#6 (Total 45 Points)

[1]

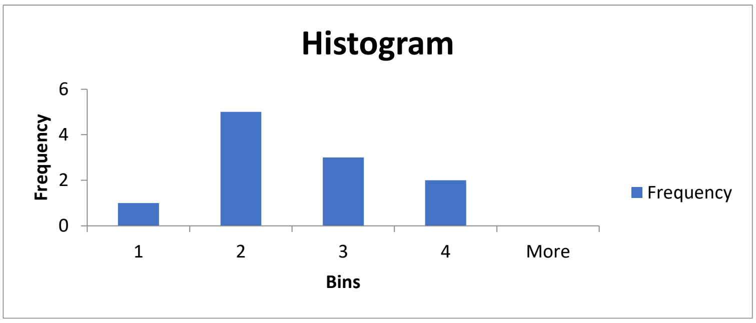
You learned in my course, that for histogram purposes you should perform a z-transformation before assessing the normality of the data using a histogram. The standardized residuals could be used because these data are normalized and could easily be used to construct the histogram.

RESIDUAL OUTPUT			
Observation	*Predicted Y*	*Residuals*	*Standard Residuals*
1	9,85	0,15	0,07
2	11,86	2,14	1,09
3	6,64	-1,64	-0,83
4	8,11	-0,11	-0,06
5	10,66	-1,66	-0,84
6	13,60	-1,60	-0,82
7	4,76	-0,76	-0,39
8	5,43	1,57	0,80
9	10,12	0,88	0,45
10	9,18	3,82	1,94
11	8,78	-2,78	-1,41

While the rule to construct the intervals is given, we assign the values of the standard residuals accordingly. We simply count the number of values that fit into the corresponding interval.

Interval	**Bins**	**# of values**
1	$-2 \leq Value < -1$	1
2	$-1 \leq Value < 0$	5
3	$0 \leq Value < 1$	3
4	$1 \leq Value < 2$	2

Based on this table, we construct the histogram.



The data are slightly right-skewed. However, the data follow approximately the normal distribution.

[2]

We are assuming that β_1 equals zero:

$$H_0: \beta_1 = 0$$

$$H_1: \beta_1 \neq 0$$

The target is to reject the null hypothesis.

The first step is to compute the standard error of the slope parameter:

$$s_{b_1} = \frac{s}{\sqrt{SS_{xx}}} = \frac{s}{\sqrt{\sum(x_i - \bar{x})^2}}$$

	Total Loss in T€	Downtime in minutes	Sq(x - MW[x])
	10	8,10	0,40
	14	9,60	4,56
	5	5,70	3,11
	8	6,80	0,44
	9	8,70	1,53
	12	10,90	11,81
	4	4,30	10,01
	7	4,80	7,09
	11	8,30	0,70
	13	7,60	0,02
	6	7,30	0,03
MW		**7,46**	
Total			**39,71**

$$s^2 = \frac{SSE}{n-2} \Rightarrow s = \sqrt{\frac{SSE}{n-2}} = \sqrt{\frac{38,72}{11-2}} = 2,07$$

$$s_{b_1} = \frac{s}{\sqrt{SS_{xx}}} = \frac{s}{\sqrt{\sum(x_i - \bar{x})^2}} = \frac{2,07}{\sqrt{39,71}} = 0,33$$

We need a test statistic that is given with

$$t = \frac{b_1}{s_{b_1}} = \frac{1,34}{0,33} = 4,07$$

The decision rule is as follows:

$$\text{Reject } H_0 \text{ if } |t| > t_{[\alpha/2]}^{(n-2)}$$

$$|4{,}07| > 2{,}26$$

For the y-intercept we get:

$$\text{Reject } H_0 \text{ if } |t| > t_{[\alpha/2]}^{(n-2)}$$

$$|-0{,}39| < 2{,}26$$

Result: b_1 is statistically significant, while b_0 is not statistically significant.

[3]

Confidence interval for b_0

$$\left[b_0 \pm t_{[\alpha/2]}^{(n-2)} * s_{b_0}\right] = [-1{,}00 \pm 2{,}26 * 2{,}54] = [-6{,}74; 4{,}73]$$

Confidence interval for b_1

$$\left[b_1 \pm t_{[\alpha/2]}^{(n-2)} * s_{b_1}\right] = [1{,}34 \pm 2{,}26 * 0{,}33] = [0{,}60; 2{,}08]$$