Properties of the Linear Correlation Coefficient r

1. The value of r is always between -1 and 1 inclusive. That is, $-1 \le r \le 1$.

2. *If all values of either variable are converted to a different scale, the value of r does not change.*

3. *The value of r is not affected by the choice of x or y.* Interchange all x- and y-values and the value of r will not change.

4. *r measures the strength of a linear relationship.* It is not designed to measure the strength of a relationship that is not linear (as in Figure 10-2(d)).

5. *r is very sensitive to outliers* in the sense that a single outlier can dramatically affect its value.

Calculating the Linear Correlation Coefficient r

The following three examples illustrate three different methods for finding the value of the linear correlation coefficient r, but you need to use only one method. *The use of computer software or a calculator (as in Example 1) is strongly recommended.* If manual calculations are absolutely necessary, Formula 10-1 is recommended (as in Example 2). If a better understanding of r is desired, Formula 10-2 is recommended (as in Example 3).

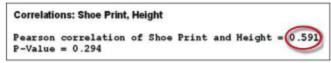**Example 1** **Finding r Using Computer Software**

The paired shoe/height data from five males are listed in Table 10-1. Use computer software or a calculator with these paired sample values to find the value of the linear correlation coefficient r for the paired sample data.
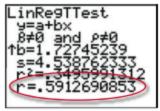
Solution

Requirement check We can always calculate the linear correlation coefficient r from paired quantitative data, but we should check the requirements if we want to use that value for making a conclusion about correlation. (1) The data are a simple random sample of quantitative data. (2) The plotted points in the scatterplot in Figure 10-1(a) appear to roughly approximate a straight-line pattern. (3) The scatterplot in Figure 10-1(a) also shows that there are no outliers. The requirements are satisfied. ⊘

If using computer software or a calculator, the value of r will be automatically calculated. For example, see the following Minitab, TI-83/84 Plus calculator, and STATDISK displays showing that $r = 0.591$. Excel and many other computer software packages and calculators provide the same value of $r = 0.591$.

MINITAB

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Correlations: Shoe Print, Height

Pearson correlation of Shoe Print and Height = 0.591
P-Value = 0.294
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TI-83/84 PLUS

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LinRegTTest
y=a+bx
β≠0 and ρ≠0
↑b=1.72745239
s=4.538762333
r²=.3495951312
r=.5912690853
```

STATDISK

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Correlation Results:
Correlation coeff, r: 0.5912691
Critical r:           ±0.8783393
P-value (two-tailed): 0.29369
```