Quiz 1 — 1/18/2024

Instructions

This take-home quiz is due on **Thursday, January 18 at 23:59**.

You may use your own course materials, as well as any materials directly linked from the course website. **No collaboration allowed.**

Type your answers **directly in this Jupyter notebook**, and submit this notebook (just the `ipynb` file) using the submission form on the course website.

Problem 1

Suppose X has a t-distribution with 13 degrees of freedom.

Write R code to compute the following.

a.

$P(X \leq 0.64)$

In [ ]:

b.

$P(X > -0.12)$

In [ ]:

c.

$P(0.17 < X \leq 0.43)$

In [ ]:

d.

The 0.85-quantile of X.

In [ ]:

Feedback. Most of you had the right idea with this problem.

Some things to remember about `pt()` vs `qt()` in R. Assume X has a t-distribution with d degrees of freedom:

1. `pt(x, df = d)` = $P(X \leq x)$. See Problem 4 in the Lesson 2 Exercises.

2. `qt(p, df = d)` = the value of x such that $P(X \leq x) = p$, or in other words, the p-quantile. See Problem 1 in the Lesson 2 Exercises.
3. For part b, note that $P(X > -0.12) = 1 - P(X \leq -0.12)$. You can compute $P(X \leq -0.12)$ using `pt()`; see item 1 above.

Problem 2

In the same folder as this notebook, there is a CSV file `data/HumanTemp.csv`, with three columns/variables: `Temp`, `Sex`, and `Pulse`.

Write R code to do the following.

a.

Find the average of the values in `Temp`. (Read the data first!)

In [ ]:

b.

Compute the 1st quartile of the values in `Temp`. Do **not** use `summary()`.

In [ ]:

c.

Create a normal QQ-plot of the values in `Temp`.

In [ ]:

d.

Based on your answer to part c, do the values in `Temp` approximately follow a normal distribution? Explain.

Your explanation should be in complete sentences, with correct spelling and grammar. Some tips:

- **Be specific.** For example, if you use pronouns like "it" or "they", make sure you are clear about what those pronouns refer to.
- **Be concise.** Don't make your explanation longer than necessary. You can answer this question using only one or two sentences.

Write your answer here. Double-click to edit.

Feedback. Most of you had the right idea with parts a-c. For a similar problem, see Problem 5 in the Lesson 2 Exercises.

For part d: see the **Normal Q-Q plot** section in Lesson 2. Also, make sure your explanation is *precise*: use the correct words. In addition, keep your language simple. Some tips:

- Be specific. For example, consider the following sentence:

  > It follows a Normal distribution because it roughly is a straight line.

What does "it" refer to here? The first "it" refers to the **values in** `Temp`, and the second "it" refers to the Normal Q-Q plot.

- The Normal Q-Q plot consists of *points*, not values. You can say:

  > The points in the Normal Q-Q plot do not approximately follow a straight line.

  You can also say:

  > The Normal Q-Q plot is not an approximately straight line.

  But you should **not** say:

  > The values do not follow a straight line.

- You should be able to answer this problem using the following template:

  > The values in `Temp` (do or do not) approximately follow a Normal distribution because the points in the Normal Q-Q plot (fill in the blank here).

Grading rubric

Problem	Weight
1a	1
1b	1
1c	1
1d	1
2a	1
2b	1
2c	1
2d	1
Max Score	**80**