

```
In [1]: import numpy as np
import pandas as pd
from numpy import linalg as lg
from numpy import cov
```

5 Data Sets

```
In [2]: a=pd.read_csv("2015.csv")
a
```

Out[2]:

	Country	Region	Happiness Rank	Happiness Score	Standard Error	Economy (GDP per Capita)	Family	Health (Life Expectancy)	Freedom
0	Switzerland	Western Europe	1	7.587	0.03411	1.39651	1.34951	0.94143	0.6655
1	Iceland	Western Europe	2	7.561	0.04884	1.30232	1.40223	0.94784	0.6287
2	Denmark	Western Europe	3	7.527	0.03328	1.32548	1.36058	0.87464	0.6495
3	Norway	Western Europe	4	7.522	0.03880	1.45900	1.33095	0.88521	0.6697
4	Canada	North America	5	7.427	0.03553	1.32629	1.32261	0.90563	0.6325
...
153	Rwanda	Sub-Saharan Africa	154	3.465	0.03464	0.22208	0.77370	0.42864	0.5920
154	Benin	Sub-Saharan Africa	155	3.340	0.03656	0.28665	0.35386	0.31910	0.4845
155	Syria	Middle East and Northern Africa	156	3.006	0.05015	0.66320	0.47489	0.72193	0.1568
156	Burundi	Sub-Saharan Africa	157	2.905	0.08658	0.01530	0.41587	0.22396	0.1185
157	Togo	Sub-Saharan Africa	158	2.839	0.06727	0.20868	0.13995	0.28443	0.3645

158 rows × 12 columns



a) Find mean, median, mode and describe

In [3]:

```

print(a.mean)
print("Median:")
print(a.median)
print("Mode:")
print(a.mode)
print("Describe")
print(a.describe())

```

```

<bound method NDFrame._add_numeric_operations.<locals>.mean of
Region Happiness Rank \

```

	Region	Happiness Rank	Country
0	Switzerland		Western Europe
1	Iceland		Western Europe
2	Denmark		Western Europe
3	Norway		Western Europe
4	Canada		North America
..
153	Rwanda		Sub-Saharan Africa
154	Benin		Sub-Saharan Africa
155	Syria	Middle East and Northern Africa	
156	Burundi		Sub-Saharan Africa
157	Togo		Sub-Saharan Africa

	Happiness Score	Standard Error	Economy (GDP per Capita)	Family \
0	7.587	0.03411	1.39651	1.34951
1	7.561	0.04884	1.30232	1.40223
2	7.527	0.03328	1.32548	1.36058
3	7.522	0.03880	1.45900	1.33095
4	7.427	0.03553	1.32629	1.32261
..
153	3.465	0.03464	0.22208	0.77370
154	3.340	0.03656	0.28665	0.35386
155	3.006	0.05015	0.66320	0.47489
156	2.905	0.08658	0.01530	0.41587
157	2.839	0.06727	0.20868	0.13995

	Health (Life Expectancy)	Freedom	Trust (Government Corruption) \
0	0.94143	0.66557	0.41978
1	0.94784	0.62877	0.14145
2	0.87464	0.64938	0.48357
3	0.88521	0.66973	0.36503
4	0.90563	0.63297	0.32957
..
153	0.42864	0.59201	0.55191
154	0.31910	0.48450	0.08010
155	0.72193	0.15684	0.18906
156	0.22396	0.11850	0.10062
157	0.28443	0.36453	0.10731

	Generosity	Dystopia Residual
0	0.29678	2.51738
1	0.43630	2.70201
2	0.34139	2.49204
3	0.34699	2.46531
4	0.45811	2.45176
..
153	0.22628	0.67042
154	0.18260	1.63328
155	0.47179	0.32858
156	0.19727	1.83302
157	0.16681	1.56726

```

[158 rows x 12 columns]>

```

```

Median:

```

```

<bound method NDFrame._add_numeric_operations.<locals>.median of
Region Happiness Rank \
0 Switzerland Western Europe 1
1 Iceland Western Europe 2

```

2	Denmark	Western Europe	3
3	Norway	Western Europe	4
4	Canada	North America	5
..
153	Rwanda	Sub-Saharan Africa	154
154	Benin	Sub-Saharan Africa	155
155	Syria	Middle East and Northern Africa	156
156	Burundi	Sub-Saharan Africa	157
157	Togo	Sub-Saharan Africa	158

	Happiness Score	Standard Error	Economy (GDP per Capita)	Family \
0	7.587	0.03411	1.39651	1.34951
1	7.561	0.04884	1.30232	1.40223
2	7.527	0.03328	1.32548	1.36058
3	7.522	0.03880	1.45900	1.33095
4	7.427	0.03553	1.32629	1.32261
..
153	3.465	0.03464	0.22208	0.77370
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156	2.905	0.08658	0.01530	0.41587
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0	0.29678	2.51738
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..
153	0.22628	0.67042
154	0.18260	1.63328
155	0.47179	0.32858
156	0.19727	1.83302
157	0.16681	1.56726

[158 rows x 12 columns]>

Mode:

	<bound method DataFrame.mode of	Country	Region	H
appiness Rank \				
0	Switzerland	Western Europe	1	
1	Iceland	Western Europe	2	
2	Denmark	Western Europe	3	
3	Norway	Western Europe	4	
4	Canada	North America	5	
..
153	Rwanda	Sub-Saharan Africa	154	
154	Benin	Sub-Saharan Africa	155	
155	Syria	Middle East and Northern Africa	156	
156	Burundi	Sub-Saharan Africa	157	
157	Togo	Sub-Saharan Africa	158	

	Happiness Score	Standard Error	Economy (GDP per Capita)	Family \
0	7.587	0.03411	1.39651	1.34951
1	7.561	0.04884	1.30232	1.40223
2	7.527	0.03328	1.32548	1.36058

3	7.522	0.03880	1.45900	1.33095
4	7.427	0.03553	1.32629	1.32261
..
153	3.465	0.03464	0.22208	0.77370
154	3.340	0.03656	0.28665	0.35386
155	3.006	0.05015	0.66320	0.47489
156	2.905	0.08658	0.01530	0.41587
157	2.839	0.06727	0.20868	0.13995

	Health (Life Expectancy)	Freedom	Trust (Government Corruption)	\
0	0.94143	0.66557	0.41978	
1	0.94784	0.62877	0.14145	
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3	0.88521	0.66973	0.36503	
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	Generosity	Dystopia Residual
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153	0.22628	0.67042
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155	0.47179	0.32858
156	0.19727	1.83302
157	0.16681	1.56726

[158 rows x 12 columns]>

Describe

	Happiness Rank	Happiness Score	Standard Error	\
count	158.000000	158.000000	158.000000	
mean	79.493671	5.375734	0.047885	
std	45.754363	1.145010	0.017146	
min	1.000000	2.839000	0.018480	
25%	40.250000	4.526000	0.037268	
50%	79.500000	5.232500	0.043940	
75%	118.750000	6.243750	0.052300	
max	158.000000	7.587000	0.136930	

	Economy (GDP per Capita)	Family	Health (Life Expectancy)	\
count	158.000000	158.000000	158.000000	
mean	0.846137	0.991046	0.630259	
std	0.403121	0.272369	0.247078	
min	0.000000	0.000000	0.000000	
25%	0.545808	0.856823	0.439185	
50%	0.910245	1.029510	0.696705	
75%	1.158448	1.214405	0.811013	
max	1.690420	1.402230	1.025250	

	Freedom	Trust (Government Corruption)	Generosity	\
count	158.000000	158.000000	158.000000	
mean	0.428615	0.143422	0.237296	
std	0.150693	0.120034	0.126685	
min	0.000000	0.000000	0.000000	
25%	0.328330	0.061675	0.150553	
50%	0.435515	0.107220	0.216130	
75%	0.549092	0.180255	0.309883	
max	0.669730	0.551910	0.795880	

	Dystopia Residual
count	158.000000

```
mean      2.098977
std       0.553550
min       0.328580
25%      1.759410
50%      2.095415
75%      2.462415
max       3.602140
```

b) Find sum(), cumsum(), count, min and max values

In [4]:

```
print(a.sum())
```

```
Country      SwitzerlandIcelandDenmarkNorwayCanadaFinlandNe...
Region      Western EuropeWestern EuropeWestern EuropeWest...
Happiness Rank      12560
Happiness Score      849.366
Standard Error      7.56579
Economy (GDP per Capita)      133.68968
Family      156.58526
Health (Life Expectancy)      99.58098
Freedom      67.72116
Trust (Government Corruption)      22.66065
Generosity      37.49269
Dystopia Residual      331.63833
dtype: object
```

In [5]:

```
print(a.cumsum())
```

```
          Country \
0          Switzerland
1      SwitzerlandIceland
2      SwitzerlandIcelandDenmark
3      SwitzerlandIcelandDenmarkNorway
4      SwitzerlandIcelandDenmarkNorwayCanada
..          ...
153  SwitzerlandIcelandDenmarkNorwayCanadaFinlandNe...
154  SwitzerlandIcelandDenmarkNorwayCanadaFinlandNe...
155  SwitzerlandIcelandDenmarkNorwayCanadaFinlandNe...
156  SwitzerlandIcelandDenmarkNorwayCanadaFinlandNe...
157  SwitzerlandIcelandDenmarkNorwayCanadaFinlandNe...

          Region  Happiness Rank \
0          Western Europe      1
1      Western EuropeWestern Europe      3
2      Western EuropeWestern EuropeWestern Europe      6
3  Western EuropeWestern EuropeWestern EuropeWest...     10
4  Western EuropeWestern EuropeWestern EuropeWest...     15
..          ...          ...
153  Western EuropeWestern EuropeWestern EuropeWest...    11934
154  Western EuropeWestern EuropeWestern EuropeWest...    12089
155  Western EuropeWestern EuropeWestern EuropeWest...    12245
156  Western EuropeWestern EuropeWestern EuropeWest...    12402
157  Western EuropeWestern EuropeWestern EuropeWest...    12560

          Happiness Score  Standard Error  Economy (GDP per Capita)  Family \
0              7.587      0.03411      1.39651      1.34951
1             15.148      0.08295      2.69883      2.75174
2             22.675      0.11623      4.02431      4.11232
3             30.197      0.15503      5.48331      5.44327
4             37.624      0.19056      6.80960      6.76588
..          ...          ...          ...          ...
153          837.276      7.32523      132.51585    155.20069
154          840.616      7.36179      132.80250    155.55455
155          843.622      7.41194      133.46570    156.02944
```

156	846.527	7.49852	133.48100	156.44531
157	849.366	7.56579	133.68968	156.58526

	Health (Life Expectancy)	Freedom	Trust (Government Corruption)	\
0	0.94143	0.66557		0.41978
1	1.88927	1.29434		0.56123
2	2.76391	1.94372		1.04480
3	3.64912	2.61345		1.40983
4	4.55475	3.24642		1.73940
..
153	98.03156	66.59679		22.18356
154	98.35066	67.08129		22.26366
155	99.07259	67.23813		22.45272
156	99.29655	67.35663		22.55334
157	99.58098	67.72116		22.66065

	Generosity	Dystopia	Residual
0	0.29678		2.51738
1	0.73308		5.21939
2	1.07447		7.71143
3	1.42146		10.17674
4	1.87957		12.62850
..
153	36.47422		326.27619
154	36.65682		327.90947
155	37.12861		328.23805
156	37.32588		330.07107
157	37.49269		331.63833

[158 rows x 12 columns]

In [6]:

```
print(a.count())
print(a.min())
print(a.max())
```

Country	158
Region	158
Happiness Rank	158
Happiness Score	158
Standard Error	158
Economy (GDP per Capita)	158
Family	158
Health (Life Expectancy)	158
Freedom	158
Trust (Government Corruption)	158
Generosity	158
Dystopia Residual	158
dtype: int64	
Country	Afghanistan
Region	Australia and New Zealand
Happiness Rank	1
Happiness Score	2.839
Standard Error	0.01848
Economy (GDP per Capita)	0.0
Family	0.0
Health (Life Expectancy)	0.0
Freedom	0.0
Trust (Government Corruption)	0.0
Generosity	0.0
Dystopia Residual	0.32858
dtype: object	
Country	Zimbabwe
Region	Western Europe
Happiness Rank	158
Happiness Score	7.587
Standard Error	0.13693
Economy (GDP per Capita)	1.69042
Family	1.40223

```

Health (Life Expectancy)    1.02525
Freedom                    0.66973
Trust (Government Corruption) 0.55191
Generosity                 0.79588
Dystopia Residual          3.60214
dtype: object

```

c) Find covariance and correlation (spearman and pearsons)

In [7]:

```
print(a.cov())
```

```

Happiness Rank    Happiness Rank    Happiness Score \
Happiness Rank    2093.461743    -51.975613
Happiness Score    -51.975613    1.311048
Standard Error      0.124358    -0.003480
Economy (GDP per Capita) -14.483883    0.360476
Family             -9.142720    0.230969
Health (Life Expectancy) -8.316021    0.204881
Freedom            -3.839647    0.098042
Trust (Government Corruption) -2.044785    0.054316
Generosity         -0.928243    0.026156
Dystopia Residual   -13.220847    0.336225

Happiness Rank    Standard Error    Economy (GDP per Capita) \
Happiness Rank    0.124358    -14.483883
Happiness Score    -0.003480    0.360476
Standard Error      0.000294    -0.001504
Economy (GDP per Capita) -0.001504    0.162506
Family             -0.000564    0.070852
Health (Life Expectancy) -0.001315    0.081323
Freedom            -0.000335    0.022495
Trust (Government Corruption) -0.000367    0.014898
Generosity         -0.000192    -0.000534
Dystopia Residual   0.000797    0.008939

Happiness Rank    Family    Health (Life Expectancy)    Freedom \
Happiness Rank    -9.142720    -8.316021    -3.839647
Happiness Score    0.230969    0.204881    0.098042
Standard Error    -0.000564    -0.001315    -0.000335
Economy (GDP per Capita) 0.070852    0.081323    0.022495
Family            0.074185    0.035741    0.018122
Health (Life Expectancy) 0.035741    0.061047    0.013422
Freedom           0.018122    0.013422    0.022708
Trust (Government Corruption) 0.006722    0.007365    0.008927
Generosity        0.003020    0.003391    0.007138
Dystopia Residual  0.022332    0.002596    0.005237

Happiness Rank    Trust (Government Corruption)    Generosity \
Happiness Rank    -2.044785    -0.928243
Happiness Score    0.054316    0.026156
Standard Error    -0.000367    -0.000192
Economy (GDP per Capita) 0.014898    -0.000534
Family            0.006722    0.003020
Health (Life Expectancy) 0.007365    0.003391
Freedom           0.008927    0.007138
Trust (Government Corruption) 0.014408    0.004199
Generosity        0.004199    0.016049
Dystopia Residual -0.002200    -0.007104

Dystopia Residual
Happiness Rank    -13.220847
Happiness Score    0.336225
Standard Error      0.000797
Economy (GDP per Capita) 0.008939

```

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	DATASET 4
Family	0.022332
Health (Life Expectancy)	0.002596
Freedom	0.005237
Trust (Government Corruption)	-0.002200
Generosity	-0.007104
Dystopia Residual	0.306417

In [8]:

```
b=a.dropna(axis=1,how='any')
b
```

Out[8]:

	Country	Region	Happiness Rank	Happiness Score	Standard Error	Economy (GDP per Capita)	Family	Health (Life Expectancy)	Freedom
0	Switzerland	Western Europe	1	7.587	0.03411	1.39651	1.34951	0.94143	0.6655
1	Iceland	Western Europe	2	7.561	0.04884	1.30232	1.40223	0.94784	0.6287
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4	Canada	North America	5	7.427	0.03553	1.32629	1.32261	0.90563	0.6329
...
153	Rwanda	Sub-Saharan Africa	154	3.465	0.03464	0.22208	0.77370	0.42864	0.5920
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155	Syria	Middle East and Northern Africa	156	3.006	0.05015	0.66320	0.47489	0.72193	0.1568
156	Burundi	Sub-Saharan Africa	157	2.905	0.08658	0.01530	0.41587	0.22396	0.1185
157	Togo	Sub-Saharan Africa	158	2.839	0.06727	0.20868	0.13995	0.28443	0.3645

158 rows × 12 columns



In [11]:

```
from scipy.stats import pearsonr
print(pearsonr(a['Happiness Rank'],a['Happiness Score']))
```

(-0.9921053148284924, 1.4013759581587442e-142)

In [10]:

```
from scipy.stats import spearmanr
print(spearmanr(a['Happiness Rank'],a['Happiness Score']))
```

SpearmanrResult(correlation=-0.9999999999999999, pvalue=0.0)

In []: