Assignment 1

Cesar A. Santiago

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Contents

1 GPA histogram.

1.1 Part 1

Whithin the categories of 2.45-2.65 and 2.65-2.85 there are the most student per category.

1.2 Part 2

Both ranges of grades: 2.45-2.65 and 2.65-2.85 both have 7 / 30 students. Therefore the categories put together make up 14 / 30 students.

1.3 Part 3

The portion of students that had less that a 2.65 GPA consited of 16 / 30 students.

2 Formulas for Mean, Variance, and Standard Variation.

- $\overline{y} = \frac{1}{n}\sum_{i=1}^{n} y_i$
- $s^2 = \frac{1}{n-1}\sum_{i=1}^{n}(y_i - \overline{y})^2$
- $s = \sqrt{s^2} = \frac{1}{n-1}\sqrt{\sum_{i=1}^{n}(y_i - \overline{y})^2 i}$

3 From the 44 observations, take the Mean, Variance, and Standard Deviation.

3.1 Consider the following 44 observations:

Set S = {0.07, 5.7, 6.2, 7.1, 7.6, 7.7, 7.8, 7.8, 7.9, 8.2, 8.3, 8.4, 8.6, 8.7, 8.8, 8.8, 8.8, 8.8, 8.8, 8.9, 8.9, 9.0, 9.1, 9.1, 9.2, 9.2, 9.3, 9.4, 9.5, 9.6, 9.6, 10.2, 10.3, 10.3, 10.5, 10.5, 10.6, 10.7, 10.9, 11.3, 11.5, 11.8, 12.4, 12.7}
Using the formulas from section 2;

- For the Mean we conclude the following:
  $\overline{y} = \frac{1}{n}\sum_{i=1}^{n} y_i = \mathbf{9.058}$
- For the Variance we conclude the following:
  $s^2 = \frac{1}{n-1}\sum_{i=1}^{n}(y_i - \overline{y})^2 = \mathbf{4.092}$
- For the Standard Deviation we conclude the following:
  $s = \sqrt{s^2} = \frac{1}{n-1}\sqrt{\sum_{i=1}^{n}(y_i - \overline{y})^2 i} = \mathbf{2.023}$

4 Resting breathing Mean and Standard Deviation.

4.1 9.7 to 14.3 breaths per minute.

On an average normal distribution the breathing rates between 9.7 and 14.3 which are $[\overline{y} - s, \overline{y} + s]$ is equivalent to about **68%**.

4.2 7.4 to 16.6 breaths per minute.

On an average normal distribution the breathing rates between 7.4 and 16.6 which are $[\overline{y} - 2s, \overline{y} + 2s]$ is equivalent to about **95%**.

4.3 9.7 to 16.6 breaths per minute.

On an average normal distribution the breathing rates between 7.4 and 16.6 which are $[\overline{y} - s, \overline{y} + 2s]$ is equivalent to about **81.5%**.

4.4 Breaths per minute lower than 5.1 and higher than 18.9.

On an average normal distribution the breathing rates lower than 5.1 and higher than 18.9 which are $5.1 < x > 18.9$ is approximately **0.27%**.

5 Time spent using the Internet.

5.1 Value exactly one Standard Deviation below

The value one Standard Deviation below the mean is 0 users. Because we can not go negative in this projection.

5.2 What portion of users pend lees than the first Standard Deviation point

Given an approximatelly normal distribution of this data the percentage of people that spend an amount lower than one Standard Deviation below the mean is 16%.

5.3 Is time spent online approximately normally distributed? Why?

This data is not normally distributed and we can deduce that because a user can not spend a negative amount of hours on the Internet per year. And a normal distribution would sugest that there are users that are under that value. Therefore this data is not normally distributed.

6 Weekly maintenance cost for a factory.

6.1 Average spendature: \$420 with a Standard Deviation of \$30

The total amount that add when we add the mean and one standard deviation is \$450. The probability that next week will go over that budget is 16%. Since this data is normally distributed then the approximate percentage of datapoints above $(\overline{y} + s)$ is our previously mentioned value of 16%.

7 Use of sumations to calculate variance s^2

7.1 Using the results given show that

$$s^2 = \frac{1}{n-1}\sum_{i=1}^{n}(y_i - \overline{y})^2 = \frac{1}{n-1}[\sum_{i=1}^{n} y^2 - \frac{1}{n}(\sum_{i=1}^{n} y_i)^2]$$

Work:

$$s^2 = \frac{1}{n-1}\sum_{i=1}^{n}(y_i - \overline{y})^2 = \frac{1}{n-1}[\sum_{i=1}^{n}(y_i)^2 - \sum_{i=1}^{n}(\overline{y})^2]$$

In this first line we distribute the parenthesis to allow more algebraic mobility.

$$=> \frac{1}{n-1}[\sum_{i=1}^{n}(y_i)^2 - \sum_{i=1}^{n}(\frac{1}{n}\sum_{i=1}^{n}(y_i)^2)]$$

We get this result by using the Mean function from Section 2.

$$=> \frac{1}{n-1}[\sum_{i=1}^{n} y_i^2 - \frac{1}{n}(\sum_{i=1}^{n} y_i)^2]$$

This final result uses the second function provided to reach the function that we desired.

7.2 Using the result from 7.1 find the Standard Deviation with the following values:

Let S be the set of sample measurements: S = {1, 4, 2, 1, 3, 3}
From the previous section we can surmise that:

$$s^2 = \frac{1}{n-1}[\sum_{i=1}^{n} y_i^2 - \frac{1}{n}(\sum_{i=1}^{n} y_i)^2]$$

When we plug in our set of values S:

$$s^2 = \frac{1}{6-1}[(1^2 + 4^2 + 2^2 + 1^2 + 3^2 + 3^2) - \frac{1}{6}(1 + 4 + 2 + 1 + 3 + 3)^2]$$

$$=> \frac{1}{5}(40 - \frac{14^2}{6})$$

$$=> \frac{1}{5}(7.33)$$

$$=> \mathbf{1.46}$$

8 Family that contains two children, an older child and a younger one.

Let S be the set of potential child combinations

$$S = \{FF, MM, FM, MF\}$$

Let A be the set of elements with no males;

$$A = \{FF\}$$

Let B be the set of elements with two males;

$$B = \{MM\}$$

Let C be the set of elements with at least one male;

$$C = \{MM, FM, MF\}$$

The following are sets that result from the combinations of the previous.

$$A \cap B = \{\} = \emptyset$$

$$A \cup B = \{FFMM\}$$

$$A \cap C = \{\} = \emptyset$$

$$A \cup C = \{FF, MM, FM, MF\}$$

$$B \cap C = \{MM\}$$

$$B \cup C = \{MM, FM, MF\}$$

$$C \cup \overline{B} = \{FM, MF\}$$