Answer on Question #85004 – Math – Statistics and Probability

Question

If the correlation between X and Y is - 0.73.Then what is the correlation between X +5 and Y- 4 ?

Solution

From definition $corr(X,Y) = \frac{cov(X,Y)}{\sigma_X \sigma_Y} = -0.73$, where $cov(X,Y) = E[(X - E[X])(Y - E[Y])]$ is the covariance of X and Y, $\sigma_X = cov(X,X)$ $\sigma_Y = cov(Y,Y)$, and $E[X]$ is expected X value.

From covariance properties, $cov(X + a, Y + b) = cov(X,Y)$, where a, b are constant values.

So, $\sigma_{X+5} = cov(X + 5, X + 5) = cov(X,X) = \sigma_X$, $\sigma_{Y-4} = cov(Y - 4, Y - 4) = cov(Y,Y) = \sigma_Y$,

$cov(X + 5, Y - 4) = cov(X,Y)$.

Thus $corr(X + 5, Y - 4) = \frac{cov(X+5,Y-4)}{\sigma_{X+5}\, \sigma_{Y-4}} = \frac{cov(X,Y)}{\sigma_X \sigma_Y} = -0.73$

Answer: the correlation between X+5 and Y-4 is equal to -0.73.