```
import pandas as pd
import numpy as np
import matplotlib as mpl
import matplotlib.pyplot as plt
import math
import io
import seaborn as sns
from scipy import stats
from google.colab import files
from numpy import random
from sklearn.linear_model import LinearRegression

%matplotlib inline
```

In this section, you will use the data for ONE variable only. Pick the variable that is more interesting to analyze. For example: if your independent variable is sequential data such as year with 30 years and one piece of data per year, your x-values might be 1971, 1972, 1973, 1974, ..., 2000. This would not be interesting to analyze. In that case, choose to use the dependent variable to analyze for this part of the project.

```
video_games = files.upload()
```

Choose Files No file chosen Upload widget is only available when the cell has been executed in the current browser session. Please rerun this cell to enable.

Saving Video Games Sales as at 22 Dec 2016 csv to Video Games Sales as at 2

```
vg = pd.read_csv(io.BytesIO(video_games['Video_Games_Sales_as_at_22_Dec_2016.csv']))
vg.head()
```

	Name	Platform	Year_of_Release	Genre	Publisher	NA_Sales	EU_S
0	Wii Sports	Wii	2006.0	Sports	Nintendo	41.36	
1	Super Mario Bros.	NES	1985.0	Platform	Nintendo	29.08	
2	Mario Kart Wii	Wii	2008.0	Racing	Nintendo	15.68	
3	Wii Sports Resort	Wii	2009.0	Sports	Nintendo	15.61	
4	Pokemon Red/Pokemon Blue	GB	1996.0	Role-Playing	Nintendo	11.27	

```
vg.dtypes
```

```
Name                object
Platform            object
Year_of_Release    float64
Genre               object
Publisher           object
```

```
    NA_Sales          float64
    EU_Sales          float64
    JP_Sales          float64
    Other_Sales       float64
    Global_Sales      float64
    Critic_Score        int64
    Critic_Count        int64
    User_Score         object
    User_Count          int64
    dtype: object
```

```
# Get the top 50 games that sold the most on a global scale.

fifty_games = vg[: 50]
sales = fifty_games['NA_Sales'].fillna(0)


sales
```

	NA_Sales
0	41.36
1	29.08
2	15.68
3	15.61
4	11.27
5	23.20
6	11.28
7	13.96
8	14.44
9	26.93
10	9.05
11	9.71
12	9.00
13	8.92
14	15.00
15	9.01
16	7.02
17	9.43
18	12.78
19	4.74
20	6.38
21	10.83
22	9.54
23	9.66
24	8.41
25	6.06

Summarize your data in a chart with columns showing data value, frequency, relative frequency, and cumulative relative frequency.

29	9.04

```
# Summarize the data

sales.describe()
```

	NA_Sales
count	50.000000
mean	9.822200
std	7.129288
min	2.500000
25%	5.915000
50%	8.330000

```
# Frequency  of each score

frequency_sales = pd.crosstab(index=sales['NA_Sales'], columns='Frequency Count')
frequency_sales
```

col_0	Frequency Count
NA_Sales	
2.50	1
3.01	1
3.43	1
3.96	1
4.34	1
4.35	1
4.74	1
4.99	1
5.03	1
5.28	1
5.51	1
5.54	1
5.89	1
5.99	1
6.03	1
6.06	2
6.38	1
6.62	1
6.85	1
6.91	1
6.99	1
7.02	1
7.97	1
8.25	1

```
# Relative Frequency

relative_freq = sales['NA_Sales'].value_counts(normalize=True)
relative_freq
```

```
6.06     0.04
41.36    0.02
5.51     0.02
6.85     0.02
9.04     0.02
5.89     0.02
6.03     0.02
9.70     0.02
5.28     0.02
4.99     0.02
8.25     0.02
8.52     0.02
```

```
5.54     0.02
6.99     0.02
6.62     0.02
5.03     0.02
5.99     0.02
3.96     0.02
2.50     0.02
7.97     0.02
6.91     0.02
4.34     0.02
4.35     0.02
3.43     0.02
8.41     0.02
29.08    0.02
9.66     0.02
15.68    0.02
15.61    0.02
11.27    0.02
23.20    0.02
11.28    0.02
13.96    0.02
14.44    0.02
26.93    0.02
9.05     0.02
9.71     0.02
9.00     0.02
8.92     0.02
15.00    0.02
9.01     0.02
7.02     0.02
9.43     0.02
12.78    0.02
4.74     0.02
6.38     0.02
10.83    0.02
9.54     0.02
3.01     0.02
Name: NA_Sales, dtype: float64
```

```
# Cumulative Relative Frequency

cumulative_freq = relative_freq.cumsum()
cumulative_freq
```

```
6.06     0.04
41.36    0.06
5.51     0.08
6.85     0.10
9.04     0.12
5.89     0.14
6.03     0.16
9.70     0.18
5.28     0.20
4.99     0.22
8.25     0.24
8.52     0.26
5.54     0.28
6.99     0.30
6.62     0.32
5.03     0.34
5.99     0.36
3.96     0.38
2.50     0.40
```

```
    7.97     0.42
    6.91     0.44
    4.34     0.46
    4.35     0.48
    3.43     0.50
    8.41     0.52
    29.08    0.54
    9.66     0.56
    15.68    0.58
    15.61    0.60
    11.27    0.62
    23.20    0.64
    11.28    0.66
    13.96    0.68
    14.44    0.70
    26.93    0.72
    9.05     0.74
    9.71     0.76
    9.00     0.78
    8.92     0.80
    15.00    0.82
    9.01     0.84
    7.02     0.86
    9.43     0.88
    12.78    0.90
    4.74     0.92
    6.38     0.94
    10.83    0.96
    9.54     0.98
    3.01     1.00
    Name: NA_Sales, dtype: float64
```

```
from numpy.ma.extras import average
# Sample mean

sales.mean()
```

```
    NA_Sales    9.8222
    dtype: float64
```

```
# Sample standard deviation
sales.std()
```

```
    NA_Sales    7.129288
    dtype: float64
```

```
# First quartile
sales.quantile(q=0.25)
```

```
    NA_Sales    5.915
    Name: 0.25, dtype: float64
```

```
# Third quartile
sales.quantile(q=0.75)
```

```
    NA_Sales    10.55
    Name: 0.75, dtype: float64
```

```
# Median
```

```
sales.median()
```

```
NA_Sales    8.33
dtype: float64
```

```
# 70th percentile
sales.quantile(q=0.70)
```

```
NA_Sales    9.672
Name: 0.7, dtype: float64
```

Answer the following question, rounded to two decimal places:

```
# Value that is 2 standard deviations above the mean. Mean plus standard deviation(2)

sales.mean() + sales.std() *2
```

```
NA_Sales    24.080777
dtype: float64
```

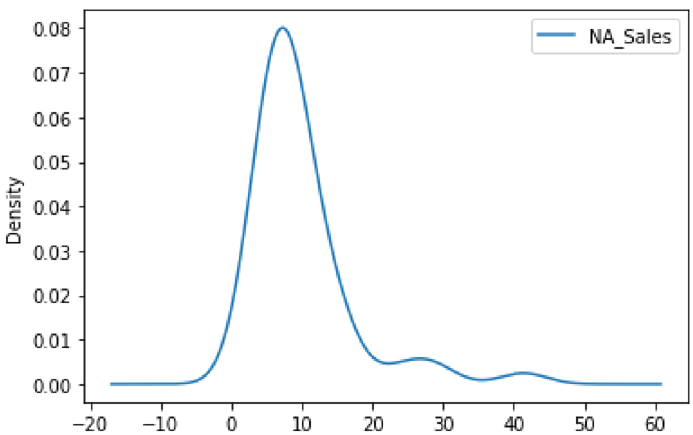
```
# Value that is 1.5 standard deviations below the mean. Mean minus standard deviation(1.5)

sales.mean() - sales.std()*(1.5)
```

```
NA_Sales   -0.871733
dtype: float64
```

```
sales.plot.kde()
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f9c57523e50>
```




```
sales.describe()
```

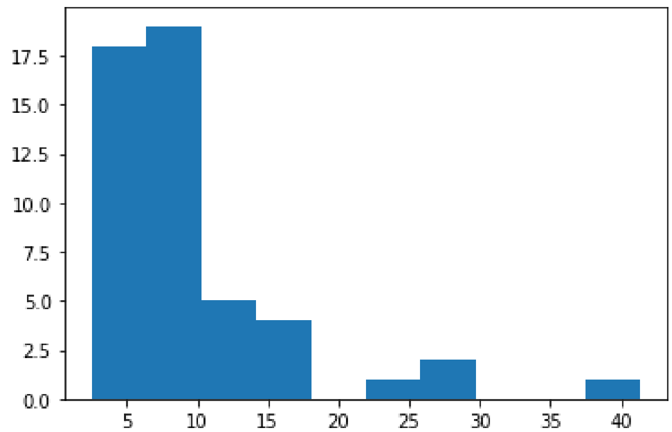
	NA_Sales
count	50.000000
mean	9.822200

Construct a histogram displaying your data. Group your data into six to ten intervals of equal width. Pick regularly spaced intervals that make sense in relation to your data.

75% 10.550000

```
sales['NA_Sales'].hist(bins=10, grid=False)
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f9c570745d0>
```



In complete sentences, describe the shape of your histogram.

A right-skewed histogram has a peak that is left of center and a more gradual tapering to the right side of the graph. I believe the histogram is right skewed because the sample was based off of sales in descending order.

Are there any potential outliers? Which values are they? Show your work and calculations as to how you used the potential outlier formula in CH3: Descriptive Statistics (since you are now using univariate data) to determine which values might be outliers.

```
# To see if a data point is an outlier and check if it falls farther than three standard deviations, we c
# Q1—1.5 x IQR
# Q3 + 1.5 x IQR

5.915 - 1.5 * 4.64 # Q1—1.5 x IQR

    -1.0449999999999999

10.55 + 1.5 * 4.64 # Q3 + 1.5 x IQR
```

```
17.509999999999998
```

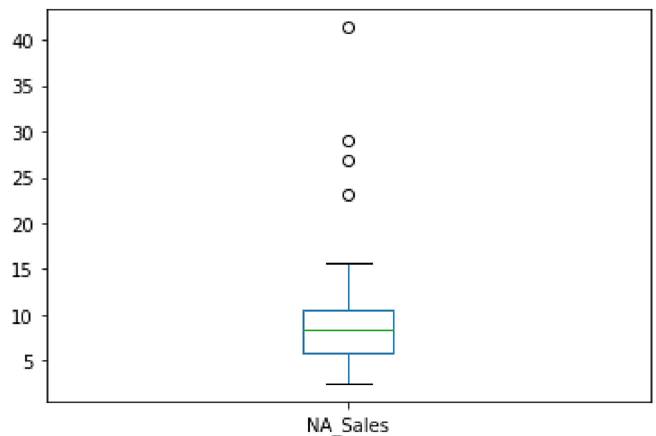
According to the Outlier formula any number in sales passed 17.509 is considered an outlier. There are 4 data points considered outliers and they are

23.20
26.93
29.08
41.36.

Construct a box plot of your data.

```
sales.boxplot( grid=False)
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f9c56efe890>
```



Does the middle 50% of your data appear to be concentrated together or spread out? Explain how you determined this.

The majority of the data is seems to be concentrated together because the majority of sales was near the mean of 8.33 million sales.

Looking at both the histogram AND the box plot, discuss the distribution of your data. For example: how does the spread of the middle 50% of your data compare to the spread of the rest of the data represented in the box plot; how does this correspond to your description of the shape of the histogram; how does the graphical display show any outliers you may have found; does the histogram show any gaps in the data that are not visible in the box plot; are there any interesting features of your data that you should point out.

The spread of the middle 50% is concentrated between 5 and 10 million sales whereas the rest of the sales were between 2 and 15 million. This corresponds to being a right skewed distribution because the 4 outliers are well passed 3 standard deviations above the mean. Therefore skewing the data more to the right. The histogram does not show any gaps in the top 50 games sold. I do find it interesting that the number 1 sold game is an exercise / sports game that makes the player move in order for the avatar on the screen to move called Wii Sports.