Solution to Kelley and Donnelly, problem 14.2

Q: What is the correlation between hours of study (X) and exam score (Y) in this table?

z_X	X	Y	z_Y	$z_X z_Y$
-0.4767	3	86	0.0000	0.0000
1.4302	5	95	1.4021	2.0053
0.4767	4	92	0.9348	0.4456
0.4767	4	83	-0.4674	-0.2228
-1.4302	2	78	-1.2464	1.7826
-0.4767	3	82	-0.6232	0.2971

Answer

We'll use the formula for the sample Pearson correlation:

$$r = 1/(n-1) \sum_i z_{xi} z_{yi}$$

To be safe we'll keep four decimal places during the calculation.

1. Find the mean and standard deviation of X and Y.

Xbar = 3.5000 s_X = 1.0488
Ybar = 86.0000 s_Y = 6.4187

2. Calculate the z scores of each X and Y score. (Shown in red, above.)

3. Multiply the pairs of z scores from X and Y. (Shown in blue, above.)

4. Add up the products of the pairs of z scores (shown in blue) and divide by 1/(n-1), where here the sample size is n = 6.

$$r = 4.3078 / (6-1) = 0.8616$$

The Pearson correlation between hours of study and exam score is 0.8616.