PS2 – STATS – Questions – SU24

Instructions

200 points

Answer **each question and their subparts completely (in order)**

EVERYONE needs to upload **one single PDF** (NO group work)

All answers should be **HANDWRITTEN (including the tables, graphs etc.) No, you cannot use Good Notes, Ipads etc. to write your assignment. You can use Excel to do the computations. However all answers (including tables and graphs) have to be handwritten.** All mathematical calculations need to be shown in detail to get credit.

Soft Deadline: Sunday Aug 25, 11:59 PM (in canvas)

Hard Deadline: Thursday Aug 29, 11:59 PM (in canvas) extended to Fri Aug 30 by 11:59 PM

Only work that is uploaded in canvas (not in the comments section, not sent to me by email) will be graded

Do not submit files from google drive; do not link files from google drive

The responsibility of submitting the correct file lies with you

If the TAs cannot see a file, or if it does not download, you will not get any credit

Please review the annotated class notes to get help on these questions

According to the syllabus, you cannot submit after the hard deadline and unless you have DRC accommodations, I cannot give you a retake / remake – remember I cannot look at or ask for student medical records

If you submit after the answers are published you will automatically get at least a 75% penalty

Breakdown of Questions and Points

Question #	Points for this Question	Materials from Classes in
Q1	20	Week 3
Q2	20	Week 3
Q3	20	Week 3
Q4	20	Week 3
Q5	20	Week 3
Q6	20	Week 3
Q7	20	Week 3
Q8	20	Week 4
Q9	20	Week 4
Q10	20	Week 4
Total	200	

Question 1 (20 points)

Suppose the Ketchup industry revenues come from an unknown distribution with a known population average of $48 million with a known population standard deviation of $14 million. A random sample of 49 ketchup companies are drawn

i) Is the population mean known or unknown? Is the population standard deviation known or unknown? What is the number of observations? Find the sampling distribution of the sample mean revenues (using CLT)

ii) Find the probability that the sample mean is between $46 million and $47 million

To get full credit, please show the a graph as done in class along with all math calculations.

Question 2 (20 points)

Suppose Anne knows that consumer spending on the week after thanksgiving follows a normal distribution. **Using a random sample** of **217** customers, Anne comes to know that consumers spent on an **average** of **$6.7** on with a population standard deviation of **$2.03**.

i) Do you know the population mean? What will you use as an estimate of the population mean? What is the sample size? What is the value of the standard error. Use the central limit theorem to find the distribution of the sample mean.

ii) If you need to find a 95% confidence interval, what will be the level of significance, margin of error and the upper and lower bound of the confidence interval?

To get full credit, please show the a graph as done in class along with all math calculations.

Question 3 (20 points)

Suppose Anne knows that consumer spending on the week after thanksgiving follows a normal distribution. **Using a random sample** of **217** customers, Anne comes to know that consumers spent on an **average** of **$6.7** on with a population standard deviation of **$2.03**.

i) If you need to find a 99% confidence interval, what will be the level of significance, margin of error and the upper and lower bound of the confidence interval?

ii) Everything else remaining the same (as the first part of this question), if Anne uses a random sample of **418 (**instead of 217), what will be the new the level of significance, margin of error and the upper and lower bound of the confidence interval?

To get full credit, please show the a graph as done in class along with all math calculations.

Question 4 (20 points)

Revenues of fast food industry follow **normal distribution** has a population **standard deviation of 1**. We want to verify a claim that the population mean revenue is **greater than 12**. A sample of **36** companies is taken & we find a sample mean revenue of **12.5**.

i) What is the numerical value of the hunch? What is the point estimate of the true population mean? What is the null hypothesis and alternative hypothesis using mathematical symbols? What type of a test is this? Find the test statistic

ii) Find the **pvalue** utilizing the test statistic . Can we reject or fail to reject the null with **90% confidence**? Why?

- To get full credit, please show the a graph as done in class along with all math calculations.

Question 5 (20 points)

Revenues of fast food industry follow **normal distribution** has a population **standard deviation of 1**. We want to verify a claim that the population mean revenue is **different from 12**. A sample of **36** companies is taken & we find a sample mean revenue of **12.5**.

i. What is the null hypothesis and alternative hypothesis using mathematical symbols? What type of a test is this? Find the test statistic. Find the **pvalue** utilizing a test statistic. Can we reject or fail to reject the null with **90% confidence**? Why?

ii. If **49** companies were sampled instead of 36 companies, find the **pvalue** utilizing a test statistic. Can we reject or fail to reject the null with **90% confidence & at 99% confidence**? Why or Why not??

- To get full credit, please show the a graph as done in class along with all math calculations.

Question 6 (20 points)

- The company that packages oatmeal uses an automatic filling machine that is set so that the expected fill volume is **16 ounces**. A quality control professional thinks that the machine is not filling in the desired amount.
- Using a random sample of **49** packages we find that the sample standard deviation equal to **0.422** ounces. The sample mean was **16.2** ounces.

i) Find the **80%** confidence interval of the mean amount filled by the machine.

ii) What is the null hypothesis and alternative hypothesis using mathematical symbols? What type of a test is this? Find the test statistic. Find the **pvalue** utilizing a test statistic. Can we reject or fail to reject the null with **80% confidence**? Why?

To get full credit, please show the a graph as done in class along with all math calculations.

Question 7 (20 points)

- An insurance company wishes to estimate the difference in mean damage to cars that crash into a barricade at 20 mph with a new bumper system versus the older bumper system. A random sample on **48** cars with the new bumper system provided a mean damage equal to **$3,950** and a sample standard deviation equal to **$600**. Another random sample of **47** cars with the older bumper system provided a mean damage of **$3,475** and a sample standard deviation equal to **$650**.

i) Develop a 95% confidence interval estimate. You should use Satterthwaite Approximation to find the degrees of freedom

ii) Is the average damage from the cars using new bumper really different from cars using old bumper? Answer by finding **pvalue** using **a 95%** confidence

To get full credit, please show the a graph as done in class along with all math calculations.

Question 8 (20 points)

- A company claims that the proportion of dissatisfied customers is less than **0.10**. To test this, a random sample of **100** customers is selected and **6** are dissatisfied

i) Find the 95% confidence interval & the 90% confidence interval

ii) Using a 5% level of significance, find the **pvalue** using the test statistic. Can we reject or fail to reject the null with **95% confidence**? Why?

Question 9 proportions (20 points)

Suppose a company that manufactures switches have two batches of switches that coming from a plant in China and another plant in Alabama. The Chinese plant was found to deliver **32** defective switches in a shipment of **800 ;** and The Alabama plant was found to deliver **30** defective switches in a shipment of **500.**

i) Using a 5% level of significance, find the **pvalue** using the test statistic. Can we reject or fail to reject the null with **95% confidence**? Why

ii) Using a 10% level of significance, find the **pvalue** using the test statistic. Can we reject or fail to reject the null with **90% confidence**? Why?

Information for the question 10

- To determine the relationship between Hours Studied (HOURS) and Exam Score (SCORE) we ran a regression. The following regression results were obtained
- SCORE = 67.16 + 5.25 HOURS
- The standard error for the slope coefficient was 0.76 and the standard error for the intercept coefficient was 2.66.
- The p value associated with the slope coefficient was 0.02 and the p value for the intercept coefficient was 0.00.
- The default level of significance is 0.05 (5%)
- The coefficient of determination [COD] was 0.73

Question 10 (20 points)

i) SCORE is the independent variable. True or False? Why? What score will a student expect if the student does not put in any hours of study? According to the regression the relationship between scores and hours studied is negative. True or False? Why? If a student studies 3 hours, what score can the student expect?

ii) What is the t statistic for the slope coefficient? Would you reject the null hypothesis that there is no relationship between these two variables using p value and the critical value technique? Why? Would you reject the null hypothesis that the intercept is 0 using p value or the critical value technique ? Why?