

STAT 260 Spring 2023: Assignment 1

Due: Friday January 20th BEFORE 11:59pm PT to Crowdmark

Please read the instructions below and in the Written Assignment 1 assignment on Crowdmark.

Solutions are to be uploaded to Crowdmark. Here you will be asked to upload your solutions to each question separately. You may hand write your solution on a piece of paper, or electronically using a tablet, or you may type your solutions. If you wish to use this question sheet and write your solutions on the page, space has been provided below. One of the quickest ways to upload handwritten work is by accessing Crowdmark from within a web browser on a smartphone. In the area where you upload work, press the “+” button. This will give you the option of using a file already on your phone, or you can use the phone camera to photograph your work. Using the phone’s camera allows you to bypass the step where you need to scan your work!

For full marks, your work must be neatly written, and contain enough detail that it is clear how you arrived at your solutions. Messy, poorly formatted work will receive deductions, or may not be graded at all.

Talking to your classmates about assigned work is a healthy practice that is encouraged. However, in the end, each person is expected to write their own solutions, in their own words, and in a way that reflects their own understanding. Assignment questions are not to be posted to homework “help” websites.

Late policy: Late assignments will be accepted until the final cutoff of 11:59pm on Sunday January 22nd. Solutions submitted within 1 hour of the Friday deadline will have a 5% late penalty automatically applied within Crowdmark. Solutions submitted after 1 hour of the Friday deadline but before the final Sunday cutoff will have a 20% late penalty applied. Solutions submitted after the final Sunday cutoff will be graded for feedback, but marks will not be awarded.

1. [2 marks] Scientists want to study the variance in grip strength of adults in Canada. To do this, they ask a random selection of 48 volunteers to grip a handle that measures force (measured in Newtons (N)) as hard as they can, and the maximum force reading from each participant was recorded.

(a) What is the population in this scenario?

adults in Canada

(b) What is the sample in this scenario?

the 48 volunteers

(c) What is the parameter of interest? Include the correct notation for the parameter.

variance in grip strength for adults in Canada
Notation: σ^2

(d) What is the random variable being measured here? Is this a discrete random variable or a continuous random variable?

grip strength
the random variable is continuous

2. [2 marks] An experiment to study the lifetime (measured in hours) for a certain type of component involved putting a sample of ten components into operation and observing them until the components broke or failed. The resulting observations were:

47 83 120 72 59 132 61 90 113 87

- (a) Calculate the mean lifetime for these components. (You may use the stat functions on your calculator here, no work needs to be shown.)

$$\bar{x} = 86.4 \text{ hours}$$

- (b) Calculate the median lifetime for these components. Show your work.

sorted data: 47 59 61 72 83 87 90 113 120 132

$$\text{median } \hat{x} = \frac{83 + 87}{2} = 85 \text{ hours}$$

- (c) Calculate the variance in lifetime for these components. (You may use the stat functions on your calculator here. Show the value you get from the stat functions as part of your work here.)

from calculator: $S = 28.08004432$

$$\text{variance } S^2 = (28.08004432)^2 = 788.489 \text{ hours}^2$$

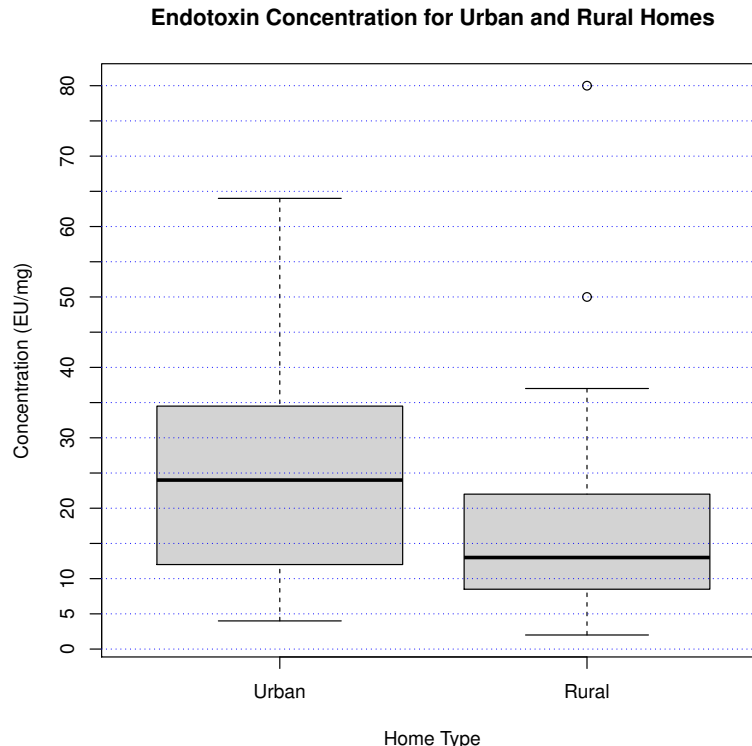
- (d) How many observations are within one standard deviation of the sample mean? That is, calculate the values of $\bar{x} - s$ and $\bar{x} + s$ and count how many of the observations fall within this range. (You may use the stat functions on your calculator here. Show the values you get from the stat functions as part of your work here.)

$$\bar{x} - S = 58.31995568 \quad \bar{x} + S = 114.4800443$$

data: 47 59 61 72 83 87 90 113 120 132
 \uparrow \uparrow
 $\bar{x} - S$ $\bar{x} + S$

There are 7 observations between $\bar{x} - S$ and $\bar{x} + S$.

3. [2 marks] Endotoxins (potentially toxic, natural compounds that are a structural component of bacterial cell walls) may impact a person's vulnerability to allergic diseases. The following data on concentration (EU/mg) in settled dust for one sample of urban homes and another of rural homes was reported, and the data is shown in the following boxplots.



- (a) What type of home (urban or rural) had the largest concentration reading? According to the boxplots what was the largest concentration reading?

Rural homes had the largest concentration reading of 80 EU/mg.

- (b) What type of home (urban or rural) had the largest median concentration? According to the boxplots what was the largest median concentration?

Urban homes had the largest median concentration reading of about 24 EU/mg.