Practical Sessions: Series 1

📑 Exercise 1:

We are interested in studying the possible relationship between the **number of annual sunshine hours (Y)** and the **average temperature in July (X)** in several French cities.

City	Average Temperature in July (X)	Annual Sunshine (Y)
Ajaccio	22.2	2726
Bordeaux	20.8	1992
Clermont-Ferrand	19.7	1898
Brest	16.6	1492
Lille	17.9	1617
Lyon	21.3	2010
Millau	19.3	2121
Nice	23.1	2668
Paris	19.5	1630
Strasbourg	20.3	2010
Toulouse	21.6	2437
Fort-de-France	27.5	2685
Papeete	25.0	2685

Questions

a) Calculate the **mean**, **variance**, and **standard deviation** for each variable X and Y.
→ To be done using Excel's predefined functions.

b) Calculate the **covariance** and the **linear correlation coefficient**.
→ To be done both with the course formulas and with Excel's predefined functions.

c) Determine the **equation of the regression line** $Y=aX + b$ using the **least squares method**.

d) Using Excel, plot the **scatter diagram** and the **regression line** on the same graph.

e) Interpret the obtained results.

📓 Exercise 2 :

Researchers want to study the relationship between the **average annual rainfall (X, in mm)** and the **annual agricultural yield of wheat (Y, in quintals per hectare)** in several regions.

Data Table

Region	Rainfall X (mm)	Wheat Yield Y (q/ha)
A	600	35
B	720	42
C	850	45
D	400	25
E	500	30
F	950	48
G	800	43
H	650	38
I	700	40
J	1000	50

Questions

a) Calculate the **mean**, **variance**, and **standard deviation** of each variable X and Y.
☞ Use Excel functions (AVERAGE, VAR.S, STDEV.S).

b) Compute the **covariance** and **correlation coefficient** between X and Y.
☞ Use formulas from the course and Excel functions (COVARIANCE.S, CORREL).

c) Determine the **regression line equation** $Y = a X + b$ using the least squares method.
☞ Use Excel functions: SLOPE, INTERCEPT.

d) Using Excel, **plot the scatter diagram** and **add the regression line** on the same graph.

e) **Interpret the results**:
What can you say about the relationship between rainfall and wheat yield?