

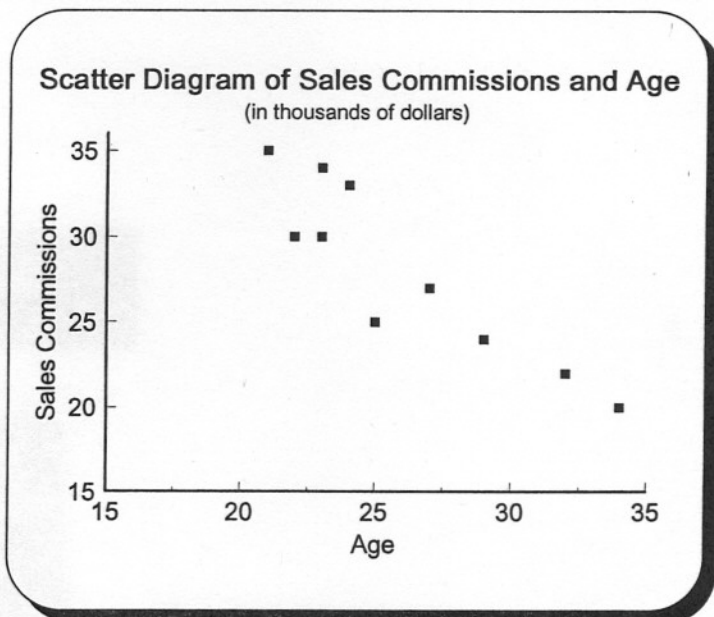
## Practice Set 23 Correlation Analysis

I. Darin Jones wants to know whether age of sales personnel affects sales performance.

Answer the following questions using the given data.

A. Draw a scatter diagram.

Age	Sales Commissions (000)	xy	x <sup>2</sup>	y <sup>2</sup>
23	30	690	529	900
25	25	625	625	625
34	20	680	1,156	400
29	24	696	841	576
21	35	735	441	1,225
32	22	704	1,024	484
23	34	782	529	1,156
24	33	792	576	1,089
27	27	729	729	729
<u>22</u>	<u>30</u>	<u>660</u>	<u>484</u>	<u>900</u>
260	280	7,093	6,934	8,084



B. Calculate the coefficient of correlation to 3 decimal places. Interpret your answer.

$$r = \frac{n(\sum XY) - (\sum X)(\sum Y)}{\sqrt{[n(\sum X^2) - (\sum X)^2][n(\sum Y^2) - (\sum Y)^2]}} = \frac{10(7,093) - (260)(280)}{\sqrt{[10(6,934) - (260)^2][10(8,084) - (280)^2]}}$$

$$= \frac{(70,930) - (72,800)}{\sqrt{[(69,340) - (67,600)][(80,840) - (78,400)]}} = \frac{-1,870}{\sqrt{[1,740][2,440]}} = \frac{-1,870}{2,060} = -.908$$

There is a high negative correlation between age of sales people and sales performance.

C. What is the coefficient of determination? Interpret your answer.

$$r^2 = (.908)^2 = .824 \text{ or } 82.4\%$$

Eighty-two and four tenths percent of the variability in sales performance is accounted for by age variability of salespeople.

D. What is the coefficient of nondetermination? Interpret your answer.

$$\bar{r}^2 = 1 - r^2 = 1 - .824 = .176 \text{ or } 17.6\%$$

Seventeen and six tenths percent of the variability in sales performance is not accounted for by age variability of salespeople.

E. Is the relationship between age of sales personnel and their sales commissions significant at the .01 level?

The null hypothesis and alternate hypothesis are  $H_0: \rho = 0$  and  $H_1: \rho \neq 0$ .

- The level of significance will be .01 for this two-tail problem with  $n - 2$  degrees of freedom.
- The relevant statistic will be  $t$ .
- If  $t$  from the test statistic is beyond the critical value of  $t$ , the null hypothesis will be rejected.
- Apply the decision rule.

$$df = n - 2 = 10 - 2 = 8 \rightarrow t = 3.355$$

$$t = \frac{r - \rho}{\sqrt{\frac{1 - r^2}{n - 2}}} = \frac{.908 - 0}{\sqrt{\frac{1 - (.908)^2}{10 - 2}}} = 6.13$$

Reject  $H_0$  because  $6.13 > 3.355$ . The population coefficient of correlation could not be zero at the .01 level of significance. **Note:** Because  $t$  may be positive or negative, the absolute value of  $r$  is used to calculate  $t$ .