

Stat 20, Fall '06 A. Adhikari
Review Problems for Quiz 4: Confidence Intervals and Accuracy

1. A simple random sample of size 300 is taken from a population of hundreds of thousands of adults. The average weight of the sampled people is 150 pounds and the SD of their weights is 30 pounds.
 - a) The average weight of the population is estimated to be _____ pounds; the SE for this estimate is about _____ pounds.
 - b) An approximate 99%-confidence interval for the average weight in the population goes from _____ pounds to _____ pounds.

2. In a simple random sample of size 400 taken from over 500,000 workers, 21% of the sampled workers are in carpools.
 - a) In the population, the percent of workers in carpools is estimated to be _____%; the SE for this estimate is about _____%.
 - b) An approximate 95%-confidence interval for the percent of carpooling workers in the population goes from _____% to _____%.

3. A simple random sample of 150 undergraduates is taken at a large university. The average MSAT score of the sampled students is 528 with an SD of 90. Construct an approximate 90%-confidence interval for the average MSAT score of undergraduates at the university.

4. In a simple random sample of 500 students taken at a large university, 180 have undeclared majors. Construct an approximate 85%-confidence interval for the percent of students at the university who have undeclared majors.

5. A simple random sample of 900 households is taken in a city. The average household size in the sample is 2.2 people, with an SD of 2 people.
 - a) Pick one of the two options: The average household size in the sample is
 - (i) known to be 2.2. (ii) estimated to be 2.2.
 - b) Pick one of the two options: The average household size in the city is
 - (i) known to be 2.2. (ii) estimated to be 2.2.
 - c) Pick one of the two options (justify your answer carefully). The distribution of household sizes in the sample
 - (i) is approximately normal. (ii) is not normal, not even approximately.
 - d) Do you think the distribution of household sizes in the city is approximately normal? Explain.
 - e) Pick one of the two options (justify your answer carefully). The normal curve
 - (i) can be used (ii) cannot be usedto construct an approximate 95%-confidence interval for the average household size in the city.
If you picked option (i), construct the interval.
 - f) True or false (explain): Approximately 95% of the households had sizes in the range 2.07 to 2.33 people.

6. A simple random sample of 400 people is taken from all the people in a city. The ages of the sampled people have an average of 35 years and an SD of 20 years.

In parts (a)-(c) fill in each blank with **either** the word “sample” **or** the word “city”.

a) 35 years is the average age of the people in the _____.

b) The interval “33 years to 37 years” is an approximate 95%-confidence interval for the average age of the people in the _____.

c) In the interval in part (b), the observed average age of the people in the _____ is being used as an estimate of the unknown average age of the people in the _____.

d) Pick one of the options (i)-(ii) to complete the sentence:

“The normal curve used in the construction of the interval in part (b) is an approximation to the probability histogram for the average age of the people in _____.”

(i) the city

(ii) a simple random sample of 400 people taken from the city

7. A simple random sample of 100 students is taken from among all students at a large school. The average height of the students in the sample is 66 inches and the SD is 2.5 inches. The histogram of their heights follows the normal curve quite closely. True, false, or cannot be determined:

a) An approximate 68%-confidence interval for the average height of all students in the school is given by 66 inches \pm 0.25 inches.

b) About 68% of the students in the school have heights in the range 66 inches \pm 0.25 inches.

c) About 68% of the students in the sample have heights in the range 66 inches \pm 2.5 inches.

8. A survey organization took a simple random sample of 275 units out of all the rental units in a city. The average monthly rent of the sampled units was \$920 and the SD was \$500. There were 964 people living in the sampled units, and there were 120 children among the these 964 people.

In parts (a)-(c) construct an approximate 68%-confidence interval for the given quantity, if possible. If this is not possible, explain why not.

a) the average monthly rent of the sampled units

b) the average monthly rent of all the rental units in the city

c) the percent of children among all people living in rental units in the city

d) “About 68% of the sampled units had rents in the range \$420 to \$1420.”

Do you agree with the quoted statement? Why or why not?

9. A simple random sample of 400 households was taken from among all households in a city. The average annual income of the sampled households was \$60,000 with an SD of \$40,000. In this context, the interval “\$56,000 to \$64,000” is an approximate 95%-confidence interval for _____.

[Fill in the blank with an appropriate phrase.]

10. City A has 500,000 voters and City B has 1,000,000 voters. In order to estimate the percent of Republicans in each city, a survey organization is planning its sampling scheme. Other things being equal, which of the two samples below will be more accurate?

- (i) A simple random sample of 1% of the voters in City A.
- (ii) A simple random of 0.75% of the voters in City B.

11. A survey organization has taken a simple random sample of voters and used the bootstrap method of our class to construct an approximate 95%-confidence interval for the percent of Democrats in the population of voters. The interval is (48%, 54%). If possible, find

- a) the percent of Democrats among the voters in the population.
- b) the percent of Democrats among the voters in the sample.
- c) the sample size.
- d) the minimum sample size which will ensure that a 95%-confidence interval for the percent of Democrats in the population has a total width of 1% (that is, the “margin of error is one half of one percentage point”).

12. A Stat 2 class has 300 students. The distribution of final exam scores in the class follows the normal curve quite closely, with an average of 70 and an SD of 12. The top 20% of the students get A grades on the final. A simple random sample of 150 students is taken.

- a) In the sample, the percent of students with A grades is expected to be _____, give or take _____.
- b) There is about a _____% chance that the average final exam score of the sampled students is greater than 72.