Medical Annex of Jijel
Academic Year: 2026–2027 | **Level:** 1st Year Medicine

Series 03: Bivariate statistics

Exercise 1

We have 5 fossil specimens of an extinct animal of different sizes, for which we have measurements of the length in cm of their humerus x and their femur y

i	x_i	y_i
1	44	40
2	65	60
3	71	59
4	75	65
5	87	77

1. Calculate the mean and variance of X and Y, as well as the covariance between the two variables.
2. Graphically represent this statistical distribution.
3. Determine, using the OLS (Ordinary Least Squares) method, the equation of the regression line of Y on X (D(Y/X)) and that of X on Y (D(X/Y))
4. Does it pass through the center of gravity $(\bar{x}, \bar{y})$? ? Justify by calculation.
5. Plot the regression line D(Y/X) on the previous graph.
6. Calculate the linear correlation coefficient. Comment.
7. Calculate the predicted length, according to this model, of the femur of a specimen whose humerus measures 55 cm

Exercise 2

The following contingency table gives the age distribution of husbands and wives, collected from civil status registers:

x_i \ y_j	[15;20[	[20;25]	[25;30]	$n_{i\bullet}$
[20;25[	4	2	0	6
[25;30[	5	6	0	11
[30;35[	0	4.	1	5
[35;40[	0	1	2	3
$n_{\bullet j}$	9	13	3	25

1. Provide the values of the following joint frequencies: n_{11} , n_{23} , n_{32} , n_{21}
2. Calculate f_{22}; state its meaning

3. Calculate the marginal distributions of X and Y
4. Are the two variables X and Y independent?
5. Graphically represent this statistical distribution.
6. Calculate the mean and variance of the two variables X and Y, , as well as the covariance between the two variables.
7. Calculate Pearson's linear correlation coefficient. Comment?
8. Determine, using the OLS method, the equation of the regression line of Y on X D(Y/X)

Exercise 3

MCQ1) The best-fit regression line of a scatter plot:

a) passes through the maximum number of points

b) passes through the minimum number of points

c) passes through at least 5 points

d) passes through extreme values

MCQ2) Pearson's linear correlation coefficient $r_{x,y}$ must be

a) Between 0 and 1 positive b) Between -1 and 0 c) Between -1 and 1 d) Always

MCQ3) Given the regression equation $Y = 2.4 + 0.56X$, the relationship between the two variables is:

a)Direct b) indirect

MCQ4) Given the regression equation $Y = 2.4 - 0.56X$, the correlation coefficient between these two variables $r_{x,y}$ is :

a) Positive b) negative c) equal to 1 d) equal to 0

MCQ5) In a regression model $= aX + b$ where $\sigma_X = 2.50$, $\sigma_Y = 5$ and $r^2_{X,Y} = 0.49$, the value of a is:

a)1.4 b) 2 c) -0.8 d) 1.4 or -1.4