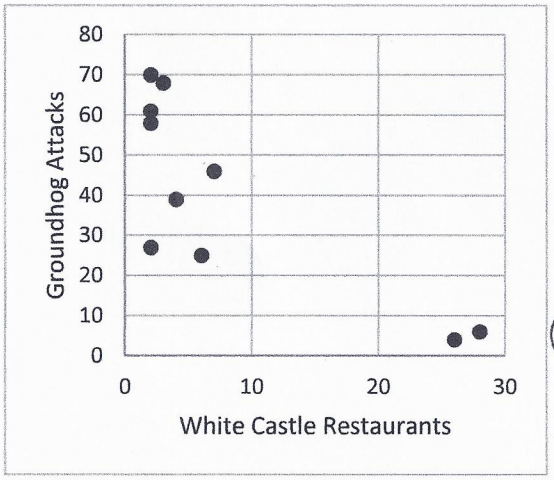
ISE 2211 • Exam VI • 12 April 2021 NAME SOLUTION

Really smart people have hypothesized that there is a *correlation* between the number of White Castle restaurants in an Ohio metropolitan area and the total incidence of attacks by deranged groundhogs, as reported by municipal animal control authorities. Here is the data:

Metropolitan Area	White Castle Restaurants (x)	Groundhog Attacks (y)
Akron	2	27
Cincinnati	26	4
Cleveland	6	25
Columbus	28	6
Dayton	4	39
Hamilton	2	61
Milford	2	58
Mt. Healthy	2	70
West Chester	7	46
Zanesville	3	68



Write a 95% confidence interval on the correlation coefficient between the number of White Castle restaurants and deranged groundhog attacks, and comment on the validity of the hypothesized relationship between them. Ignore the $n \geq 30$ requirement in computing the interval.

$\sum x_i = 82$, $\sum y_i = 404$ (+1)

$\sum x_i^2 = 1586$, $\sum y_i^2 = 21652$ (+1)

$\sum x_i y_i = 1536$ (+1)

$\bar{x} = 8.2$, $\bar{y} = 40.4$ (+1)

(+1)
$$S_{xy} = 1536 - \frac{404 \cdot 82}{10} = -1776.8$$
$$S_{xx} = 1586 - \frac{82^2}{10} = 913.6$$

$$\hat{\beta}_1 = \frac{-1776.8}{913.6} = -1.945 \quad (+1)$$

$$\hat{\beta}_0 = 40.4 - (-1.945)\,8.2 = 56.35 \quad (+1)$$

$$SS_T = 21652 - 10 \cdot 40.4^2 = 5330.4$$

$$SS_E = 5330.4 - (-1.945)(-1776.8) = 1874.5 \quad (+1)$$

$$R^2 = 1 - \frac{1874.5}{5330.4} = 0.6483 \quad (+1) \Rightarrow R = 0.8052 \quad (+1)$$

$Z_{\alpha/2} = Z_{.025} = 1.960$ (+1)

C.I.: $\tanh\left(\tanh^{-1}(0.8052) \pm \frac{1.960}{\sqrt{7}}\right)$ (+1)

$0.3561 < \rho < 0.9521$

(+2)

-- probably too wide of a range to suggest statistical significance or not

(+1)