#8 (Total 40 Points)

[1]

Year	Attacks (y)	Employees	Vulnerabilities (x)	y*x	x^2
1	10	100	20	200,00	400,00
2	15	120	25	375,00	625,00
3	18	150	30	540,00	900,00
4	20	180	35	700,00	1225,00
5	25	210	40	1000,00	1600,00
6	30	240	45	1350,00	2025,00
7	35	270	50	1750,00	2500,00
8	40	300	55	2200,00	3025,00
9	45	330	60	2700,00	3600,00
10	50	360	65	3250,00	4225,00
Total	**288,00**		**425,00**	**14065,00**	**20125,00**

$$b_1 = \frac{n * \sum x_i * y_i - \sum x_i * \sum y_i}{n * \sum(x_i^2) - (\sum x_i)^2} = \frac{10 * 14065 - (288 * 425)}{10 * 20125 - (425)^2} = 0{,}89$$

$$\bar{y} = \frac{1}{n} * \sum_{i=1}^{n} y_i = \frac{1}{10} * (10 + 15 + \cdots + 50) = 28{,}80$$

$$\bar{x} = \frac{1}{n} * \sum_{i=1}^{n} x_i = \frac{1}{10} * (20 + 25 + \cdots + 65) = 42{,}50$$

$$b_0 = \bar{y} - b_1 * \bar{x} = 28{,}80 - (0{,}89 * 42{,}50) = -9{,}03$$

[2]

$$\hat{y}_i = -9{,}03 + 0{,}89 * x_i$$

Positive relationship between the number of vulnerabilities and the number of attacks.

[3]

$$H_0: \beta_1 = 0$$

$$H_1: \beta_1 \neq 0$$

$$t_{b_1} = \frac{b_1}{s_{b_1}} = \frac{0{,}15}{0{,}005} = 30$$

$$t_{0{,}025}^{8} = 2{,}31$$

$$\Rightarrow |t_{b_1}| = 30 > 2{,}31 = t_{0{,}025}^{8}$$

Reject H_0; b_1 is statistically significant.

$$H_0: \beta_0 = 0$$

$$H_1: \beta_0 \neq 0$$

$$t_{b_1} = \frac{b_0}{s_{b_0}} = \frac{-5{,}15}{1{,}15} = -4{,}48$$

$$t^8_{0{,}025} = 2{,}31$$

$$\Longrightarrow \left|t_{b_0}\right| = 4{,}48 > 2{,}31 = t^8_{0{,}025}$$

Reject H_0; b_0 is statistically significant.

[4]

$$\left[b_1 \pm t^{(n-2)}_{[\alpha/2]} * s_{b_1}\right] = [0{,}15 \pm 2{,}31 * 0{,}005] = [0{,}14; 0{,}16]$$

$$\left[b_0 \pm t^{(n-2)}_{[\alpha/2]} * s_{b_0}\right] = [-5{,}15 \pm 2{,}31 * 1{,}15] = [-7{,}81; -2{,}50]$$