

Run the following

In [193]:

```
!cat hw_dataB.csv
```

```
,id,sex,weight,height,BMI
0,1,M,190,77,0.03204587620172036
1,2,F,120,70,0.024489795918367346
2,3,F,110,68,0.02378892733564014
3,4,M,150,72,0.028935185185185185
4,5,O,120,66,0.027548209366391185
5,6,M,120,60,0.03333333333333333
6,7,F,140,70,0.02857142857142857
```