Winter 2023 Final Exam
Problem 16

Problem 16

We collect data on the play times of 100 games of *Chutes and Ladders* (sometimes known as *Snakes and Ladders*) and want to use this data to perform a hypothesis test.

Problem 16.1

Which of the following pairs of hypotheses can we test using this data?

Option 1: **Null Hypothesis:** In a random sample of Chutes and Ladders games, the average play time is 30 minutes. **Alternative Hypothesis:** In a random sample of Chutes and Ladders games, the average play time is not 30 minutes.

Option 2: **Null Hypothesis:** In a random sample of Chutes and Ladders games, the average play time is not 30 minutes. **Alternative Hypothesis:** In a random sample of Chutes and Ladders games, the average play time is 30 minutes

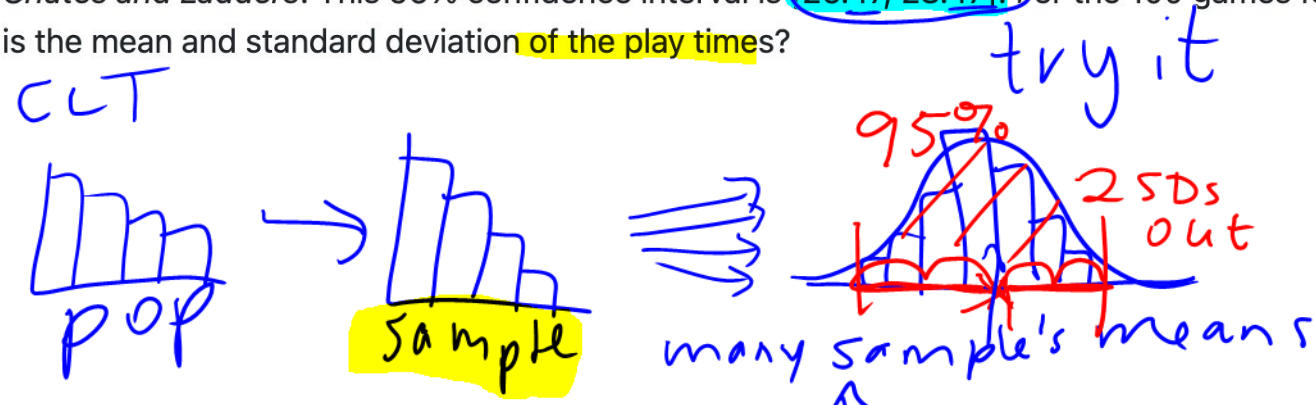
Option 3: **Null Hypothesis:** A game of Chutes and Ladders takes, on average, 30 minutes to play. **Alternative Hypothesis:** A game of Chutes and Ladders does not take, on average, 30 minutes to play.

Option 4: **Null Hypothesis:** A game of Chutes and Ladders does not take, on average, 30 minutes to play. **Alternative Hypothesis:** A game of Chutes and Ladders takes, on average, 30 minutes to play.

- Option 1
- Option 2
- Option 3
- Option 4

Problem 16.2

We use our collected data to construct a 95% CLT-based confidence interval for the average play time of a game of *Chutes and Ladders*. This 95% confidence interval is [26.47, 28.47]. For the 100 games for which we collected data, what is the mean and standard deviation of the play times?



try it

halfway point

27.47

↑ sample mean

↑ this SD = 0.5 = $\frac{\text{Sample SD}}{\sqrt{100}}$

5 = Sample SD

Problem 16.3

Does the CLT say that the distribution of play times of the 100 games is roughly normal?

- Yes
- No

Problem 16.4

Of the two hypotheses you selected in part (a), which one is better supported by the data?

- Null Hypothesis
- Alternative Hypothesis

! games take 30 min on avg = 30

not 30 min ≠ 30

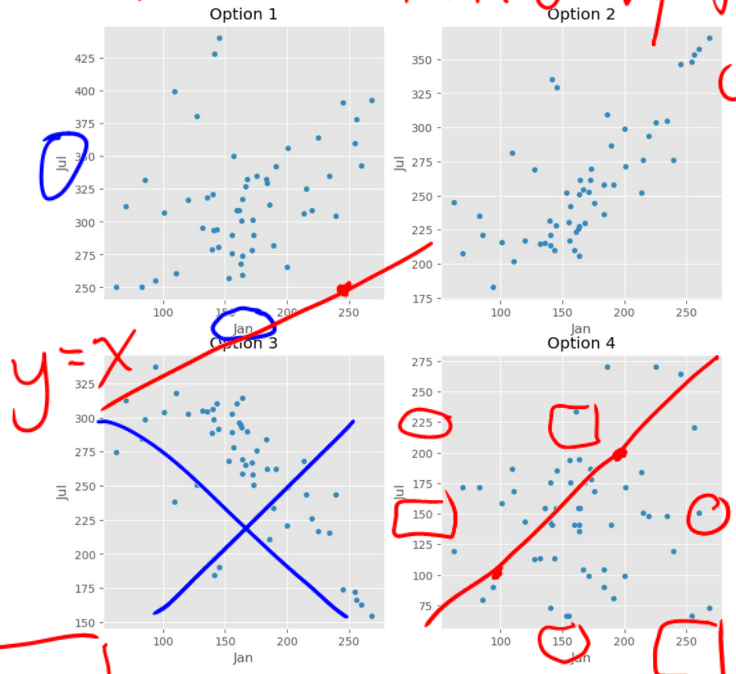
Spring 2023 Final Exam
Problem 11

Problem 11

Raine finds the regression line that predicts the number of sunshine hours in July (y) for a city given its number of sunshine hours in January (x). In doing so, they find that the correlation between the two variables is $\frac{2}{5}$.

Problem 11.1

Which of these could be a scatter plot of number of sunshine hours in July vs. number of sunshine hours in January?



- Option 1
- Option 2
- Option 3
- Option 4

Problem 11.2

Suppose the standard deviation of the number of sunshine hours in January for cities in California is equal to the standard deviation of the number of sunshine hours in July for cities in California.

Raine's hometown of Santa Clarita saw 60 more sunshine hours in January than the average California city did. How many **more sunshine hours than average** does the regression line predict that Santa Clarita will have in July? Give your answer as a positive integer. *(Hint: You'll need to use the fact that the correlation between the two variables is $\frac{2}{5}$.)*

$$\frac{y - \text{mean}}{SD_y} = \frac{2}{5} \cdot \frac{60}{SD_x} \quad 12 = \frac{24}{SD_x}$$

24

Problem 11

Raine finds the regression line that predicts the number of sunshine hours in July (y) for a city given its number of sunshine hours in January (x). In doing so, they find that the correlation between the two variables is $\frac{2}{5}$.

To imagine what the dataset may look like in a few years, Anthony subtracts 5 from the number of sunshine hours in both January and July for all California cities in the dataset – i.e., he subtracts 5 from each x value and 5 from each y value in the dataset. He then creates a regression line to use the new xs to predict the new ys.

Problem 11.3

What is the slope of Anthony's new regression line?

Problem 11.4

Suppose the intercept of Raine's original regression line – that is, before Anthony subtracted 5 from each x and each y – was 10. What is the intercept of Anthony's new regression line?

- -7
- -5
- -3
- 0
- 3
- 5
- 7

Spring 2022 Final Exam
Problem 16

Problem 16

The HAUGA bedroom furniture set includes two items, a bed frame and a bedside table. Suppose the amount of time it takes someone to assemble the bed frame is a random quantity drawn from the probability distribution below.

Time to assemble bed frame	Probability
10 minutes	0.1
20 minutes	0.4
30 minutes	0.5

Similarly, the time it takes someone to assemble the bedside table is a random quantity, independent of the time it takes them to assemble the bed frame, drawn from the probability distribution below.

Time to assemble bedside table	Probability
30 minutes	0.3
40 minutes	0.4
50 minutes	0.3

Problem 16.1

What is the probability that Stella assembles the bed frame in 10 minutes if we know it took her less than 30 minutes to assemble? Give your answer as a decimal between 0 and 1.

want to know

given

$$P(A \text{ given } B) = \frac{P(A \text{ and } B)}{P(B)}$$

Problem 16

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20 minutes	0.4
30 minutes	0.5

Similarly, the time it takes someone to assemble the bedside table is a random quantity, independent of the time it takes them to assemble the bed frame, drawn from the probability distribution below.

Time to assemble bedside table	Probability
30 minutes	0.3
40 minutes	0.4
50 minutes	0.3

Problem 16.2

What is the probability that Ryland assembles the bedside table in 40 minutes ~~if we know that it took him 30 minutes to assemble the bed frame?~~ Give your answer as a decimal between 0 and 1

Problem 16

The HAUGA bedroom furniture set includes two items, a bed frame and a bedside table. Suppose the amount of time it takes someone to assemble the bed frame is a random quantity drawn from the probability distribution below.

Time to assemble bed frame	Probability
10 minutes	0.1
20 minutes	0.4
30 minutes	0.5

Similarly, the time it takes someone to assemble the bedside table is a random quantity, independent of the time it takes them to assemble the bed frame, drawn from the probability distribution below.

Time to assemble bedside table	Probability
30 minutes	0.3
40 minutes	0.4
50 minutes	0.3

Case 1: bedframe in 10 anything for table

0.1 1

Case 2: bedframe in 20 30 or 40 for table

0.4 0.7

Problem 16.3

What is the probability that Jin assembles the complete HAUGA set in at most 60 minutes? Give your answer as a decimal between 0 and 1.

Cases

Case 3: bedframe in 30

0.5

table in 30

0.3

$0.1 * 1 + 0.4 * 0.7 + 0.5 * 0.3$