Manatee Example

Based on example on page 495 Elementary Statistics 9th ed. by Mario Triola

Manatees are large, gentle sea creatures that live along the Florida coast. Many manatees are killed of injured by powerboats each year as pleasure boaters take to the sea for recreation. The data the follow in Table 1 list the number of powerboat registrations (in 1000's) and the number of manatees killed by boats in Florida for the years 1991 to 2000. Figure 1 is a scatter plot of the data in Table 1.

Table 1: manatees killed in Florida from 1991 to 2000 versus Number of Powerboat registrations (in tens of thousands)

Year	1991	1992	1993	1994	1995
PowerBoats	68	68	67	70	71
Manatees	53	38	35	49	42
Year	1996	1997	1998	1999	2000
PowerBoats	73	76	81	83	84
Manatees	60	54	67	82	78

1) For this setting identify the response variable.

2) For this setting, identify the predictor variable.

3) Does there appear to be any correlation between the predictor and response variables? If so classify that correlation as linear or non-linear.

4) Describe the "direction" of the correlation

5) Classify the strength of the correlation as strong or weak

6) Use Figure 2 to predict the number of manatees killed when powerboat registrations are 725,000.

7) If 65 manatees were killed in a year, how many powerboats would you suspect had been registered for that year?

Figure 1: Scatter diagram of Number of manatees killed versus Powerboat registrations

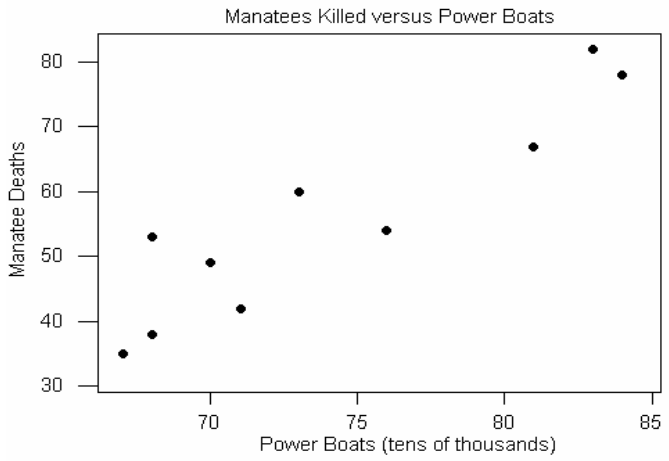
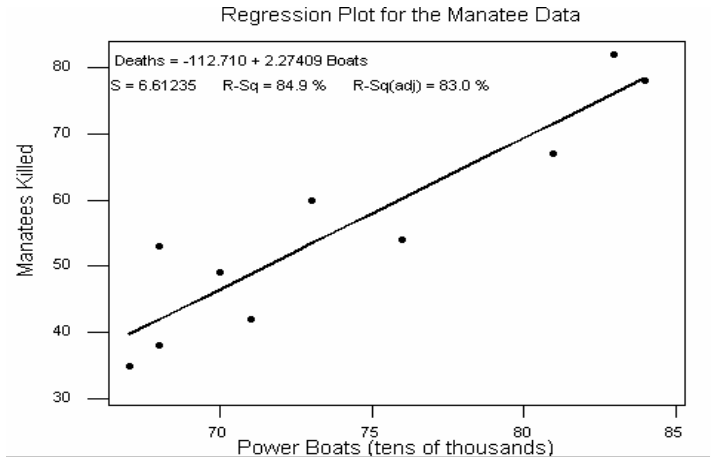


Figure 2: Fitted Line Plot (Regression Plot) for the Manatee Data



Manatee Example

Minitab output for the manatee example:

Output 1: Descriptive statistics for the variables in the manatee study

Descriptive Statistics: Boats, Deaths

Variable	N	Mean	Median	TrMean	StDev	SE Mean
Boats	10	74.10	72.00	73.75	6.51	2.06
Deaths	10	55.80	53.50	55.13	16.05	5.08

Variable	Minimum	Maximum	Q1	Q3
Boats	67.00	84.00	68.00	81.50
Deaths	35.00	82.00	41.00	69.75

Table 1: Raw data, intermediate values, and summary statistics

Boats	Manatees	xy	x^2	y^2
68	53	3604	4624	2809
68	38	2584	4624	1444
67	35	2345	4489	1225
70	49	3430	4900	2401
71	42	2982	5041	1764
73	60	4380	5329	3600
76	54	4104	5776	2916
81	67	5427	6561	4489
83	82	6806	6889	6724
84	78	6552	7056	6084
741	558	42214	55289	33456
Σ x	Σ y	Σxy	Σx^2	Σy^2

Equation 1: The correlation Coefficient:

$$r = \frac{n \cdot \Sigma(xy) - \Sigma x \cdot \Sigma y}{\sqrt{n(\Sigma x^2) - (\Sigma x)^2} \cdot \sqrt{n(\Sigma y^2) - (\Sigma y)^2}} = \frac{n \cdot \Sigma(xy) - \Sigma x \cdot \Sigma y}{n(n-1)s_x \cdot s_y}$$

$$= \frac{10 \cdot (42214) - (741)(558)}{10(9) \cdot 6.51 \cdot 16.05} = 0.921$$

A) Compare the correlation coefficient computed by hand with that given in the minitab output below.

Output 2: Minitab correlation coefficient output

Correlations: Boats, Deaths

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Pearson correlation of Boats and Deaths = 0.922
P-Value = 0.000
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