Correlation example

The table below gives data on height (in inches) and hand span (in centimeters) for 23 students enrolled in Math 160. For the height data distribution, the mean is $\bar{x} = 68.04$ inches and the standard deviation is $s_x = 3.019$ inches. For the hand span data distribution, the mean is $\bar{y} = 20.27$ cm and the standard deviation is $s_y = 2.144$ cm. The three columns on the right give the intermediate results needed in calculation the *correlation* for these distributions.

X=Height	Y=Hand span	$\dfrac{x_i - \bar{x}}{s_x}$	$\dfrac{y_i - \bar{y}}{s_y}$	$\left(\dfrac{x_i - \bar{x}}{s_x}\right)\left(\dfrac{y_i - \bar{y}}{s_y}\right)$
66.0	20.0	-0.677	-0.124	0.084
69.0	21.1	0.317	0.389	0.123
69.0	17.6	0.317	-1.243	-0.394
61.5	16.5	-2.168	-1.756	3.807
63.0	17.5	-1.671	-1.290	2.155
68.0	19.0	-0.014	-0.590	0.008
67.5	20.8	-0.180	0.249	-0.045
71.0	22.5	0.979	1.042	1.021
73.0	25.0	1.642	2.208	3.626
69.0	23.0	0.317	1.276	0.404
72.0	20.2	1.311	-0.030	-0.040
71.0	21.1	0.979	0.389	0.381
66.0	20.7	-0.677	0.203	-0.137
66.0	16.0	-0.677	-1.989	1.347
66.0	20.3	-0.677	0.016	-0.011
70.0	21.2	0.648	0.436	0.283
69.0	20.0	0.317	-0.124	-0.039
70.0	22.1	0.648	0.856	0.555
72.0	21.9	1.311	0.762	0.999
63.0	17.5	-1.671	-1.290	2.155
69.0	21.0	0.317	0.343	0.109
66.0	20.2	-0.677	-0.030	0.021
68.0	20.9	-0.014	0.296	-0.004

To get the correlation, we compute an average of the products in the last column:

$$r = \frac{\sum \left(\dfrac{x_i - \bar{x}}{s_x}\right)\left(\dfrac{y_i - \bar{y}}{s_y}\right)}{n-1} = \frac{0.084 + 0.123 + \cdots + 0.021 - 0.004}{23 - 1} = 0.746$$