The linear correlation coefficient is $r = 0.591$ (from Examples 1, 2, and 3) and $n = 5$ (because there are five pairs of sample data), so the test statistic is

$$t = \frac{r}{\sqrt{\frac{1 - r^2}{n - 2}}} = \frac{0.591}{\sqrt{\frac{1 - 0.591^2}{5 - 2}}} = 1.269$$

Computer software packages use more precision to obtain the more accurate test statistic of $t = 1.270$. With $n - 2 = 3$ degrees of freedom, Table A-3 shows that the test statistic of $t = 1.269$ yields a P-value that is greater than 0.20. Software packages and the TI-83/84 Plus calculator show that the P-value is 0.2937. Because the P-value of 0.2937 is greater than the significance level of 0.05, we fail to reject H_0. ("If the P is low, the null must go." The P-value of 0.2937 is not low.)

Interpretation

We conclude that there is not sufficient evidence to support the claim of a linear correlation between shoe print lengths and heights.

One-Tailed Tests Examples 7 and 8 illustrate a two-tailed hypothesis test. The examples and exercises in this section will generally involve only two-tailed tests, but one-tailed tests can occur with a claim of a positive linear correlation or a claim of a negative linear correlation. In such cases, the hypotheses will be as shown here.

Claim of Negative Correlation (Left-tailed test)	Claim of Positive Correlation (Right-tailed test)
H_0: $\rho = 0$	H_0: $\rho = 0$
H_1: $\rho < 0$	H_1: $\rho > 0$

For these one-tailed tests, the P-value method can be used as in earlier chapters.

Rationale for Methods of This Section We have presented Formulas 10-1 and 10-2 for calculating r and have illustrated their use. Those formulas are given below along with some other formulas that are "equivalent," in the sense that they all produce the same values.

Formula 10-1

$$r = \frac{n\Sigma xy - (\Sigma x)(\Sigma y)}{\sqrt{n(\Sigma x^2) - (\Sigma x)^2}\sqrt{n(\Sigma y^2) - (\Sigma y)^2}}$$

Formula 10-2

$$r = \frac{\Sigma(z_x z_y)}{n - 1}$$

$$r = \frac{\Sigma(x - \bar{x})(y - \bar{y})}{(n - 1)s_x s_y} \qquad r = \frac{\Sigma\left[\frac{(x - \bar{x})}{s_x}\frac{(y - \bar{y})}{s_y}\right]}{n - 1} \qquad r = \frac{s_{xy}}{\sqrt{s_{xx}}\sqrt{s_{yy}}}$$