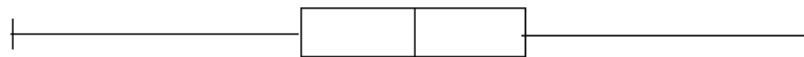


# Classroom Voting Questions: Elementary Statistics

## Inference for the Mean of a Population

1. If you are testing two groups of individuals to see if they differ in regards to their working memory capacity, your alternative hypothesis would be that the two groups
  - (a) differ significantly in terms of working memory capacity.
  - (b) differ in terms of working memory capacity.
  - (c) differ, but not significantly, in terms of working memory capacity.
  - (d) do not differ in terms of working memory capacity.
  - (e) do not differ significantly in terms of working memory capacity.
2. This box plot is for a sample that accurately represents a normal distribution:



Which of the following box plots is for a sample that represents a Student's  $t$ -distribution with the same standard deviation and sample size as the normal distribution above?

- (A)
- (B)
- (C)
- (D)

(E) Two from (A)-(D) are correct.

(F) Three from (A)-(D) are correct.

(G) All from (A)-(D) are correct.

3. A random sample of 25 observations, with a mean of 44.4 and a sample standard deviation of 3.5, is drawn from a population that is approximately normally distributed. If one sets up a hypothesis test with population mean equal to 43 against an alternative that the population mean is not 43, using  $\alpha = 0.01$ , what is the value of the test statistic?
- (a) 2.000
  - (b) 2.576
  - (c) 2.797
  - (d) 2.857
  - (e) 10.000
4. A random sample of 25 observations, with a mean of 44.4 and a sample standard deviation of 3.5, is drawn from a population that is approximately normally distributed. If one sets up a hypothesis test that the population mean is equal to 43 against an alternative that the population mean is not 43, using  $\alpha = 0.01$ , what is the 0.01 significance point (critical value) from the appropriate distribution?
- (a) 2.576.
  - (b) 2.797.
  - (c)  $-2.576$ .
  - (d)  $-2.797$ .
  - (e) Both (a) and (c) are correct.
  - (f) Both (b) and (d) are correct.
5. A random sample of 25 observations, with a mean of 44.4 and a sample standard deviation of 3.5, is drawn from a population. If one sets up a hypothesis test that the population mean is equal to 43 against an alternative that the population mean is not 43, using  $\alpha = 0.05$ , what is the 0.05 significance point (critical value) from the appropriate distribution?
- (a) 1.96.
  - (b) 2.064.
  - (c)  $-1.96$ .
  - (d)  $-2.064$ .
  - (e) None of the above

6. A random sample of 25 observations, with a mean of 44.4 and a sample standard deviation of 3.5, is drawn from a population that is approximately normally distributed. If one sets up a hypothesis test with population mean equal to 43 against an alternative that the population mean is not 43, using  $\alpha = 0.01$ , does one reject the null hypothesis and why?

- (a) Yes, the test statistic is larger than the tabled critical value.
- (b) No, the test statistic is larger than the tabled critical value.
- (c) Yes, the test statistic is smaller than the tabled critical value.
- (d) No, the test statistic is smaller than the tabled critical value.
- (e) insufficient information

7. In a random sample of 2013 adults, 1283 indicated that they believe that rudeness is a more serious problem than in past years. Which of the test statistics shown below would be appropriate to determine if there is sufficient evidence to conclude that more than three-quarters of U.S. adults believe that rudeness is a worsening problem?

- (a)  $\frac{\hat{p} - .5}{\sqrt{(.5)(1 - .5)/2013}}$
- (b)  $\frac{\hat{p} - .75}{\sqrt{(.75)(1 - .75)/2013}}$
- (c)  $\frac{\bar{x} - .75}{\sqrt{s/2013}}$

8. A climate researcher sets up an experiment that the mean global temperature is  $\mu = 60^\circ$  F, looking for an indication of global warming in a climate model projection. For the year 2050, the series of 10 models predict an average temperature of  $65^\circ$  F. A standard one-tailed  $t$ -test is run on the data. Then the power of the test

- (a) increases as  $\mu$  decreases.
- (b) remains constant as  $\mu$  changes.
- (c) increases as  $\mu$  increases.
- (d) decreases as  $\mu$  increases.

9. Kim's husband is in residency to become a medical doctor. He doesn't seem to get much sleep. Neither do his resident friends at the hospital. Kim hypothesizes that medical residents get, on average, less than 5 hours of sleep each day. She conducts a hypothesis test and gets statistically significant results. Which of the following might be a reasonable summary of the results?

- (a) Accept the null hypothesis. At the 5% significance level, the data provide sufficient evidence to conclude that the mean hours of sleep for medical residents is less than 5 hours.
- (b) Accept the null hypothesis. At the 5% significance level, the data do not provide sufficient evidence to conclude that the mean hours of sleep for medical residents is less than 5 hours.
- (c) Reject the null hypothesis. At the 5% significance level, the data provide sufficient evidence to conclude that the mean hours of sleep for medical residents is less than 5 hours.
- (d) Reject the null hypothesis. At the 5% significance level, the data do not provide sufficient evidence to conclude that the mean hours of sleep for medical residents is less than 5 hours.
10. Kim's husband is in residency to become a medical doctor. He doesn't seem to get much sleep. Neither do his resident friends at the hospital. Kim hypothesizes that medical residents get, on average, less than 5 hours of sleep each day. She conducts a hypothesis test but does not get statistically significant results. Which of the following might be a reasonable summary of the results?
- (a) Do not reject the null hypothesis. At the 5% significance level, the data provide sufficient evidence to conclude that the mean hours of sleep for medical residents is 5 hours.
- (b) Do not reject the null hypothesis. At the 5% significance level, the data provide sufficient evidence to conclude that the mean hours of sleep for medical residents is less than 5 hours.
- (c) Do not reject the null hypothesis. At the 5% significance level, the data do not provide sufficient evidence to conclude that the mean hours of sleep for medical residents is less than 5 hours.
- (d) Reject the null hypothesis. At the 5% significance level, the data do not provide sufficient evidence to conclude that the mean hours of sleep for medical residents is less than 5 hours.
11. The state legislature ordered that a study be done to see whether the mean number of reported crimes at institutions of higher learning across the state differs from the national mean. A hypothesis test will be performed at the 1% significance level using the critical-value approach. What are the critical values?
- (a)  $\pm \frac{t_{0.01}}{2}$
- (b)  $\pm t_{\frac{0.01}{2}}$
- (c)  $\pm \frac{t_{0.99}}{2}$

(d)  $\pm t_{\frac{0.99}{2}}$

12. Cody thinks that on average more than 30 students enter the gym between 12:00 p.m. and 12:30 p.m. on class days. If Cody performs a hypothesis test, a decrease in which of the following quantities—all other quantities remaining the same—would increase the probability of Cody’s rejecting the null hypothesis?
- (a) sample size
  - (b) sample variance
  - (c) sample mean
13. Cody thinks that on average more than 30 students enter the gym between 12:00 p.m. and 12:30 p.m. on class days. If Cody performs a hypothesis test, and gets a  $P$ -value of 0.02, what is the probability that more than 30 students will enter the gym between 12:00 pm and 12:30 pm on a randomly-selected class day?
- (a) less than 0.02
  - (b) 0.02
  - (c) more than 0.02
  - (d) The answer cannot be determined from the information given.
14. A drug company claims that their new weight loss pill will cause obese people to lost an average of 15 pounds after six weeks of use. The null hypothesis is that the mean is 15 pounds, while the alternative hypothesis is that the mean is less than 15 pounds. We try out the pill on 75 obese people and find that, after six weeks, the mean weight loss is only 8.2 pounds. The  $P$ -value of our result is 0.00216. What do we conclude?
- (a) This proves that the pill works as claimed by the drug company.
  - (b) This proves that the pill does not work as claimed by the drug company.
  - (c) The results are ambiguous, so we can draw no conclusions.
  - (d) None of the above
15. A tire company claims that their tires last an average of 30,000 miles. Our null hypothesis is that the claim is true, while our alternative hypothesis is that the tires last for an average of less than 30,000 miles. We test 50 of their tires finding that this sample lasts only for an average of 28,000 miles. We calculate a  $P$ -value of 0.389 for this result. What do we conclude?
- (a) We conclude that the company’s claim is correct.

- (b) We conclude that the company's claim is incorrect.
  - (c) The results are ambiguous, so we can draw no conclusions.
  - (d) None of the above
16. Zoe wants to know the average height of trees in her city. She randomly selects thirty trees in her city and measures their heights, obtaining a mean of 37.1 feet and a standard deviation of 15.6 feet. Which statistical procedure should she perform? (Assume that all assumptions for the procedure are satisfied.)
- (a) confidence interval for one mean with  $\sigma$  known ( $z$ -interval procedure)
  - (b) confidence interval for one mean with  $\sigma$  unknown ( $t$ -interval procedure)
  - (c) hypothesis test for one mean with  $\sigma$  known ( $z$ -test)
  - (d) hypothesis test for one mean with  $\sigma$  unknown ( $t$ -test)
17. Stan and Priscilla head up the family's traditional Christmas tamale making, in which everyone gets together and makes an unbelievable number of tamales. You can always count on Tio Carlos insisting that the tamales be big. Are the tamales this year averaging 3.5 ounces like they always do? (The standard deviation in weights each year is around 0.31 ounces.) Stan and Priscilla randomly select twenty of the tamales made so far and find that their mean weight is 3.53 ounces. Which statistical procedure should they perform? (Assume that all assumptions for the procedure are satisfied.)
- (a) confidence interval for one mean with  $\sigma$  known ( $z$ -interval procedure)
  - (b) confidence interval for one mean with  $\sigma$  unknown ( $t$ -interval procedure)
  - (c) hypothesis test for one mean with  $\sigma$  known ( $z$ -test)
  - (d) hypothesis test for one mean with  $\sigma$  unknown ( $t$ -test)
18. David wants to know whether the mean brix level of Haden mangoes available in his city's supermarkets differs from 14. He randomly selects thirty Haden mangoes from his city's supermarkets and measures their brix levels, finding the mean to be 13.3, with a standard deviation of 1.8. Which statistical procedure should he perform? (Assume that all assumptions for the procedure are satisfied.)
- (a) confidence interval for one mean with  $\sigma$  known ( $z$ -interval procedure)
  - (b) confidence interval for one mean with  $\sigma$  unknown ( $t$ -interval procedure)
  - (c) hypothesis test for one mean with  $\sigma$  known ( $z$ -test)
  - (d) hypothesis test for one mean with  $\sigma$  unknown ( $t$ -test)