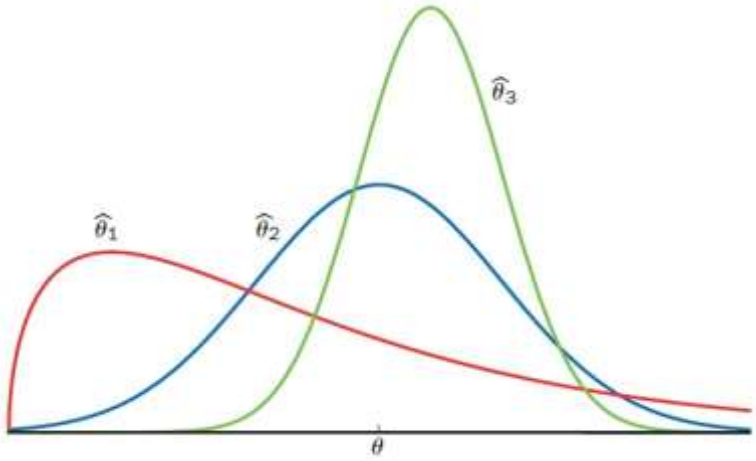
1. A statistic $\hat{\theta}$ is an unbiased estimator of θ if $E(\hat{\theta}) = \theta$.

- True
- False

2. The given graph shows the probability density functions for three different statistics that could be used to estimate a population parameter θ.



Which of the given statistics is most appropriate to estimate the population parameter θ?

- $\hat{\theta}_1$
- $\hat{\theta}_2$
- $\hat{\theta}_3$
- All of them are equally appropriate.

3. A confidence interval for a population mean is guaranteed to contain the true value of μ.

- True
- False

4. As the confidence coefficient increases, the confidence interval _____.

- becomes narrower.
- stays the same.
- becomes wider.
- changes in a random fashion.

5. The owner of a small tailor shop keeps careful records of all alterations. Two common alterations to men's clothing include lengthening the inseam on pants and letting out a sports coat around the waist. A random sample of each type of alteration was obtained, and the summary statistics are given in the given table. Measurements are in inches.

Alteration	Sample size	Sample mean	Assumed σ
Pants inseam	33	0.74	0.22
Sports coat waist	42	1.05	0.37

Fill in the blanks.

1. A 95% confidence interval for the mean alteration of the in seams on men's pants is _(Answer 1, Answer 2)_. (Give your answer to three decimal places.)

2. The sample necessary in order for the bound on the error of estimation to be 0.05 for the confidence interval in part 1 is greater then or equal to _(Answer 3)_. (Give your answer as a whole number.)

3. The 95% lower bound for the mean alternation of the in seams on men's pants is _(Answer 4)_. (Give your answer to three decimal places.)

6. Every t distribution is symmetric and centered at 0.

- **a.** True
- **b.** False

7. The confidence interval for μ based on a t distribution is used only for sample sizes less than or equal to 30.

- True
- False

8. Every time you access this problem, the question will be different.
What critical value $t_{\alpha,v}$ from Table V should be used to calculate the confidence interval for the mean of the population in the following situation?
A 99% confidence interval based on n = x observations has a critical value of ____ (four decimal places.)

What critical value $t_{\alpha,v}$ from Table V should be used to calculate the confidence interval for the mean of the population in the following situation?
A 95% confidence bound based on n = y observations has a critical value of ____(four decimal places.)

What critical value $t_{\alpha,v}$ from Table V should be used to calculate the confidence interval for the mean of the population in the following situation?
A 80% confidence interval based on n = z observations has a critical value of ___ (four decimal places.)

9. Every time you access this problem, the question can change.
A typical washing machine has several different cycles, including soak, wash, and rinse. The energy consumption of a washing machine is linked to the length of each cycle. A random sample of 21 washing machines was obtained, and the length (in minutes) of each wash cycle was recorded. The summary statistics are $\bar{x}$=37.8 and S = 5.9. Assume the underlying distribution of main wash cycle times is normal.

Fill in the blanks. (Give your answers to four decimal places.)

A C% confidence interval for the true mean wash cycle time is (___, ___).

10. A statistical hypothesis is always stated in terms of a population parameter.

- **a.** True
- **b.** False

11. In a test of a statistical hypothesis, we attempt to find evidence in favor of the null hypothesis.

- **a.** True
- **b.** False

12. Which of the following is a valid null hypothesis?

- $\bar{x} \neq 5$
- $\mu = 5$
- $\bar{x} = 5$
- $\mu \neq 5$

Which of the following is a valid alternative hypothesis?

- $\mu > 25$
- $\bar{x} \geqslant 25$
- $\mu \geq 25$
- $\bar{x} > 25$

13. Each time you access the problem, the question will change.
Officials in Dexter, a small town in upstate New York, have decided to install more fire hydrants in order to decrease insurance rates for many businesses. Prior to the new installations, the mean distance to a fire hydrant for downtown buildings was x feet. After the new installations, a random sample of downtown buildings will be obtained, and the distance to the nearest fire hydrant will be recorded. The data will be used to determine whether there is evidence that the mean distance to a fire hydrant has decreased. State the null and alternative hypotheses in terms of μ, the population mean distance to a fire hydrant.

- H_o: $\mu > x$; H_a: $\mu < x$
- H_o: $\mu = x$; H_a: $\mu \neq x$
- H_o: $\mu < x$; H_a: $\mu > x$
- H_o: $\mu = x$; H_a: $\mu < x$

14. For the following, please match the type of error with the appropriate definition.

____ **1.**	If we reject the null hypothesis, when the null hypothesis is really true	**a.** Type I Error
____ **2.**	If we do not reject the null hypothesis when alternative hypothesis is true.	**b.** Type II Error

15. Each time you access the problem, the question will change.
This part of the problem changes each time you access the question. The annual Waikiki Roughwater Swim contest is held over a 2.4-mile course and ends near the Hilton Rainbow Tower. The 2013 winner was Rhys Mainstone in 48 minutes, 10 seconds. Before the race, a random sample of the current velocity (in knots) along the race course is obtained, and the resulting information is used to determine whether the race should be canceled. A mean current velocity, m, of more than x knots is considered unsafe.

a. State the null and alternative hypotheses.

- $H_o: \mu \leq x; H_a: \mu > x$
- $H_o: \mu = x; H_a: \mu < x$
- $H_o: \mu < x; H_a: \mu = y$
- $H_o: \mu > x; H_a: \mu < x$

b. Describe type I and type II errors in this context.

- A type I error would be canceling the swimmers because you decide that the mean current velocity is more than 0.65 knots when it is actually less than that. A type II error would be failing to realize that mean is too small and running the race when it should have not been canceled.
- A type I error would be canceling the race because you decide that the mean current velocity is less than 0.65 knots when it is actually more than that., A type II error would be failing to realize that mean is too small and running the race when it should have not been canceled.
- A type I error would be canceling the race because you decide that the mean current velocity is more than 0.65 knots when it is actually less than that. A type II error would be failing to realize that mean is too high and running the race when it should have been canceled.
- A type I error would be canceling the race because you decide that the mean current velocity is more than 0.35 knots when it is actually less than that. A type II error would be failing to realize that mean is too high and running the race when it should have been canceled.

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c. Which error is more serious for the swimmers? Why?

- A type I error is more serious for swimmers because it would result in unnecessarily canceling the race and losing a great deal of revenue and good will.
- A type II error is more serious for swimmers because it would result in swimming in dangerous currents.
- A type I error is more serious for swimmers because it would result in swimming in dangerous currents.
- A type II error is more serious for swimmers because it would result in unnecessarily canceling the race and losing a great deal of revenue and good will.

d. Which error is more serious for the race organizers? Why?

- A type II error is more serious for race organizers because it would result in swimming in dangerous currents.
- A type I error is more serious for race organizers because it would result in swimming in dangerous currents.
- A type II error is more serious for race organizers because it would result in unnecessarily canceling the race and losing a great deal of revenue and good will.
- A type I error is more serious for race organizers because it would result in unnecessarily canceling the race and losing a great deal of revenue and good will

16. Which of the following will increase power?

- increase σ
- increase n
- decrease α
- decrease the distance between the actual mean, μ_0, and μ_a