Math 160+060 Practice Final

1) **Chemicals in butter-flavoring:** Workers in a microwave popcorn production plant in Missouri breathe chemicals that are part of the butter-flavoring. Are these workers at greater risk of developing lung problems? To investigate this question, 135 workers at the plant receive a survey, but only 117 respond.
Researchers want to compare workers in the popcorn production area with workers who have jobs in other parts of the plant. People in these other jobs are not directly exposed to the butter flavorings. Of the 97 workers in the production area, 30 reported experiences of "shortness of breath." Of the 20 workers in other jobs, only 1 reported "shortness of breath."
Is this an observational study or an experiment?
   a) observational study
   b) experiment

2) **Chemicals in butter-flavoring:** Workers in a microwave popcorn production plant in Missouri breathe chemicals that are part of the butter-flavoring. Are these workers at greater risk of developing lung problems? To investigate this question, 135 workers at the plant receive a survey, but only 117 respond.
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What can we conclude from this study?

   a) The chemicals in the butter-flavorings are causing shortness of breath because a much larger percentage of workers in the production area have shortness of breath.
   b) Exposure to the chemicals in butter-flavoring is associated with a greater incidence of lung problems, such as shortness of breath.

3) **Hospital floors:** Hospital floors are usually bare tiles instead of carpet. Carpets will decrease noise but might increase germ growth. To study this, researchers installed carpet in 8 of 16 hospital rooms. They randomly selected the rooms to carpet. The other rooms had bare tiles.

After two weeks of normal use, they collected air samples from the rooms and counted the bacteria in each sample.

   a) What is the explanatory variable?

   b) What is the response variable?

4) In its January 25, 2012, issue, the *Journal of the American Medical Association* (JAMA) reported on the effects of overconsumption of low, normal, and high protein diets on weight gain, energy expenditure, and body composition. Researchers conducted a single blind, randomized controlled trial of 25 U.S. adults. The subjects were healthy, weight-stable, male and female volunteers, aged 18 to 35 years. All subjects consumed a weight-stabilizing diet for 13 to 25 days. Afterwards, the researchers randomly assigned participants to diets containing various percentages of energy from protein: 5% (low protein), 15% (normal protein), or 25% (high protein). The subjects were not aware of the specific protein level diet to which they were assigned. On these diets the researchers overfed the participants during the last 8 weeks of their 10 to 12 week stay in the inpatient metabolic unit. The goal was to investigate the effect of overconsumption of protein on weight gain, energy expenditure, and body composition.

What is the purpose of random assignment in this experiment? Choose all that apply.

   a) to generalize the experiment results to a larger group
   b) to produce treatment groups with similar characteristics
   c) to control for confounding variables

5) Advice columnist Ann Landers once asked her divorced readers whether they regretted their decision to divorce. She received approximately 30,000 replies. Of the 30,000, about 23,000 came from women. Nearly 75% said they were glad they divorced. Of these, most said they wished they had divorced sooner.

Which is the most accurate statement about the survey?

   a) This sample is large (approximately 30,000) so the results are representative of the population of divorced people in the U.S.
   b) The results are believable, so the survey is not biased.
   c) This is a convenience sample and is biased by an unequal number of males and females.
   d) This survey is biased by voluntary participation and probably overestimates the percentage who are glad they divorced.

6) According to OpenSecrets.org, the net worth of U.S. senators is strongly skewed to the right. In 2010, the two measures of center for U.S. senators were $2,502,770 and $13,224,333. Which number best represents the mean net worth and which represents the median net worth of US Senators?
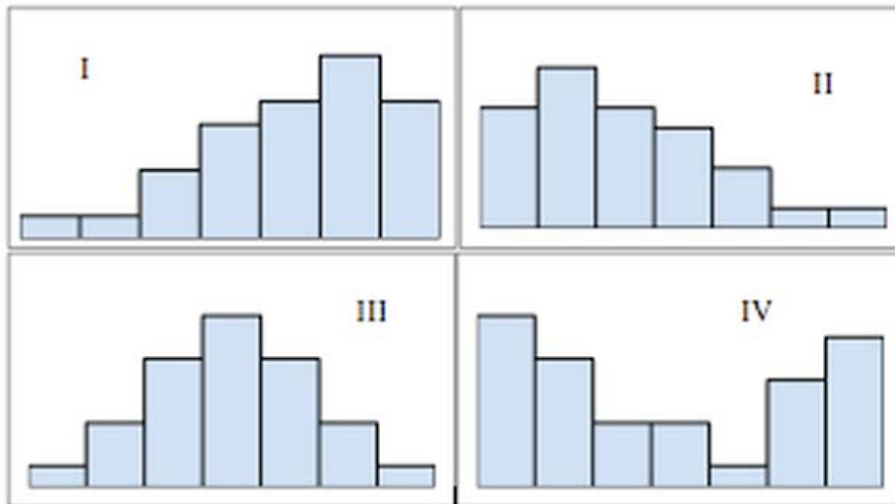
Mean:

Median:

7) A local swim club offers competitive meets throughout the season. Some races are *open competitions* with no qualifying times. Other races are *qualified competitions*. For example, 15- to 16-year-old girls are eligible to swim the 100-meter freestyle in a *qualified competition* if they posted a time of 1-minute 8-second time or less during the qualifying period.

Consider the group of 15- to 16-year-old females who swim the 100-meter freestyle in the *open competitions* and the group of 15- to 16-year-old females who swim the 100-meter freestyle in the *qualified competitions*.

Which group's distribution of race times would most likely have the largest standard deviation?

a) The group competing in the *open competitions* is most likely to have a higher standard deviation than the group competing in the *qualified competitions* .
b) The group competing in the *qualified competitions* is most likely to have a higher standard deviation than the group competing in the *open competitions* .
c) Both groups would likely have the same standard deviation.
d) There is not enough information to predict the relative sizes of their standard deviations.

8) Assume that the following histograms are drawn on the same scale.

a) Which one of the histograms has the largest median, and why?

b) Which one of the histograms has the smallest median, and why?

9) The graphs below give the cancer mortality rate for countries with low per capita income and countries with high per capita income. The cancer mortality rate is given as a percentage of total deaths.

Cancer mortality rate (160 countries)
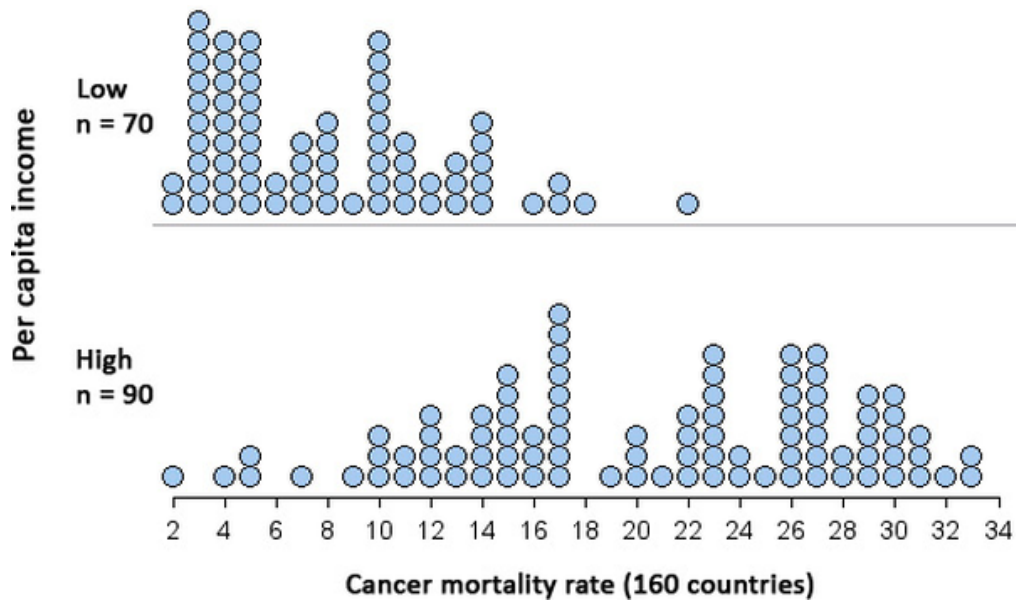
Which of the following statements is valid? Choose all that apply.

a) Because the cancer mortality rate varies for low income countries and also for high income countries, we cannot draw any conclusions from this data.
b) Based on the shape, center, and spread of each distribution, people living in countries with high-per-capita income are more likely to die from cancer.
c) Since the two groups have a different number of countries, we cannot draw conclusions from this data.

10) Use descriptions of shape, center, and spread to analyze and compare the distribution of sugar in the *adult* and *child* cereals.

Sugar (grams/serving)
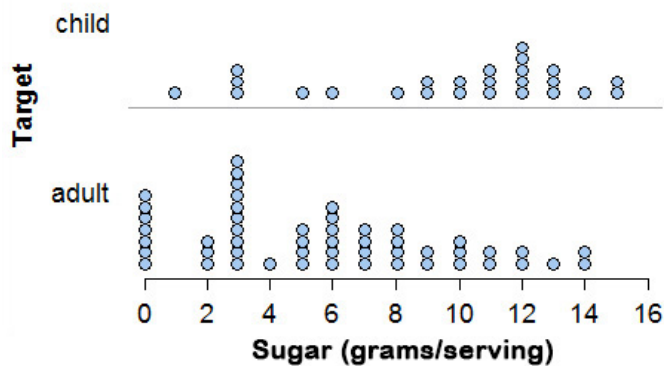
11) Evaluate $(8 - 3)^2 - 2^2 \cdot 3$

12) Evaluate $\dfrac{4 - \sqrt{5^2 - 3^2}}{6}$

13) Evaluate the expression for the given values of the variables.
$a + bx$ $a = 17, \ b = -3, \ x = 5$

14) In 2011, 18% of all smartphones sold worldwide were sold by Samsung. If Samsung sold 94 million smartphones that year, what was the total number of all smartphones sold worldwide in 2011?

15) In 2012, 122 million people in the United States owned smartphones. By 2015, that number had risen to 190 million. What is the percent increase in the number of smartphone owners in the U.S. from 2012 to 2015?

16) Simplify by combining like terms (if possible): $7x^3 - 4x^2 + x + 2x^2 + 10x$

17) Model S trains are on a scale of 1/64 size. If a model S version of the GE-9-44CW locomotive is 3 inches tall, how tall is the actual locomotive? Write your answer in feet.

18) How many seconds are in 3 days?

19) If 16.04 g of methane (CH_4) = 1 mole of CH_4, how many moles of CH_4 are required to make 9 g of CH_4?

20) If Sheila earns $425 in four days, then how much will she earn in 10 days?

21) If a runner can run at a rate of 100 meters in 15 seconds, what would this runner's total time be for a 10k race? (1 km = 1,000 m)
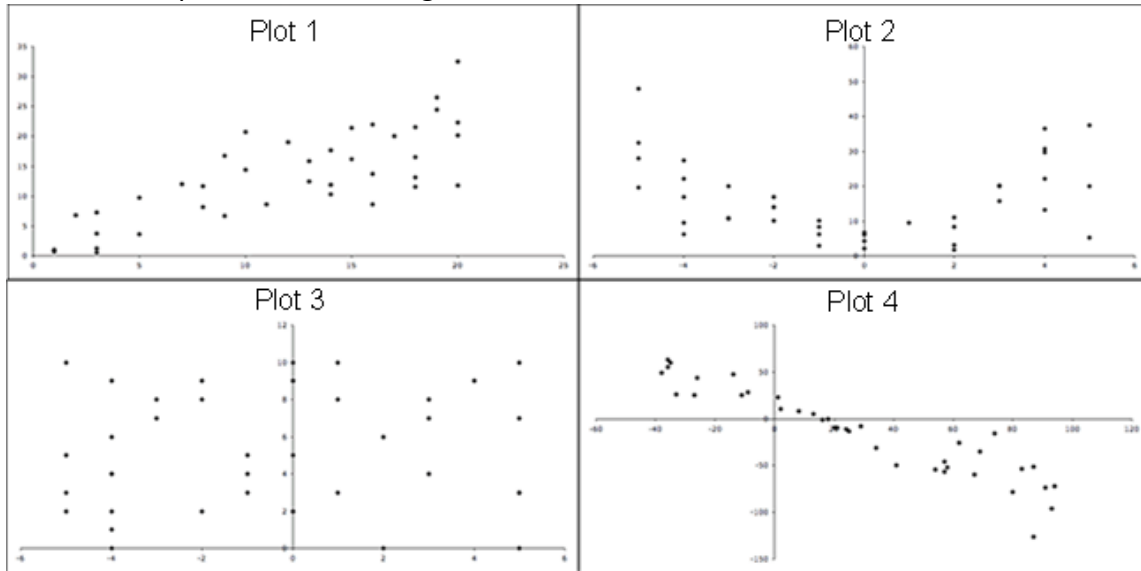
22) Find the equation of the line that passes through the points (3, 2) and (5, -5)

23) Which of the plots has negative linear association?
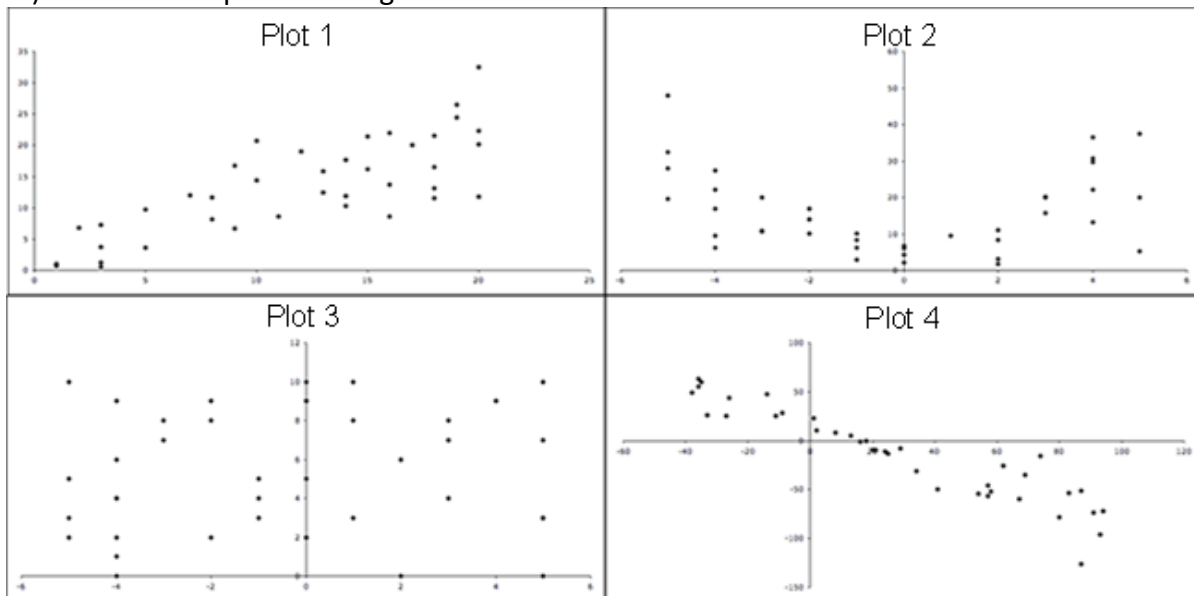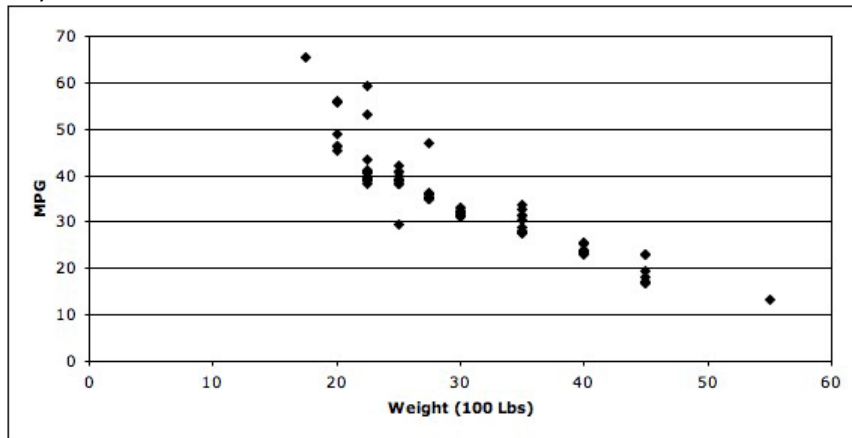

A) Plot 1   B) Plot 2   C) Plot 3   D) Plot 4

24) Which of the plots has the strongest *nonlinear* association?

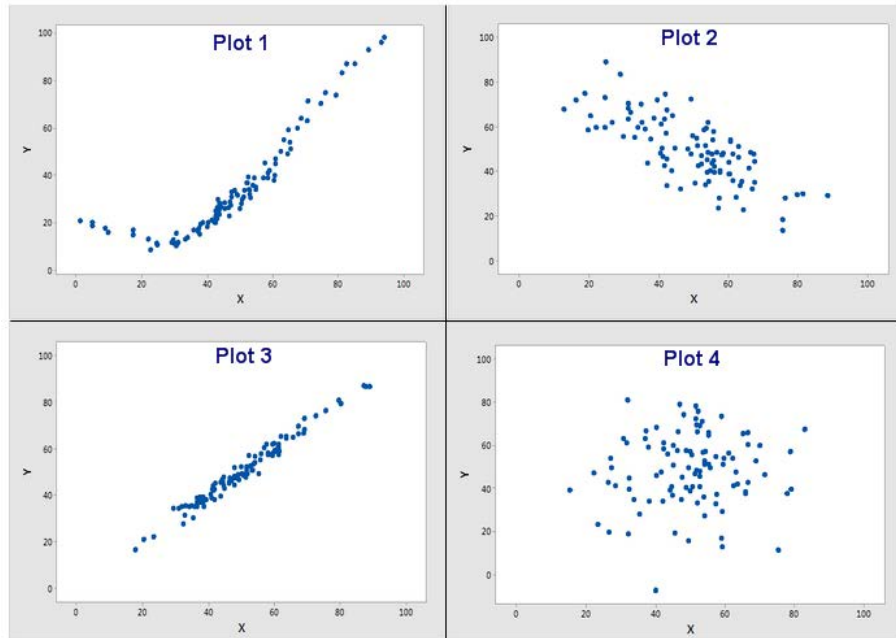A) Plot 1   B) Plot 2   C) Plot 3   D) Plot 4

25)

Is the following statement valid or invalid?

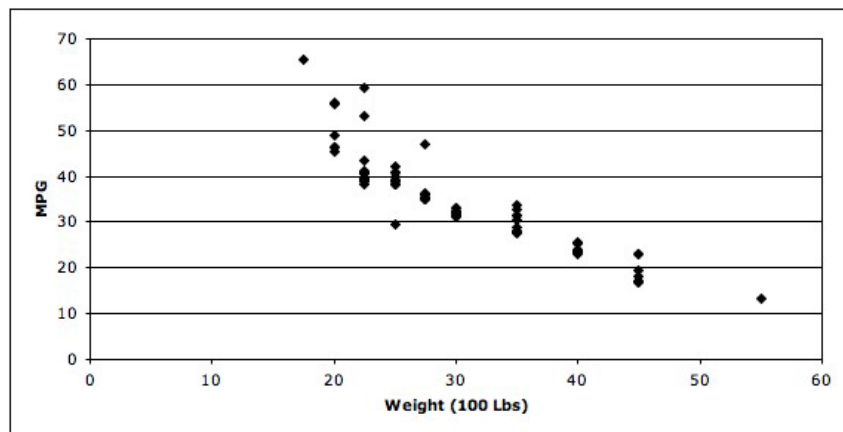The strong association proves that more weight causes a lower mpg rating.

26)

Which one of these correlation coefficient values is the most appropriate choice for the data shown in Plot 2?
A) −0.75   B) 0.09   C) 0.88   D) 0.99

27)

Note that automobile fuel efficiency is often measured in miles that the car can be driven per gallon of fuel (mpg). Suppose we have a collection of cars, we measure their weights and fuel efficiencies, and generate the following graph of the data. Which of the following can possibly be the regression line for this data set?
A) Y = -1.11X + 5.17   B) Y = 1.11X + 68.17
C) Y = -1.11X + 68.17   D) Y = 1.11X + 5.17

28) **Final and course grade:** For this data set, the least squares regression line is
$Y = 31.72 + 0.62X$, where X represents the final exam score as a percent and Y represents the predicted course grade as a percent.
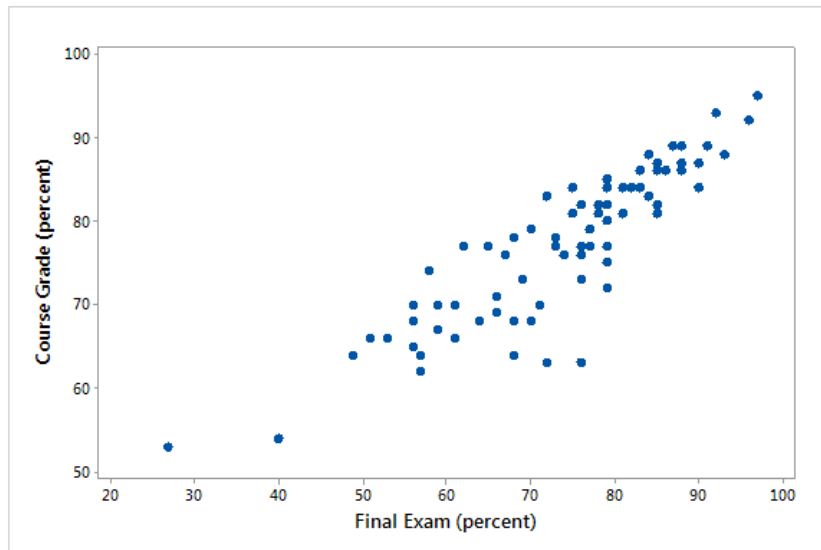
Notice that the regression line for this data set has slope 0.62. What is the most precise and accurate interpretation of the slope?
A) Students with higher final exam scores tend to have higher course grades.
B)For every 1% increase in a student's final exam score, we expect to see a 0.62% decrease in the course grade.
C) For every 1% increase in a student's final exam score, we expect to see a 0.62% increase in the course grade.
D) For every 1%t increase in a student's final exam score, we expect to see a 62% increase in the course grade.

29)Suppose that we have found that the least squares regression line for a set of data set where X represents the weight of the cars in hundreds of pounds and Y represents the mpg rating to be $Y = -1.11X + 68.17$.
Use the given equation of the regression line given to predict the mpg rating of a car that weighs 3700 lbs.
A) 27.1 mpg   B) 64.063 mpg   C) 4175.17 mpg   D) -4038.83 mpg

30) A local Honda dealership collects data on customers. Here is data from 311 customers who purchased a Honda Civic.

	Hybrid Honda Civic	Standard-engine Honda Civic	Row totals
Male	77	117	194
Female	34	83	117
Column totals	111	200	311

What does the data suggest about the relationship between gender and engine type?

31) Here are the results of a survey that students conducted at a mall. The students conducted this survey as part of a statistics project to determine if younger adults are more likely to have tattoos.

	At least one tattoo	No tattoo	Row Totals
Age 18 - 29	170	320	490
Age 30 - 50	60	445	505
Column Totals	230	765	995

If we randomly select a person in the sample who is 30 to 50 years old, what is the probability that this person has a tattoo?

32) In 1912, the RMS Titanic, a British passenger ship, sank in the North Atlantic Ocean after colliding with an iceberg. Historians do not know the exact passenger list, so the death toll is estimated. Here is data from the 2201 passengers on board, by cabin class.

	First Class	Second Class	Third Class	Crew	Row totals
Died	122	167	528	673	1490
Survived	203	118	178	212	711
Column Totals	325	285	706	885	2201

If we randomly select a passenger, what is the probability that the passenger is in a first class cabin and survived the Titanic?

33) Find the z-score that has 45% of the distribution's area to its right.

34) A particular brand of batteries has a mean lifespan of 570 hours, with a standard deviation of 80 hours. If 64 batteries are randomly selected, find the probability that they have a mean lifespan between 565 hours and 575 hours.

35) Assume that the weight of adult giant pandas are normally distributed with μ = 250 pounds and σ = 15. What is the probability that a randomly selected adult giant panda weighed more than 275 pounds?

36) The average number of pounds of sugar a person consumes each year is 156 with a standard deviation of 22 pounds (Source: American Dietetic Association). If a sample of 36 individuals is randomly selected, find the probability that the mean of the sample will be greater than 160 pounds.

37) Assume that the salaries of elementary school teachers in the United States are normally distributed with a mean of $35,000 and a standard deviation of $4000. What is the cutoff salary for teachers in the bottom 20%?

38) Find the critical value z_c that corresponds to an 80% confidence level.

39) A survey of 280 homeless persons showed that 63 were veterans. Construct a 90% confidence interval for the proportion of homeless persons who are veterans.

40) A random sample of 16 fluorescent light bulbs has a mean life of 645 hours with a standard deviation of 31 hours. Assume the population has a normal distribution. Construct a 95% confidence interval for the population mean, μ.

41) A computer repairer believes that the mean repair cost for damaged computers is more than $95. To test this claim, you determine the repair cost for 12 randomly selected computers and find that the mean repair cost is $100, with a standard deviation of $12.50. At $\alpha = 0.05$, do you have enough evidence to support the repairer's claim?