1. Question — You want to compare two stocks. The following averaged monthly returns were yielded by stock A and B, respectively:

A	B
1.7	-0.1
2.4	-0.3
0.1	3.2
0.5	2.5
-2.5	5.2
6.6	-1.3
1.5	0.2
0.2	1.8
0.1	2.2
2.1	0.3
3.1	0.1
-1.1	1.9

Table 1: Averaged monthly returns

Compute the covariance between the two stocks. What does this value mean?

Answer :
1) Compute average returns for both stocks (A: 1.23, B: 1.31)
2) Compute: $(\text{yield}_{A_i} - 1.23) * (\text{yield}_{B_i} * 1.31)$

$(\text{yield}_{A_i} - 1.23) * (\text{yield}_{B_i} * 1.31)$
-0.6627
-1.8837
-2.1357
-0.8687
-14.5097
-14.0157
-0.2997
-0.5047
-1.0057
-0.8787
-2.2627
-1.3747

Table 2: $(\text{yield}_{A_i} - 1.23) * (\text{yield}_{B_i} * 1.31)$ for each month

3) Compute sum and divide by 11 (sample covariance, thus N-1):

$$\sum_{i=1}^{12}(\text{yield}_{A_i} - 1.23) * (\text{yield}_{B_i} * 1.31) = -40.4$$
$$\rightarrow \frac{-40.4}{11} = -3.67$$

Assets are negatively correlated $\rightarrow$ Opposite returns

2. Question — Compute the pearson coefficient based on the above values:

Answer : Let's define a table containing all components

A	B	$x_i - \overline{x}$	$y_i - \overline{y}$	$(x_i - \overline{x}) * (y_i - \overline{y})$	$(x_i - \overline{x})^2$	$(y_i - \overline{y})^2$
1.7	-0.1	0.48	-1.41	-0.6689583333	0.225625	1.983402778
2.4	-0.3	1.18	-1.61	-1.889791667	1.380625	2.586736111
0.10	3.20	-1.13	1.89	-2.128125	1.265625	3.578402778
0.50	2.50	-0.73	1.19	-0.8639583333	0.525625	1.420069444
-2.50	5.20	-3.73	3.89	-14.49645833	13.875625	15.14506944
6.60	-1.30	5.38	-2.61	-14.01979167	28.890625	6.803402778
1.50	0.20	0.28	-1.11	-0.3047916667	0.075625	1.228402778
0.20	1.80	-1.03	0.49	-0.5039583333	1.050625	0.2417361111
0.10	2.20	-1.13	0.89	-1.003125	1.265625	0.7950694444
2.10	0.30	0.88	-1.01	-0.8822916667	0.765625	1.016736111
3.10	0.10	1.88	-1.21	-2.265625	3.515625	1.460069444
-1.10	1.90	-2.33	0.59	-1.375625	5.405625	0.3500694444

Table 3: Necessary components for pearsons correlatoin coefficient.

$$r_{xy} = \frac{\sum_{i=1}^{n}(x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_{i=1}^{n}(x_i - \bar{x})^2}\sqrt{\sum_{i=1}^{n}(y_i - \bar{y})^2}}$$
$$\leftrightarrow \frac{-40.4}{\sqrt{\sum_{i=1}^{n}(x_i - \bar{x})^2}\sqrt{\sum_{i=1}^{n}(y_i - \bar{y})^2}}$$
$$\leftrightarrow \frac{-40.4}{7.63 * 6.05} = -0.87$$