Chapter 8 Problems 2, 6

8.1 Exercise 2

Consider a situation where a response equal to or greater than 12.5 was undesirable. The collection of data was very expensive and time-consuming: however, a team was able to collect the following set of random measurements: 9.46, 10.61, 8.07, 12.21, 9.02, 8.99 10.03, 11.73, 10.99, 10.56.

(a) Conduct an attribute assessment.

(b) Make a visual assessment of data normality using a histogram. From the plot estimate the mean and percentage of time 12.5 or larger.

(c) Make a visual assessment of data normality using a normal probability plot. From this plot estimate the median and percentage of time 12.5 or larger. Estimate the response level where 10% is below. Estimate the response level that 10% of the population does not exceed. Estimate the range of response exhibited by 80%; i.e. ± 40% from the median, of the population.

(d) Use the *Z* table, i.e., Table A to refine these estimates.

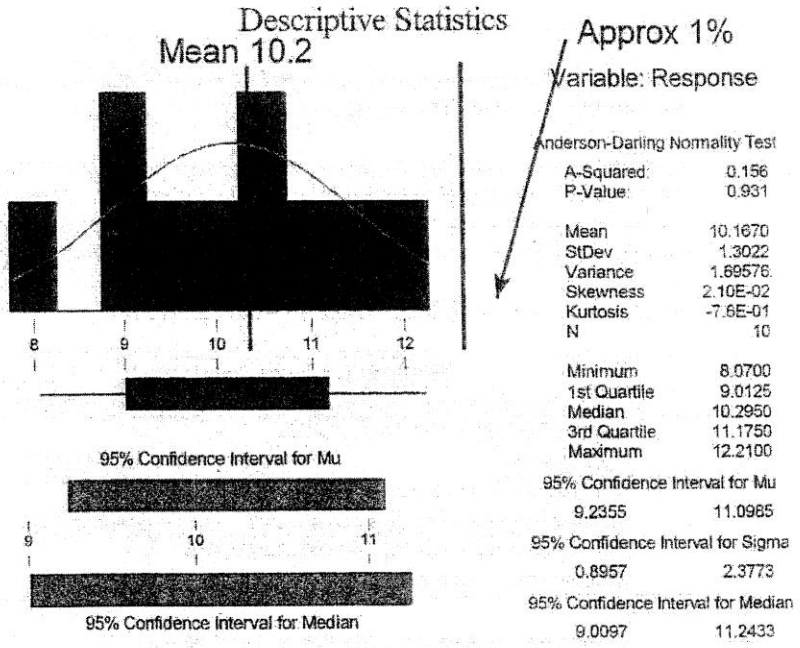
	Description	Results
1	"Attribute estimate" of failure rate	Zero failure rate
2	Does data appear normal from a histogram?	Hard to tell
3	Histogram estimate for median and percentage of time larger than 12.5	Hard to tell
4	Histogram estimate for the response level where 10% is below	Hard to tell
5	Histogram estimate for the response level that 10% of the population does not exceed	Hard to tell
6	Histogram estimate for the response level 80% of the time	Hard to tell
7	Mean	10.167
8	Standard deviation	1.3022
9	Calculated estimate for median and percentage of time larger than 12.5	10.2950 and 3.67%
10	Calculated estimate for the response level where 10% is below	8.3779
11	Calculated estimate for the response level that 10% of the population does not exceed	11.9561
12	Calculated estimate for the response level 80% of the time	8.3779 - 11.9561

(a) Conduct an attribute assessment (relative to the specification)

Output is satisfactory

(b) Make a visual assessment of data normality using a histogram. From the plot estimate the mean and percentage of time 12.5 or larger.

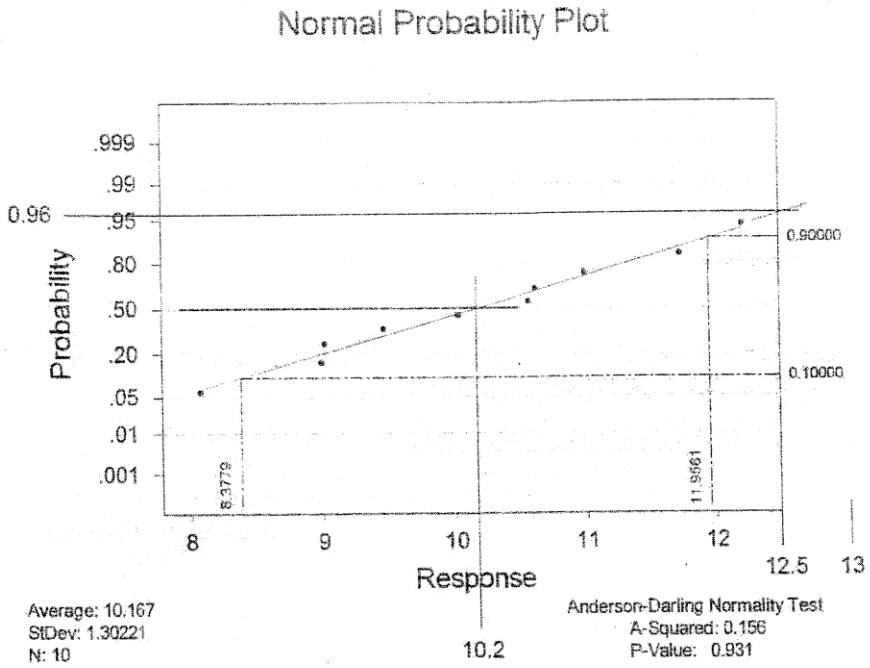
From the figure below it is difficult to assess normality. A rough estimate for the mean is 10.2. Rough estimate of the percentage of time 12.5 or greater is 1%



(c) Make a visual assessment of data normality using a normal probability plot. From this plot estimate the median and percentage of time 12.5 or larger. Estimate the response level where 10% is below. Estimate the response level that 10% of the population does not exceed. Estimate the range of response exhibited by 80%; i.e. ± 40% from the median, of the population.

From the plot below (many lines were drawn manually):

- Data appears to be from a normal distribution
- Median: 10.2
- Percentage of time 12.5 or larger: 4%
- 10% time less than: 8.38
- 80% range: 8.3779 – 11.9561



(d) Use the Z table, i.e., Table A to refine these estimates.

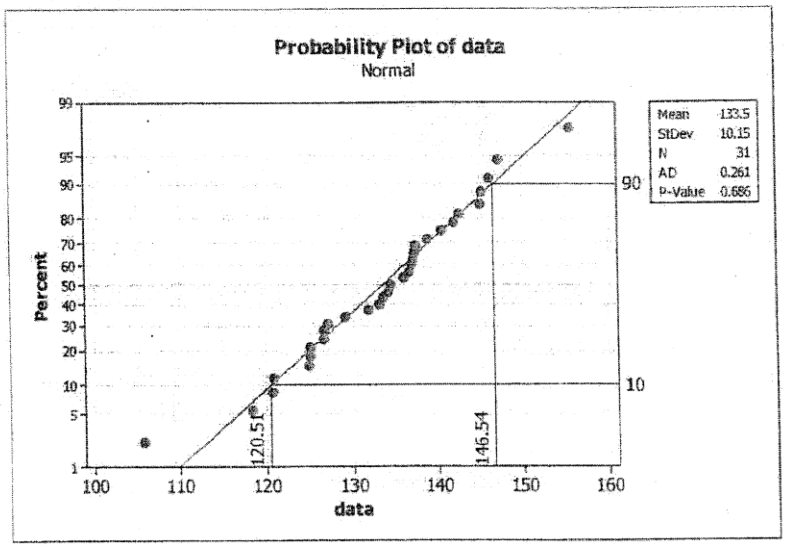
$$Z = \frac{X - \mu}{\sigma} = \frac{12.5 - 10.1670}{1.3022} = 1.79$$

From Z table: 3.67%

8.4 Exercise 6

Consider that the 31 observations in Exercise 10.13 were a random sample from a population. Determine the estimated 80% frequency of occurrence range. Determine the estimated proportion below a lower specification limit of 120 and an upper specification limit of 150.

- 80% frequency of occurrence range



- Specification limits of 120 and 150