Importing data and creating table

Attributes:

X1 : Login Hours

X2 : Break time duration

Y *(Label)* : Productivity

```
import numpy as np
import pandas as pd

temp={"X1":[8.1,7.3,7.8,8.9,9.2,8.5,8.4,7.2,9.1,7.6,7.8,7.9],
      "X2":[1.25,1.38,1.57,1.27,1.67,1.08,1.22,1.37,1.25,1.40,1.27,1.63],
      "Y":[9.03,8.65,8.94,9.42,9.58,9.19,9.17,8.99,9.57,8.80,8.88,8.90]}
df=pd.DataFrame(temp)
df
```

	X1	X2	Y
0	8.1	1.25	9.03
1	7.3	1.38	8.65
2	7.8	1.57	8.94
3	8.9	1.27	9.42
4	9.2	1.67	9.58
5	8.5	1.08	9.19
6	8.4	1.22	9.17
7	7.2	1.37	8.99
8	9.1	1.25	9.57
9	7.6	1.40	8.80
10	7.8	1.27	8.88
11	7.9	1.63	8.90

Calculating Means

```
X1bar = df["X1"].sum(axis=0)/len(df["X1"])
X1bar
```

```
8.149999999999999
```

```
X2bar = df["X2"].sum(axis=0)/len(df["X2"])
X2bar
```

```
1.3633333333333333
```

```
Ybar = df["Y"].sum(axis=0)/len(df["Y"])
Ybar
```

```
9.093333333333332
```

Calculating (Xi - Xbar) and (Xi - Xbar)^2

```
X1_err = df["X1"]-X1bar
df["X1i-X1bar"] = X1_err
df
```

	X1	X2	Y	X1i-X1bar
0	8.1	1.25	9.03	-0.05
1	7.3	1.38	8.65	-0.85
2	7.8	1.57	8.94	-0.35
3	8.9	1.27	9.42	0.75
4	9.2	1.67	9.58	1.05
5	8.5	1.08	9.19	0.35
6	8.4	1.22	9.17	0.25
7	7.2	1.37	8.99	-0.95
8	9.1	1.25	9.57	0.95
9	7.6	1.40	8.80	-0.55
10	7.8	1.27	8.88	-0.35
11	7.9	1.63	8.90	-0.25

```
X1_err2 = df["X1i-X1bar"]*df["X1i-X1bar"]
df["(X1i-X1bar)^2"] = X1_err2
df
```

	X1	X2	Y	X1i-X1bar	(X1i-X1bar)^2
0	8.1	1.25	9.03	-0.05	0.0025
1	7.3	1.38	8.65	-0.85	0.7225
2	7.8	1.57	8.94	-0.35	0.1225
3	8.9	1.27	9.42	0.75	0.5625

```
X2_err = df["X2"]-X2bar
df["X2i-X2bar"] = X2_err
df
```

	X1	X2	Y	X1i-X1bar	(X1i-X1bar)^2	X2i-X2bar
0	8.1	1.25	9.03	-0.05	0.0025	-0.113333
1	7.3	1.38	8.65	-0.85	0.7225	0.016667
2	7.8	1.57	8.94	-0.35	0.1225	0.206667
3	8.9	1.27	9.42	0.75	0.5625	-0.093333
4	9.2	1.67	9.58	1.05	1.1025	0.306667
5	8.5	1.08	9.19	0.35	0.1225	-0.283333
6	8.4	1.22	9.17	0.25	0.0625	-0.143333
7	7.2	1.37	8.99	-0.95	0.9025	0.006667
8	9.1	1.25	9.57	0.95	0.9025	-0.113333
9	7.6	1.40	8.80	-0.55	0.3025	0.036667
10	7.8	1.27	8.88	-0.35	0.1225	-0.093333
11	7.9	1.63	8.90	-0.25	0.0625	0.266667

```
X2_err2 = df["X2i-X2bar"]*df["X2i-X2bar"]
df["(X2i-X2bar)^2"] = X2_err2
df
```

	X1	X2	Y	X1i-X1bar	(X1i-X1bar)^2	X2i-X2bar	(X2i-X2bar)^2
0	8.1	1.25	9.03	-0.05	0.0025	-0.113333	0.012844
1	7.3	1.38	8.65	-0.85	0.7225	0.016667	0.000278
4	9.2	1.67	9.58	1.05	1.1025	0.306667	0.094044

Calculating (Xi - Xbar) * (Yi - Ybar)

```
Y_err = df["Y"]-Ybar
df["Yi-Ybar"] = Y_err
df
```

	X1	X2	Y	X1i-X1bar	(X1i-X1bar)^2	X2i-X2bar	(X2i-X2bar)^2	Yi-Ybar
0	8.1	1.25	9.03	-0.05	0.0025	-0.113333	0.012844	-0.063333
1	7.3	1.38	8.65	-0.85	0.7225	0.016667	0.000278	-0.443333
2	7.8	1.57	8.94	-0.35	0.1225	0.206667	0.042711	-0.153333
3	8.9	1.27	9.42	0.75	0.5625	-0.093333	0.008711	0.326667
4	9.2	1.67	9.58	1.05	1.1025	0.306667	0.094044	0.486667
5	8.5	1.08	9.19	0.35	0.1225	-0.283333	0.080278	0.096667
6	8.4	1.22	9.17	0.25	0.0625	-0.143333	0.020544	0.076667
7	7.2	1.37	8.99	-0.95	0.9025	0.006667	0.000044	-0.103333
8	9.1	1.25	9.57	0.95	0.9025	-0.113333	0.012844	0.476667
9	7.6	1.40	8.80	-0.55	0.3025	0.036667	0.001344	-0.293333
10	7.8	1.27	8.88	-0.35	0.1225	-0.093333	0.008711	-0.213333

```
X1Y_err = df["X1i-X1bar"]*df["Yi-Ybar"]
df["(X1i-X1bar)*(Yi-Ybar)"] = X1Y_err
df
```

	X1	X2	Y	X1i-X1bar	(X1i-X1bar)^2	X2i-X2bar	(X2i-X2bar)^2	Yi-Ybar	(X1i-X1bar)*(Yi-Ybar)
0	8.1	1.25	9.03	-0.05	0.0025	-0.113333	0.012844	-0.063333	0.003167
1	7.3	1.38	8.65	-0.85	0.7225	0.016667	0.000278	-0.443333	0.376833

```
X2Y_err = df["X2i-X2bar"]*df["Yi-Ybar"]
df["(X2i-X2bar)*(Yi-Ybar)"] = X2Y_err
df
```

	X1	X2	Y	X1i-X1bar	(X1i-X1bar)^2	X2i-X2bar	(X2i-X2bar)^2	Yi-Ybar	(X1i-X1bar)*(Yi-Ybar)	(X2 X2bar (Y Yba
0	8.1	1.25	9.03	-0.05	0.0025	-0.113333	0.012844	-0.063333	0.003167	0.007
1	7.3	1.38	8.65	-0.85	0.7225	0.016667	0.000278	-0.443333	0.376833	-0.007
2	7.8	1.57	8.94	-0.35	0.1225	0.206667	0.042711	-0.153333	0.053667	-0.031
3	8.9	1.27	9.42	0.75	0.5625	-0.093333	0.008711	0.326667	0.245000	-0.030
4	9.2	1.67	9.58	1.05	1.1025	0.306667	0.094044	0.486667	0.511000	0.149
5	8.5	1.08	9.19	0.35	0.1225	-0.283333	0.080278	0.096667	0.033833	-0.027
6	8.4	1.22	9.17	0.25	0.0625	-0.143333	0.020544	0.076667	0.019167	-0.010
7	7.2	1.37	8.99	-0.95	0.9025	0.006667	0.000044	-0.103333	0.098167	-0.000
8	9.1	1.25	9.57	0.95	0.9025	-0.113333	0.012844	0.476667	0.452833	-0.054
9	7.6	1.40	8.80	-0.55	0.3025	0.036667	0.001344	-0.293333	0.161333	-0.010

Final Dataset

```
print(df)
```

```
     X1    X2     Y  ...   Yi-Ybar  (X1i-X1bar)*(Yi-Ybar)  (X2i-X2bar)*(Yi-Yb
0   8.1  1.25  9.03  ... -0.063333               0.003167               0.007
1   7.3  1.38  8.65  ... -0.443333               0.376833              -0.007
2   7.8  1.57  8.94  ... -0.153333               0.053667              -0.031
3   8.9  1.27  9.42  ...  0.326667               0.245000              -0.030
4   9.2  1.67  9.58  ...  0.486667               0.511000               0.149
5   8.5  1.08  9.19  ...  0.096667               0.033833              -0.027
6   8.4  1.22  9.17  ...  0.076667               0.019167              -0.010
7   7.2  1.37  8.99  ... -0.103333               0.098167              -0.000
8   9.1  1.25  9.57  ...  0.476667               0.452833              -0.054
9   7.6  1.40  8.80  ... -0.293333               0.161333              -0.010
10  7.8  1.27  8.88  ... -0.213333               0.074667               0.019
11  7.9  1.63  8.90  ... -0.193333               0.048333              -0.051

[12 rows x 10 columns]
```

Calculating summations, w1, w2 and w0

```
sum_mul_X1 = df["(X1i-X1bar)*(Yi-Ybar)"].sum(axis=0)
sum_mul_X1
```

```
2.0779999999999985
```

```
sum_sq_X1 = df["(X1i-X1bar)^2"].sum(axis=0)
sum_sq_X1
```

```
4.989999999999998
```

```
sum_mul_X2 = df["(X2i-X2bar)*(Yi-Ybar)"].sum(axis=0)
sum_mul_X2
```

```
-0.04863333333333311
```

```
sum_sq_X2 = df["(X2i-X2bar)^2"].sum(axis=0)
sum_sq_X2
```

```
0.35346666666666654
```

Formulae

y = w0 + w1 * x1 + w2 * x2

w1 = sum_mul_X1 / sum_sq_X1

w2 = sum_mul_X2 / sum_sq_X2

```
w1 = sum_mul_X1 / sum_sq_X1
w2 = sum_mul_X2 / sum_sq_X2

print("w1 = ", w1)
print("w2 = ", w2)
```

```
w1 =  0.41643286573146276
w2 =  -0.13758958883440153
```

```
w0 = Ybar - w1*X1bar - w2*X2bar
w0
```

```
5.886985950399478
```

Results

w1 = 0.41643286573146276

w2 = -0.13758958883440153

Predicting values

Calcutating y_pred for x1 = 9.5 and x2 = 1.67

```
x1 = 9.5
x2 = 1.67
Y_pred = w0 + w1*x1 + w2*x2
Y_pred
```

```
9.613323561494925
```

Calcutating y_pred for x1 = 7 and x2 = 1.15

```
x1 = 7
x2 = 1.15
Y_pred = w0 + w1*x1 + w2*x2
Y_pred
```

```
8.643787983360157
```