

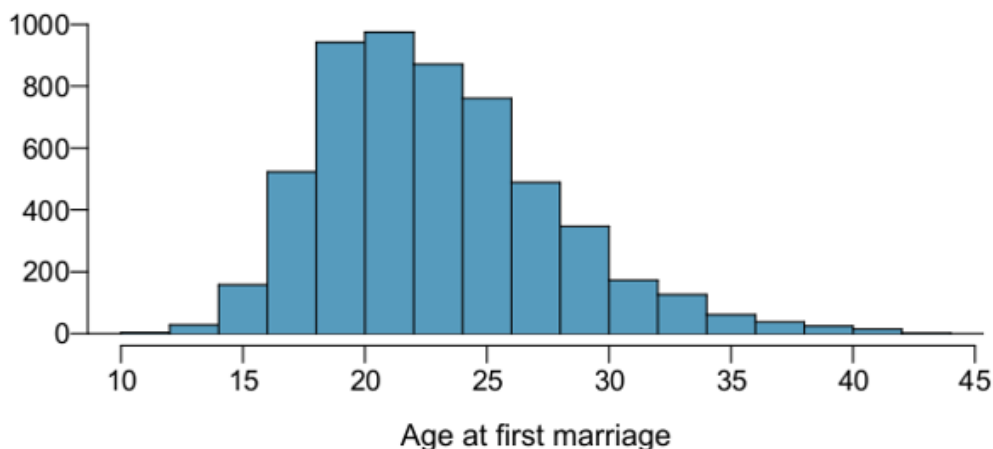


STAT 201 - Week-In-Review 10

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Problem Statements

1. Suppose scores on a Statistics exam are normally distributed with an unknown mean and a standard deviation of ten points. A random sample of 50 scores is taken and gives a sample mean of 75. Find a 95% confidence interval for the true mean of statistics exam scores.
2. The National Survey of Family Growth conducted by the Centers for Disease Control gathers information on family life, marriage and divorce, pregnancy, infertility, use of contraception, and men's and women's health. One of the variables collected in this survey is the age at first marriage. The histogram shows the distribution of ages at first marriage of 5,534 randomly sampled women between 2006 and 2010. The average age at first marriage among these women is 23.44. Consider the population standard deviation of 4.72 (NSFG, 2010). (please round ages to two decimal places).



Estimate the average age at first marriage of women using a 95% confidence interval.

3. Suppose a simple random sample of size $n = 80$ is drawn from a normal population with an unknown mean μ and a known standard deviation σ . Let $[2.19, 3.67]$ be an estimated 95% confidence interval for μ based on the observed sample.
 - (A) Find the sample mean.
 - (B) Find the corresponding margin of error.
 - (C) Suppose we wish to construct a 98% confidence interval based on a new sample while keeping the margin of error unaltered. Should we increase, or decrease the sample size?
 - (D) Now suppose we wish to construct a new confidence interval based on a new sample of size $n = 30$ while keeping the margin of error unaltered. Should we increase, or decrease the confidence level?
4. Peggy is interested in the mean height μ of young American women aged between 18 to 24 years in the US, and wishes to construct a 95% CI for μ . Assume that the corresponding population standard deviation σ is known to be 2.5 inches.



What would be the minimum sample size she needs to take so as to ensure that the corresponding error bound does not exceed 0.58 inches?

5. Which of the following are the correct interpretations of a 95% confidence interval? Select all that apply.
- (a) The interval estimator contains the unknown true parameter value with probability 0.95 (before sampling).
 - (b) The interval estimator fails to contain the unknown true parameter value with probability 0.05 (before sampling).
 - (c) We are 95% confident that the calculated CI based on the present sample would contain the unknown true parameter value.
 - (d) If repeated random samples of a fixed size are drawn from the given population distribution under identical conditions a large number of times, **approximately** 95% of the estimated CIs contain the unknown true parameter value.
 - (e) If repeated random samples of a fixed size are drawn from the given population distribution under identical conditions a large number of times, **approximately** 5% of the estimated CIs **fail** to contain the unknown true parameter value.
 - (f) A future random sample of the same size drawn under identical conditions from the given population distribution will result in a CI that will contain the unknown true parameter value with probability 0.95.
6. Dewey, Lie, and Howei is a regional branch office of the tax preparation conglomerate Hookem, Billem, Cheatem, and Soakemi. One week before the deadline for filing federal income tax returns, the systolic blood pressure of a random sample of 45 employees at Dewey, Lie, and Howe is measured. Based on the observations in this sample, a 95% confidence interval for the mean systolic blood pressure μ of all employees is calculated to be (142, 165).

Which of the following statements gives a statistically correct, acceptable interpretation of this interval?

- (a) We are 95% confident that the interval (142, 165) contains the population mean systolic blood pressure μ of all employees.
- (b) 95% of the sample of employees have a systolic blood pressure between 142 and 165.
- (c) 95% of the population of employees have a systolic blood pressure between 142 and 165.
- (d) The probability that the population mean systolic blood pressure μ is between 142 and 165 is 0.95.
- (e) If the sampling procedure were repeated many times and a 95% confidence interval calculated from the observations in each sample, 95% of the resulting confidence intervals would contain the population mean systolic blood pressure μ ; the interval (142, 165) is possibly one such interval.
- (f) We are 95% confident that the population mean systolic blood pressure μ of all employees is in the interval (142, 165).



- (g) If the sampling procedure were repeated many times and the sample mean systolic blood pressure from the observations in each sample were calculated, then 95% of the sample means would be between 142 and 165.
- (h) We are 95% confident that the systolic blood pressures in this sample have a sample mean that is between 142 and 165.
- (i) On 95% of the days the population mean systolic blood pressure μ is between 142 and 165.
7. The 95% confidence interval for the average lifetime μ of light bulbs is (166, 198) hours. Which of the following is the correct interpretation of the above confidence interval for μ ?
- (a) 95% of all light bulbs will last between 166 hours and 198 hours.
- (b) The true average is between 166 and 198 about 95% of the time.
- (c) The true average is between 166 and 198 hours with 95% confidence.
- (d) We are 95% confident the next light bulb will last between 166 and 198 hours.
- (e) If we repeat the process with 1000 samples, about 950 of them would correctly capture the true average μ . The interval (166, 198) is possibly one of them.
8. The pH of rain, measured at a weather station in Michigan, was observed for 39 consecutive rain storms. The sample mean is 4.6982 and the sample variance is 0.39623. Assume the observations to be independent and the population distribution to be approximately normal. Based on the above information, obtain a 99% confidence interval for the mean pH μ of the population of storms at that location.
9. A hospital is trying to cut down on emergency room wait times. It is interested in the amount of time patients must wait before being called back to be examined. An investigation committee randomly surveyed 70 patients. The sample mean was 1.5 hours with a sample standard deviation of 0.5 hours.
Construct a 95% confidence interval for the population mean time spent waiting.
10. A New Research Center poll included 1500 randomly selected adults who were asked whether "global warming is a problem that requires immediate government action". Results showed that 850 of those surveyed indicated that immediate government action is required. Let p be the population proportion of adults who believe that immediate government action is required. Compute a 95% confidence interval for p .
11. The university is interested to know whether the students support sport passes to be included in their tuition fees. 250 students are sampled to estimate the proportion of students who support sports passes being included in tuition. Of them, 133 support it and 117 oppose. Let p be the population proportion of students who support sport passes to be included in the tuition fees. Compute a 90% confidence interval for p .
12. The 90% confidence interval for the proportion of patients who experience side effects from the medication Obecalp is (22.7%, 27.5%). Which of the following statements is a valid statement about this confidence interval?
- (a) We are 90% confident that all patients will have side effects 22.7% to 27.5% of the time.



- (b) There is a 90% probability that the population proportion of patients who get side effects is between 22.7% and 27.5%.
 - (c) The population proportion of patients who will experience side effects is between 22.7% and 27.5% with 90% confidence.
 - (d) If we replicate the same experiment under identical conditions based on 1000 repeated samples each having the same size, then in about 900 of the cases, the estimated confidence intervals will cover the population proportion of patients who will experience side effects. The interval (22.7%, 27.5%) is possibly one of them.
 - (e) Between 22.7% to 27.5% of patients will have side effects 90% of the time.
 - (f) The population proportion of patients who experience side effects is between 22.7% and 27.5%.
13. A new method of pre-coating fittings used in oil, brake and other fluid systems in heavy-duty trucks is being studied. What should the minimum sample size n be to estimate the proportion of fittings p that leak to within 0.02 (length = 0.04) with 90% confidence? (No prior information about p is available).