

Example 2 Finding r Using Formula 10-1

Use Formula 10-1 to find the value of the linear correlation coefficient r for the paired shoe print and height data given in Table 10-1.

Solution

Requirement check See the discussion of the requirement check in Example 1. The same comments apply here. ✓

Using Formula 10-1, the value of r is calculated as shown below. Here, the variable x is used for the shoe print lengths, and the variable y is used for the heights. Because there are five pairs of data, $n = 5$. Other required values are computed in Table 10-2.

Table 10-2 Calculating r with Formula 10-1

x (Shoe Print)	y (Height)	x^2	y^2	xy
29.7	175.3	882.09	30730.09	5206.41
29.7	177.8	882.09	31612.84	5280.66
31.4	185.4	985.96	34373.16	5821.56
31.8	175.3	1011.24	30730.09	5574.54
27.6	172.7	761.76	29825.29	4766.52
$\Sigma x = 150.2$	$\Sigma y = 886.5$	$\Sigma x^2 = 4523.14$	$\Sigma y^2 = 157271.47$	$\Sigma xy = 26649.69$

Using Formula 10-1 with the results from Table 10-2, r is calculated as follows:

$$\begin{aligned}
 r &= \frac{n \Sigma xy - (\Sigma x)(\Sigma y)}{\sqrt{n(\Sigma x^2) - (\Sigma x)^2} \sqrt{n(\Sigma y^2) - (\Sigma y)^2}} \\
 &= \frac{5(26649.69) - (150.2)(886.5)}{\sqrt{5(4523.14) - (150.2)^2} \sqrt{5(157271.47) - (886.5)^2}} \\
 &= \frac{96.15}{\sqrt{55.66} \sqrt{475.10}} = 0.591
 \end{aligned}$$

Example 3 Finding r Using Formula 10-2

Use Formula 10-2 to find the value of the linear correlation coefficient r for the paired shoe print and height data given in Table 10-1.

Solution

Requirement check See the discussion of the requirement check in Example 1. The same comments apply here. ✓

If manual calculations are absolutely necessary, Formula 10-1 is much easier than Formula 10-2, but Formula 10-2 has the advantage of making it easier to *understand* how r works. (See the *rationale* for r discussed later in this section.) As in Example 2, the variable x is used for the shoe print lengths, and the variable y is used for the heights. In Formula 10-2, each sample value is replaced by its corresponding

Teacher Evaluations Correlate with Grades

Student evaluations of faculty are often

used to measure teaching effectiveness. Many studies reveal a correlation with higher student grades being associated with higher faculty evaluations. One study at Duke University involved student evaluations collected before and after final grades were assigned. The study showed that "grade expectations or received grades caused a change in the way students perceived their teacher and the quality of instruction." It was noted that with student evaluations, "the incentives for faculty to manipulate their grading policies in order to enhance their evaluations increase." It was concluded that "the ultimate consequence of such manipulations is the degradation of the quality of education in the United States." (See "Teacher Course Evaluations and Student Grades: An Academic Tango," by Valen Johnson, *Chance*, Vol. 15, No. 3.)

