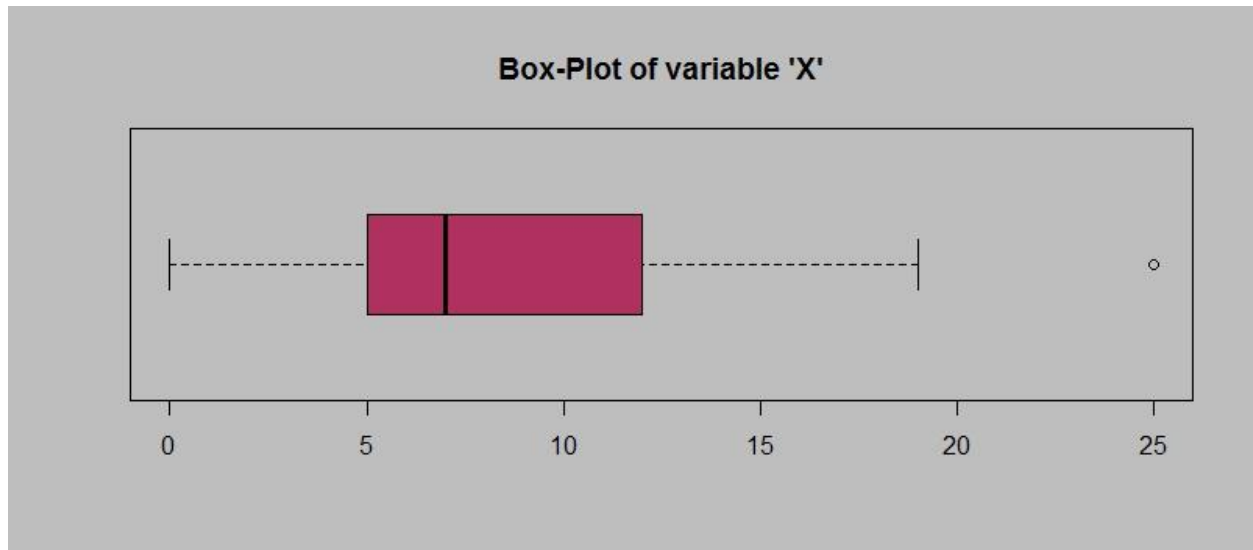


Topics: Descriptive Statistics and Probability

2.



Answer the following three questions based on the box-plot above.

- (i) What is inter-quartile range of this dataset? (please approximate the numbers) In one line, explain what this value implies.

Ans: Approximately (First Quartile Range) $Q1 = 5$ (Third Quartile Range) $Q3 = 12$,
Median (Second Quartile Range) $= 7$
(Inter-Quartile Range) $IQR = Q3 - Q1 = 12 - 5 = 7$
Second Quartile Range is the Median Value

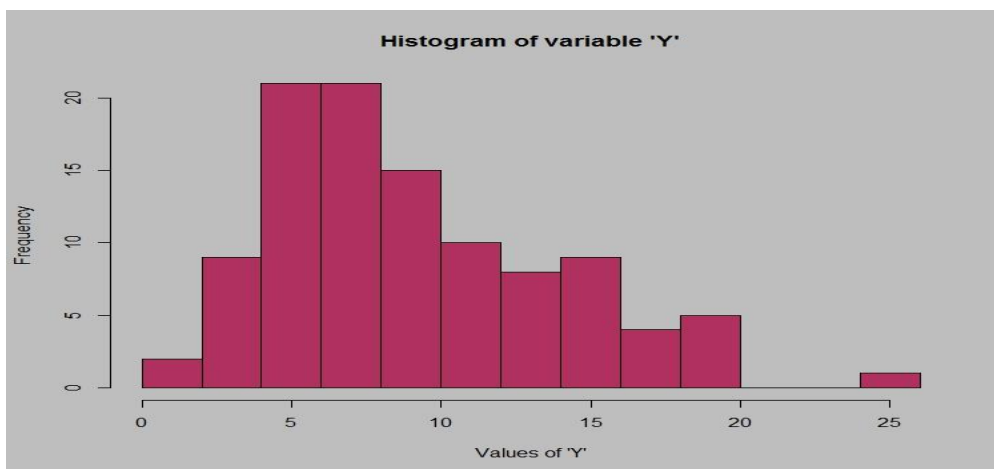
- (ii) What can we say about the skewness of this dataset?

Ans: Right-Skewed median is towards the left side it is not normal distribution

- (iii) If it was found that the data point with the value 25 is actually 2.5, how would the new box-plot be affected?

Ans: In that case there would be no Outliers on the given dataset because of the outlier the data had positive skewness it will reduce and the data will normal distributed

3.



Answer the following three questions based on the histogram above.

- (i) Where would the mode of this dataset lie?

Ans: The mode of this data set lie in between 5 to 10 and approximately between 4 to 8.

- (ii) Comment on the skewness of the dataset.

Ans: The given data is Right-Skewed. Mean>Median>Mode

- (iii) Suppose that the above histogram and the box-plot in question 2 are plotted for the same dataset. Explain how these graphs complement each other in providing information about any dataset.

Ans: They both are right-skewed and both have outliers the median can be easily visualized in box plot where as in histogram mode is more visible.

4. AT&T was running commercials in 1990 aimed at luring back customers who had switched to one of the other long-distance phone service providers. One such commercial shows a businessman trying to reach Phoenix and mistakenly getting Fiji, where a half-naked native on a beach responds incomprehensibly in Polynesian. When asked about this advertisement, AT&T admitted that the portrayed incident did not actually take place but added that this was an enactment of something that "could happen." Suppose that one in 200 long-distance telephone calls is misdirected. What is the probability that at least one in five attempted telephone calls reaches the wrong number? (Assume independence of attempts.)

Ans: IF 1 in 200 long-distance telephone calls are getting misdirected.

probability of call misdirecting = $1/200$

Probability of call not Misdirecting = $1 - 1/200 = 199/200$

The probability for at least one in five attempted telephone calls reaches the wrong number

Number of Calls = 5

$n = 5$

$p = 1/200$

$q = 199/200$

$P(x)$ = at least one in five attempted telephone calls reaches the wrong number

$$P(x) = {}^nC_x p^x q^{n-x}$$

$$P(x) = ({}^nC_x) (p^x) (q^{n-x}) \quad \# \quad {}^nC_r = \frac{n!}{r! * (n - r)!}$$

$$P(1) = ({}^5C_1) (1/200)^1 (199/200)^{5-1}$$

$$P(1) = 0.0245037$$

5. Returns on a certain business venture, to the nearest \$1,000, are known to follow the following probability distribution

x	P(x)
-2,000	0.1
-1,000	0.1
0	0.2
1000	0.2
2000	0.3
3000	0.1

$$E(X) = \sum X_i \cdot P(X_i) \quad | \quad E(X^2) = \sum X_i^2 \cdot P(X_i)$$

-200		400000
-100		100000
0		0
200		200000
600		1200000
300		900000
Total: 800		2800000

- (i) What is the most likely monetary outcome of the business venture?

Ans: The most likely monetary outcome of the business venture is 2000\$

As for 2000\$ the probability is 0.3 which is maximum as compared to others

- (ii) Is the venture likely to be successful? Explain

Ans: To determine whether the venture is likely to be successful, we need to define what success means. If success is defined as making a profit, then we can say that the venture is likely to be successful because the probability of earning a profit (i.e., earning more than 0) is 0.6 (the sum of the probabilities for $x = 0, 1000, 2000, \text{ and } 3000$)

- (iii) What is the long-term average earning of business ventures of this kind? Explain

Ans: The long-term average is Expected value = $\sum (X_i \cdot P(X_i)) = 800\$$ which means on an average the returns will be + 800\$

- (iv) What is the good measure of the risk involved in a venture of this kind? Compute this measure

Ans: One measure of risk is the standard deviation of the distribution. To compute the standard deviation, we first need to compute the variance, which is the sum of the squared deviations from the expected value, weighted by their probabilities. That is,

$$\text{Variance} = [(-2000 - 800)^2(0.1) + (-1000 - 800)^2(0.1) + (0 - 800)^2(0.2) + (1000 - 800)^2(0.2) + (2000 - 800)^2(0.3) + (3000 - 800)^2(0.1)] = \$1,264,000$$

Then, the standard deviation is the square root of the variance, which is approximately \$1,124. Therefore, the measure of risk involved in this venture is about \$1,124.