

1. True or False: It is possible that a hypothesis test yields a statistically significant result and still has made a Type II Error.
A) True B) False

2. True or False: If $P\text{-value} > \alpha$, we reject the null hypothesis.
A) True B) False

3. True or False: In a classical approach hypothesis test, the level of significance α equals the total area of the critical region.
A) True B) False

4. True or False: Suppose $(4, 9)$ is a confidence interval estimating σ^2 to a level of confidence 90%. Then $(2, 3)$ is a confidence interval estimating σ to a level of confidence 90%.
A) True B) False

5. True or False: If $(0.25, 0.75)$ is a 90% confidence interval for p obtained from a particular sample, then the sample proportion \hat{p} of that particular sample has to be 0.5. Likewise, if $(0.25, 0.75)$ is a 90% confidence interval for σ obtained from a particular sample, then the sample standard deviation s of that particular sample has to be 0.5.
A) True B) False

6. True or False: A calculation error in determining the critical value is an example of a Type I error.
A) True B) False

7. A fast food restaurant claims that their burgers weigh 150 grams on average. A customer suspects that the burgers are lighter than advertised. The customer randomly buys 36 burgers and finds that the average weight of this sample is 148 grams and the standard deviation of this sample is 6 grams. Conduct a hypothesis test of population mean using a classical (critical value) approach and a P -value approach, at a significance level $\alpha = 0.02$.

8. A restaurant has been maintaining a customer satisfaction rate of 80%. After a renovation, the restaurant wants to test if their customer satisfaction rate has changed. To investigate, the restaurant randomly surveys 100 customers and finds that 75 of them are satisfied. Complete a hypothesis test using this sample with a confidence interval approach, at a confidence level 95%.

9. The average phone screen time of Americans is about 5 hours. We want to know if Americans aged 60 or older has an average screen time that is different from 5 hours. Suppose we have a random sample of size 36 from Americans 60 or older with a sample mean $\bar{x} = 4.1$ and a sample standard deviation $s = 2$. Conduct a hypothesis test using a confidence interval approach with $\alpha = 0.02$.

10. We want to estimate the proportion p of Boston residents who use their phones for more than one hour per day. In a random survey we conducted, exactly 50 out of the 100 individuals surveyed reported that they use their phones for more than one hour per day.

- (a) What is the sample proportion \hat{p} of our particular sample?
- (b) Is the variable \hat{p} approximately normally distributed?
- (c) Find an interval estimator for the population proportion p from this particular sample, to a confidence level 90%.

11. We want to estimate the proportion p of Boston residents who use their phones for more than one hour per day. In a random survey we conducted, exactly 50 out of the 100 individuals surveyed reported that they use their phones for more than one hour per day. In the last question, we find out that the margin of error E of this sample obtained is larger than 0.05. We decide to conduct another survey of a larger size n so that, to a confidence level 90%, the error of margin E of the new confidence interval is ≤ 0.05 . Find the sample size n needed to achieve this margin of error E , use a prior estimate of p that is 0.7.

- A) $n=227$ B) $n=228$ C) $n=271$ D) $n=227.31$

12. A random sample of 20 batteries has sample variance of $s^2 = 4.2$. Construct a 95% confidence interval for the population standard deviation σ of battery weights. You may assume the weights are normally distributed.