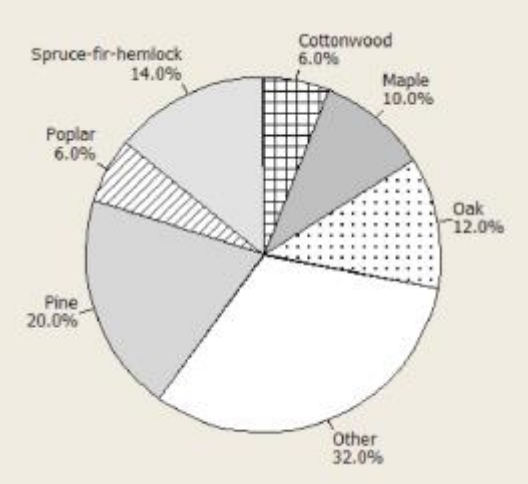
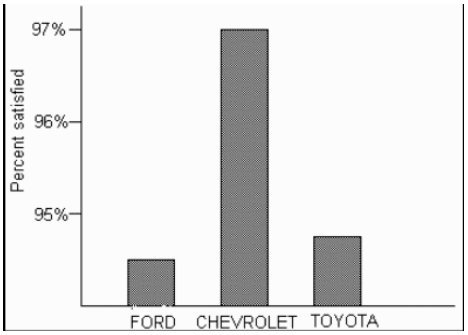
Final Review

Multiple Choice
Identify the choice that best completes the statement or answers the question.



1. The pie chart below describes the distribution of state tree types for the 50 states in the United States. The category "Other" include all trees that are the state tree for two or fewer states. Which of the following conclusions can we draw from this chart?

   a. Some states have not designated a "state tree."
   b. The cottonwood is the state tree for 12 states.
   c. Taken together, oak, pine, and maple are the state trees for more than half the states.
   d. There are 10 states that have designated a pine as their state tree.
   e. There is no state that has designated the Eastern Red Cedar as its state tree.



2. The following bar graph gives the percent of owners of three brands of trucks who are satisfied with their truck. From this graph, we may conclude that

   a. owners of other brands of trucks are less satisfied than the owners of these three brands.
   b. Chevrolet owners are much more satisfied than Ford or Toyota owners.
   c. There are only small differences in the satisfaction of owners for the three brands
   d. Chevrolet probably sells more trucks than Ford or Toyota.
   e. A pie chart would have been a better choice for displaying these data.

3. Here are the IQ test scores of 10 randomly chosen fifth-grade students:

   145 139 126 122 125 130 96 110 118 118

   To make a stemplot of these scores, you would use as stems

   a. 0 and 1
   b. 09, 10, 11, 12, 13, and 14
   c. 96, 110, 118, 122, 125, 126, 130, 139, and 145.
   d. 0, 2, 3, 5, 6, 8, 9.
   e. None of the above is a correct answer.

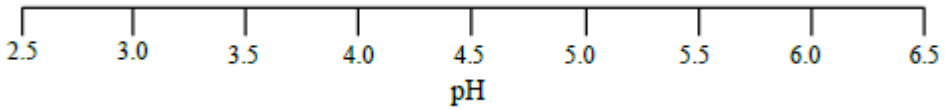
4. If a distribution is skewed to the right, which of the following is true?

   a. The mean must be less than the median.
   b. The mean and median must be equal.
   c. The mean must be greater than the median.
   d. The mean is either equal to or less than the median,
   e. It's impossible to tell which of the above statements is true without seeing the data.

5. Rainwater was collected in water collectors at 30 different sites near an industrial complex and the amount of acidity (pH level) was measured. The data ranged from pH 2.6 to pH 6.3. The following stemplot of the data was constructed.

```
2|679
3|237789          Key: 3|7 = pH 3.7
4|1222446899
5|0556788
6|0233
```

Which of the following boxplots is a correct representation of the same distribution?



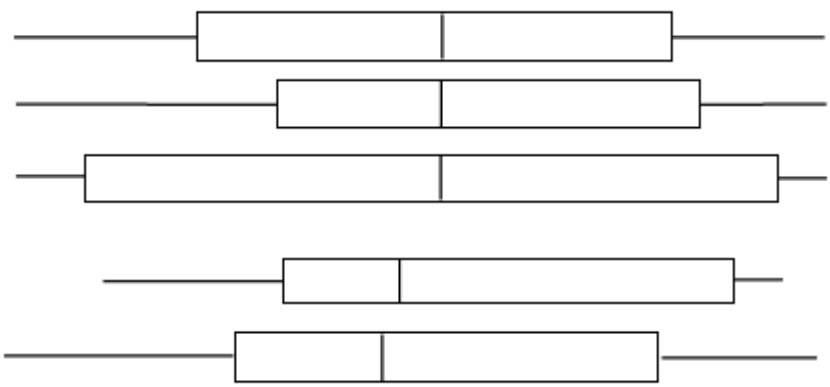
a.

b.

c.

d.

e.



6. A sample of 250 high school students were asked, "If you had $1000 to contribute to one kind of charitable organization, which type of organization would you choose?" Below is a two-way table of responses to this question and gender.

	Organization				
Gender	Education	Environment	Health	International Aid	Other
Female	19	33	50	28	10
Male	23	29	28	17	13

Which of the following conclusions seems to be supported by the data?

a. Most of the females who chose a health organization would have chosen an environmental organization as their second choice, had they been asked.
b. There is no association between gender and choice of organization.
c. The proportion of males who said they would contribute to an environmental organization was higher than the proportion of females who said they would contribute such an organization.
d. None of the students surveyed said they would contribute to religious organizations.
e. The marginal distribution of Organization is 140, 110.

7. A small company that prints custom t-shirts has 6 employees, one of whom is the owner and manager. Suppose the owner makes $120,000 per year and the other employees make between $40,000 and $50,000 per year. One day, the owner decides to give himself a $30,000 raise. Which of the following describes how the company's mean and median salaries would change?

   a. The mean and median would both increase by $5,000.
   b. The mean would increase by $5,000 and the median would not change.
   c. The mean would increase by $6,000 and the median would not change.
   d. The median would increase by $6,000 and the mean would not change.
   e. The mean would increase by $6,000, but we cannot determine the change in the median without more information.

8. The mean speed of vehicles in the "cars only" lanes of the New Jersey turnpike is 68 miles per hour. The mean speed of vehicles in the "any vehicle" lanes is 64 miles per hour. What must be true about the mean speed of all vehicles on the turnpike, assuming these are the only types of lanes?

   a. It could be any number between 64 and 68 miles per hour.
   b. It must be larger than the median speed.
   c. It must be larger than 66 miles per hour.
   d. It must be 66 miles per hours.
   e. We don't have enough information to draw any conclusion about the mean speed of all vehicles.

9. The mean birth weight of infants born at a certain hospital in the month of April was 128 oz. with a standard deviation of 10.2 oz. Which of the following is a correct interpretation of standard deviation?

   a. All the infants born in April weighed between 117.8 oz. and 138.2 oz.
   b. About half the infants born in April weighed between 117.8 oz. and 138.2 oz
   c. The difference between the mean weight and the median weight of infants born in April was 10.2 oz.
   d. The distance between the weight of each infant bon in April and the mean weight was, on average, about 10.2 oz.
   e. The mean weight of infants born in subsequent months is likely to be within 10.2 oz. of the mean weight in April.

10. A medical researcher collects health data on many women in each of several countries. One of the variables measured for each woman in the study is her weight in pounds. The following list gives the five-number summary for the weights of adult women in one of the countries.

    Country A: 92, 110, 120, 160, 240

    About what percent of Country A women weigh between 110 and 240 pounds?
    a. 50%
    b. 65%
    c. 75%
    d. 85%
    e. 95%

11. The heights of American men aged 18 to 24 are approximately Normally distributed with a mean of 68 inches and a standard deviation of 2.5 inches. Only about 5% of young men have heights outside the range

    a. 65.5 inches to 70.5 inches
    b. 63 inches to 73 inches
    c. 60.5 inches to 75.5 inches
    d. 58 inches to 78 inches
    e. none of the above

12. Use the information in the previous problem. About what percentage of the men are over 70.5 inches tall?

    a. 2.5
    b. 5
    c. 16
    d. 32
    e. 68

13. The area under the standard Normal curve corresponding to $-0.3 < Z < 1.6$ is

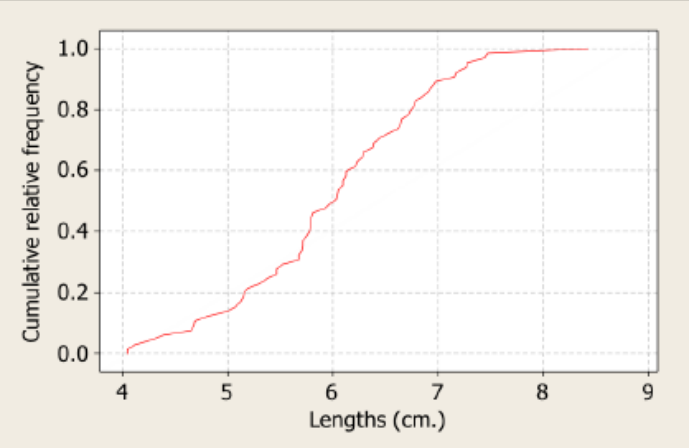
    a. 0.3273
    b. 0.4713
    c. 0.5631
    d. 0.9542
    e. none of the above

14. The distribution of the time it takes for different people to solve a certain crossword puzzle is strongly skewed to the right, with a mean of 30 minutes and a standard deviation of 15 minutes. The distribution of *z*-scores for those times is

    a. Normally distributed, with mean 30 and standard deviation 15.
    b. Skewed to the right, with mean 30 and standard deviation 15.
    c. Normally distributed, with mean 0 and standard deviation 1.
    d. Skewed to the right, with mean 0 and standard deviation 1.
    e. Skewed to the right, but the mean and standard deviation cannot be determined without more information.

15. The cumulative relative frequency graph at right shows the distribution of lengths (in centimeters) of fingerlings at a fish hatchery. The interquartile range for this distribution is approximately:

    a. 0.18 to 0.85 centimeters
    b. 5 to 7 centimeters
    c. 5.5 to 6.7 centimeters
    d. 1.2 centimeters
    e. 2 centimeters



16. Which of the following properties is true for all Normal density curves?

    I. They are symmetric.
    II. The curve reaches its peak at the mean.
    III. 95% percent of the area under the curve is within one standard deviation of the mean.

    a. I only
    b. II only
    c. I and II only
    d. I and III only
    e. All three statements are correct.

17. A fire department in a rural county reports that its response time to fires is approximately Normally distributed with a mean of 22 minutes and a standard deviation of 11.9 minutes. Approximately what proportion of their response times is over 30 minutes?

    a. 0.03
    b. 0.21
    c. 0.25
    d. 0.75
    e. 0.79

18. Other things being equal, larger automobile engines are less fuel-efficient. You are planning an experiment to study the effect of engine size (in liters) on the fuel efficiency (in miles per gallon) of sport utility vehicles. In this study,

    a. gas mileage is a response variable, and you expect to find a negative association.
    b. gas mileage is a response variable, and you expect to find a positive association.
    c. gas mileage is an explanatory variable, and you expect to find a strong negative association.
    d. gas mileage is an explanatory variable, and you expect to find a strong positive association.
    e. gas mileage is an explanatory variable, and you expect to find very little association.

19. The correlation between the heights of fathers and the heights of their (fully grown) sons is $r = 0.52$. This value was based on both variables being measured in inches. If fathers' heights were measured in feet (one foot equals 12 inches), and sons' heights were measured in furlongs (one furlong equals 7920 inches), the correlation between heights of fathers and heights of sons would be

    a. much smaller than 0.52
    b. slightly smaller than 0.52
    c. unchanged: equal to 0.52
    d. slightly larger than 0.52
    e. much larger than 0.52

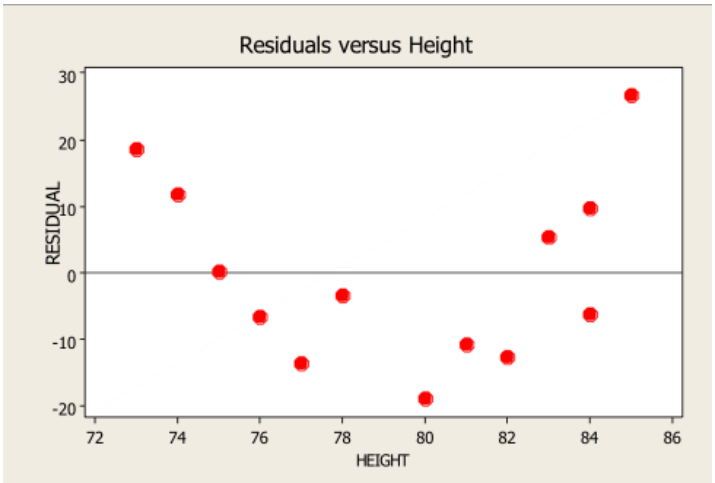
20. All but one of the following statements contains an error. Which statement could be correct?

    a. There is a correlation of 0.54 between the position a football player plays and his weight
    b. We found a correlation of $r = –0.63$ between gender and political party preference.
    c. The correlation between the distance travelled by a hiker and the time spent hiking is $r = 0.9$ meters per second.
    d. We found a high correlation between the height and age of children: $r = 1.12$.
    e. The correlation between mid-August soil moisture and the per-acre yield of tomatoes is $r = 0.53$.

21. A set of data describes the relationship between the size of annual salary raises and the performance ratings for employees of a certain company. The least squares regression equation is $\hat{y} = 1400 + 2000x$ where y is the raise amount (in dollars) and x is the performance rating. Which of the following statements *must* be true?

    a. For each one-point increase in performance rating, the raise will increase on average by $1400.
    b. The actual relationship between salary raises and performance rating is linear.
    c. The residuals for half the observations in the dataset will be positive.
    d. The correlation between salary raise and performance rating is negative.
    e. If the mean performance rating is 1.2, then the mean raise is $3800.

22. A least-squares regression line for predicting weights of basketball players on the basis of their heights produced the residual plot below. What does the residual plot tell you about the linear model?



a. A residual plot is not an appropriate means for evaluating a linear model.
b. The curved pattern in the residual plot suggests that there is no association between the weight and height of
c. The curved pattern in the residual plot suggests that the linear model is not appropriate
d. There are not enough data points to draw any conclusions from the residual plot.
e. The linear model is appropriate, because there are approximately the same number of points above and below the horizontal line in the residual plot.

Use the following information to answer the questions below:

One concern about the depletion of the ozone layer is that the increase in ultraviolet (UV) light will decrease crop yields. An experiment was conducted in a green house where soybean plants were exposed to varying levels of UV, measured in Dobson units. At the end of the experiment the yield (kg) was measured. A regression analysis was performed with the following results:

Predictor	Estimate	Std. Error	T	P
Constant	3.9800	0.0538	73.98	<.0001
UV	-0.04629	0.01074	4.31	0.0008

23. The least-squares regression line is the line that

a. minimizes the sum of the distances between the actual UV values and the predicted UV values.
b. minimizes the sum of the squared residuals between the actual yield and the predicted yield.
c. minimizes the sum of the distances between the actual yield and the predicted UV
d. minimizes the sum of the squared residuals between the actual UV reading and the predicted UV values.
e. minimizes the perpendicular distance between the regression line and each data point.

24. Which of the following is correct?

a. If the UV value increases by 1 Dobson unit, the yield is expected to increase by 0.0463 kg.
b. If the yield increases by 1 kg, the UV value is expected to decrease by 0.0463 Dobson units.
c. If the UV value increases by 1 Dobson unit, the yield is expected to decrease by 0.0463 kg.
d. The predicted yield is 4.3 kg when the UV value is 20 Dobson units.
e. None of the above is correct.

25. Which statements below about least-squares regression are correct?

    I. Switching the explanatory and response variables will not change the least-squares regression line.
    II. The slope of the line is very sensitive to outliers in the *x* direction with large residuals.
    III. A value of r^2 close to 1 does <u>not</u> guarantee that the relationship between the variables is linear.

    a. Only I is correct
    b. Only II is correct
    c. Only III is correct
    d. Both II and III are correct
    e. All three statements are correct

26. A new headache remedy was given to a group of 25 subjects who had headaches. Four hours after taking the new remedy, 20 of the subjects reported that their headaches had disappeared. From this information you conclude

    a. that the remedy is effective for the treatment of headaches.
    b. nothing, because the sample size is too small.
    c. nothing, because there is no control group for comparison.
    d. that the new treatment is better than aspirin.
    e. that the remedy is not effective for the treatment of headaches.

27. We wish to draw a sample of 5 without replacement from a population of 50 households. Suppose the households are numbered 01, 02, . . . , 50, and suppose that the relevant line of the random number table is

    11362 35692 96237 90842 46843 62719 64049 17823.

    Then the households selected are

    a. households 11 13 36 62 73
    b. households 11 36 23 08 42
    c. households 11 36 23 23 08
    d. households 11 36 23 56 92
    e. households 11 35 96 90 46

28. A maple sugar manufacturer wants to estimate the average trunk diameter of Sugar Maples trees in a large forest. There are too many trees to list them all and take a SRS, so he divides the forest into several hundred 10 meter by 10 meter plots, selects 25 plots at random, and measures the diameter of every Sugar Maple in each one. This is an example of a

    a. multistage sample.
    b. stratified sample
    c. simple random sample.
    d. cluster sample.
    e. convenience sample.

29. A researcher for a consumer products company is field testing a new formula for laundry detergent. He has contracted with 60 families, each with two children, who have agreed to test the product. He randomly assigns 30 families to the group that will use the new formula and 30 to the group that will use the company's current detergent formula. The most important reason for this random assignment is that

    a. randomization makes the analysis easier since the data can be collected and entered into the computer in any order.
    b. randomization eliminates the impact of any confounding variables.
    c. randomization is a good way to create two groups of 30 families that are as similar as possible, so that comparisons can be made between the two groups.
    d. randomization ensures that the study is double-blind.
    e. randomization reduces the impact of outliers.

30. To test the effect of music on productivity, a group of assembly line workers are given portable mp3 players to play whatever music they choose while working for one month. For another month, they work without music. The order of the two treatments for each worker is determined randomly. This is

    a. an observational study.
    b. a matched pairs experiment
    c. a completely randomized experiment.
    d. a block design, but not a matched pairs experiment.
    e. impossible to classify unless more details of the study are provided.

31. A nutritionist wants to study the effect of storage time (6, 12, and 18 months) on the amount of vitamin C present in freeze dried fruit when stored for these lengths of time. Six fruit packs were randomly assigned to each of the three storage times. The treatment, experimental unit, and response are respectively:

    a. A specific storage time, amount of vitamin C, a fruit pack
    b. A fruit pack, amount of vitamin C, a specific storage time
    c. Random assignment, a fruit pack, amount of vitamin C
    d. A specific storage time, a fruit pack, amount of vitamin C
    e. A specific storage time, six fruit packs, amount of vitamin C

32. A researcher observes that, on average, the number of divorces in cities with Major League Baseball teams is larger than in cities without Major League Baseball teams. Which of the following is the most plausible explanation for this observed association?

    a. The presence of a Major League Baseball team causes the number of divorces to rise (perhaps husbands are spending too much time at the ballpark).
    b. The high number of divorces is responsible for the presence of Major League Baseball teams (more single men means potentially more fans at the ballpark, making it attractive for an owner to relocate to such cities).
    c. The association is due to confounding (Major League teams tend to be in large cities with more people, hence a greater number of divorces).
    d. The association makes no sense, since many married couples go to the ballpark together.
    e. The association is purely coincidental. It is implausible to believe the observed association could be anything other than accidental.

33. Control groups are used in experiments in order to accomplish which one of the following?

a. Limit the effects of variables other than the explanatory variable on the outcome.
b. Control the subjects of a study to ensure that all participate equally.
c. Guarantee that someone other than the investigators, who have a vested interest in the outcome, controls how the experiment is conducted.
d. Achieve a proper and uniform level of randomization.
e. Reduce variability in results

34. The probability that you will be ticketed for illegal parking on campus is about 1/3. During the last nine days, you have illegally parked every day and have NOT been ticketed (you lucky person!). Today, on the 10th day, you again decide to park illegally. Assuming the outcomes are independent from day to day, the probability that you will be caught is

a. $\frac{1}{3}$
b. $\frac{1}{3} + \left(\frac{1}{3}\right)^9$
c. $\frac{1}{3} - \left(\frac{1}{3}\right)^9$
d. $\frac{1}{10}$
e. $\frac{9}{10}$

Use the following for problems 35 – 37. The two-way table below gives information on seniors and juniors at a high school and by which means they typically get to school.

	Car	Bus	Walk	Totals
Juniors	146	106	48	300
Seniors	146	64	40	250
Totals	292	170	88	550

35. You select one student from this group at random. What is the probability that this student typically takes a bus to school?

a. 0.256
b. 0.309
c. 0.353
d. 0.455
e. 0.604

36. You select one student from this group at random. If the student says he is a junior, what is the probability that he walks to school?

a. 0.073
b. 0.160
c. 0.455
d. 0.600
e. 0.833

37. You select one student from this group at random. Which of the following statement is true about the events "Typically walks to school" and "Junior?"

a. The events are mutually exclusive and independent.
b. The events are not mutually exclusive but they are independent.
c. The events are mutually exclusive, but they are not independent.
d. The events are not mutually exclusive, nor are they independent.
e. The events are independent, but we do not have enough information to determine if they are mutually exclusive.

38. Of people who died in the United States in a recent year, 86% were white, 12% were black, and 2% were Asian. (We will ignore the small number of deaths among other races.) Diabetes caused 2.8% of deaths among whites, 4.4% among blacks, and 3.5% among Asians. The probability that a randomly chosen death was due to diabetes is about

a. 0.96
b. 0.107
c. 0.042
d. 0.038
e. 0.030

39. In your top dresser drawer are 6 blue socks and 10 grey socks, unpaired and mixed up. One dark morning you pull two socks from the drawer (without replacement, of course!). What is the probability that the two socks match?

a. 0.075
b. 0.375
c. 0.450
d. 0.500
e. 0.550

40. A marketing survey compiled data on the total number of televisions in households. If X = the number of televisions in a randomly-selected household, and we omit the rare cases of more than 5 televisions, then X has the following distribution:

X	0	1	2	3	4	5
P(X)	0.24	0.37	0.20	0.11	0.05	0.03

What is the probability that a randomly chosen household has at least two televisions?

a. 0.19
b. 0.20
c. 0.29
d. 0.39
e. 0.61

41. A business evaluates a proposed venture as follows. It stands to make a profit of $10,000 with probability 3/20, to make a profit of $5000 with probability 9/20, to break even with probability 5/20, and to lose $5000 with probability 3/20. The expected profit in dollars is

a. 1500
b. 0
c. 3000
d. 3250
e. -1500

42. X and Y are independent random variables, and *a* and *b* are constants. Which one of the following statements is true?

a. $\sigma_{X+Y} = \sigma_X + \sigma_Y$
b. $Var(X - Y) = Var(X) + Var(Y)$
c. $Var(a + bX) = bVar(X)$
d. $\sigma_{X-Y} = \sigma_X - \sigma_Y$
e. $Var(X + Y) = \sqrt{Var(X^2) + Var(Y^2)}$

43. Let the random variable *X* represent the profit made on a randomly selected day by a certain store. Assume that *X* is Normal with mean \$360 and standard deviation \$50. What is $P(X > \$400)$?

a. 0.2199
b. 0.2881
c. 0.5319
d. 0.7881
e. 0.8450

44. In a large population of college students, 20% of the students have experienced feelings of math anxiety. If you take a random sample of 10 students from this population, the mean and standard deviation of the number of students in the sample who have experienced math anxiety is:

a. m= 1.6; s= 1.414
b. m= 1.6; s= 1.265
c. m=2; s=1.6
d. m=2; s=1.1414
e. m=2; s=1.265

45. Jen's commute to work requires that she take the Blue subway line, then transfer to the Red line. The length of the trip on the Blue line has a mean of 18 minutes with a standard deviation of 2 minutes. The Red line trip takes 12 minutes with a standard deviation of 1 minute. The waiting time between when she gets off the Blue line and her Red line train arrives has mean of 10 minutes and a standard deviation of 5 minutes. Assume (perhaps unrealistically) that these times are independent random variables. What are the mean and standard deviation of her entire commute?

a. Mean = 40 minutes; Standard deviation = 8 minutes
b. Mean = 40 minutes; Standard deviation = 5.48 minutes
c. Mean = 40 minutes; Standard deviation = 2.83 minutes
d. Mean = 30 minutes; Standard deviation = 5.48 minutes
e. Mean = 30 minutes; Standard deviation = 8 minutes

46. Following a recent dramatic drop of 500 points in the Dow Jones Industrial Average, a poll conducted for the Associated Press found that 92% of those polled said that a year from now their family financial situation will be as good as it is today or better. Which of the following terms describes the number 92%?

a. statistic
b. sample
c. sample parameter
d. population parameter
e. population

47. What is distribution of values taken by a statistic in all possible samples of the same size from the same population called?

a. the probability that the statistic is obtained.
b. the population parameter.
c. the variance of the values.
d. the sampling distribution of the statistic
e. the distribution of sample data.

48. If a statistic used to estimate a parameter is such that the mean of its sampling distribution is equal to the true value of the parameter being estimated, what is the statistic said to be?

a. random
b. biased
c. a proportion
d. unbiased
e. non-varying.

49. Suppose you take a random sample of size 25 from a population with mean of 120 and a standard deviation of 15. Your sample has a mean of 115 and a standard deviation of 13.8. Which of the following has a mean of 120 and a standard deviation of 3?

a. the distribution of the population
b. the distribution of the sample data.
c. the sampling distribution of the sample mean.
d. the sampling distribution of the population mean.
e. No important distribution related to this situation has the given mean and standard deviatior

50. The central limit theorem refers to which of the following characteristic of the sampling distribution of the sample mean?

a. Regardless of the shape of the population's distribution, the sampling distribution of the sample mean from sufficiently large samples will be approximately Normally distributed
b. Regardless of the shape of the population's distribution, the standard deviation of the sampling distribution of the sample mean from sufficiently large samples will be $\frac{\sigma}{\sqrt{n}}$.
c. Regardless of the shape of the population's distribution, the mean of the sampling distribution of the sample mean from sufficiently large samples will be equal to the mean of the population
d. As you take larger and larger samples from a Normally distributed population, the standard deviation of the sampling distribution of the sample mean gets smaller and smaller
e. As you take larger and larger samples from a Normally distributed population, the mean of the sampling distribution of the sample mean gets closer and closer to the population mean

51. In an opinion poll, 25% of a random sample of 200 people said that they were strongly opposed to having a state lottery. The standard error of the sample proportion is approximately

a. 0.0094
b. 0.0305
c. 0.0353
d. 0.2500
e. 6.1237

52. The report of a sample survey of 1,014 adults says, "With 95% confidence, between 9% and 15% of all Americans expect to spend more money on gifts this year than last year." What does the phrase "95% confidence" mean?

a. 95% of all Americans will spend between 9% and 15% more than what they spent last year.
b. 9% to 15% of all Americans will spend 95% of what they spent last year.
c. there is a 95% chance that the percent who expect to spend more is between 9% and 15%.
d. the method used to get the interval from 9% to 15%, when used over and over, produces intervals which include the true population percentage about 95% of the time.
e. we can be 95% confident that the method used to get the interval always gives the right answer.

53. Some scientists believe that a new drug would benefit about half of all people with a certain blood disorder. To estimate the proportion of patients who would benefit from taking the drug, the scientists will administer it to a random sample of patients who have the blood disorder. What sample size is needed so that the 95% confidence interval will have a margin of error of no more than 3%?

a. 748
b. 1068
c. 1503
d. 2056
e. 2401

54. You want to calculate a 98% confidence interval for a population mean from a sample of $n = 18$. What is the appropriate critical t^*?

a. 2.110
b. 2.326
c. 2.539
d. 2.552
e. 2.567

55. The heights (in inches) of males in the United States are believed to be approximately Normally distributed with mean μ. The mean height of a random sample of 25 American adult males is found to be $\bar{x} = 69.72$ inches and the standard deviation $s = 4.15$. What is the standard error of $\bar{x}$?

a. 0.17
b. 0.69
c. 0.83
d. 1.856
e. 2.04

56. In a test of H_0: $p = 0.7$ against H_a: $p \neq 0.7$, a sample of size 80 produces $z = 0.8$ for the value of the test statistic. Which of the following is closest to the P-value of the test?

a. 0.2090
b. 0.2119
c. 0.4238
d. 0.4681
e. 0.7881

57. An opinion poll asks a simple random sample of 100 college seniors how they view their job prospects. In all, 53 say "good." Does the poll give convincing evidence to conclude that more than half of all seniors think their job prospects are good? If p = the proportion of all college seniors who say their job prospects are good, what are the hypotheses for a test to answer this question?

a. H_0: $p = 0.5$, H_a: $p > 0.5$.
b. H_0: $p > 0.5$, H_a: $p = 0.5$
c. H_0: $p = 0.5$, H_a: $p \neq 0.5$.
d. H_0: $p = 0.5$, H_a: $p < 0.5$.
e. H_0: $p \neq 0.5$, H_a: $p > 0.5$.

58. In a test of H_0: $\mu = 100$ against H_a: $\mu \neq 100$, a sample of size 10 produces a sample mean of 103 and a P-value of 0.08. Which of the following is true at the 0.05 level of significance?

a. There is sufficient evidence to conclude that $\mu \neq 100$.
b. There is sufficient evidence to conclude that $\mu = 100$.
c. There is insufficient evidence to conclude that $\mu = 100$.
d. There is insufficient evidence to conclude that $\mu \neq 100$.
e. There is sufficient evidence to conclude that $\mu > 103$.

59. Which of the following is *not* a required condition for performing a t-test about an unknown population mean μ?

a. The data can be viewed as a simple random sample from the population of interest.
b. The population standard deviation σ is known.
c. The population distribution is Normal or the sample size is large (say $n > 30$).
d. The data represent n independent observations
e. All four of the above are required conditions.

60. The infamous psychologist, Dr. Visegrips, claims that his secret sleep tapes cause people to become better at basic algebra "All you have to do," the doctor explains, "is listen to my tapes while you sleep at night, and you'll be better at algebra in two months" A math teacher at a local high school has expressed interest but demands evidence. Five people are randomly selected from students at the school. They take an algebra skills test, listen to Dr. Visegrips' tape for two months while they sleep, and then take a second test. The test scores are as follows:

	Test scores				
Person	A	B	C	D	E
Pre-test	68	69	74	71	65
Post-test	70	68	75	72	68

Which of the following conditions must be met in order to use a t-procedure on these paired data?

a. The distribution of both pre-test scores and post-test scores must be approximately Normal.
b. The distribution of pre-test scores and the distribution of differences (after – before) must be approximately Normal.
c. Only the distribution of pre-test scores must be approximately Normal.
d. Only the distribution of differences (after – before) must be approximately Normal.
e. All three distributions—before, after, and the difference—must be approximately Normal.

61. Bags of a certain brand of tortilla chips claim to have a net weight of 14 ounces. Net weights actually vary slightly from bag to bag and are Normally distributed with mean μ. A representative of a consumer advocacy group wishes to see if there is any evidence that the mean net weight is less than advertised and so intends to test the hypotheses

$$H_0 : \mu = 14 \qquad H_a : \mu < 14$$

A Type I error in this situation would mean

a. concluding that the bags are being underfilled when they actually aren't.
b. concluding that the bags are being underfilled when they actually are.
c. concluding that the bags are not being underfilled when they actually are.
d. concluding that the bags are not being underfilled when they actually aren't.
e. none of these

62. A city planner is comparing traffic patterns at two different intersections. He randomly selects 12 times between 6 am and 10 pm, and he and his assistant count the number of cars passing through each intersection during the 10-minute interval that begins at that time. He plans to test the hypothesis that the mean difference in the number of cars passing through the two intersections during each of those 12 times intervals is 0. Which of the following is the appropriate test of the city planner's hypothesis?

a. Two-proportion *z*-test
b. Two-sample *z*-test
c. Matched pairs *t*-test
d. Two proportion *t*-test
e. Two-sample *t*-test

Janice and her cousin Linda are a little competitive about the relative merits of their home towns. One contest they had was to determine who had more rainy days. They found weather records on the internet and each of them randomly selected 60 days from the past 5 years. Janice found that there had been measurable rainfall on 17 of the 60 days she selected for Asheville, and Linda found that there had been measurable rainfall on 12 of the 60 days she selected for Lincoln. They intend to perform a test of significance on their data, using the hypotheses $H_0: p_A - p_L = 0$ *verses* $H_a: p_A - p_L \neq 0$ and the 0.05 significance level.

63. When calculating the test statistic, what expression would they use to estimate the standard deviation of the sampling distribution of the difference in proportions, $\hat{p}_A - \hat{p}_L$?

a. $\sqrt{\frac{12^2}{60} + \frac{17^2}{60}}$

b. $\sqrt{\frac{12}{\sqrt{60}} + \frac{17}{\sqrt{60}}}$

c. $\sqrt{\frac{(0.28)(0.72)}{60} + \frac{(0.2)(0.8)}{60}}$

d. $\sqrt{\frac{(0.24)(0.76)}{60} + \frac{(0.24)(0.76)}{60}}$

e. $\sqrt{\frac{(0.28)(0.72)}{60}} + \sqrt{\frac{(0.2)(0.8)}{60}}$

64. Janice and Linda's test statistic is 1.07. Which of the following is closest to the appropriate *P*-value for the test?
   a. 0.0446
   b. 0.0892
   c. 0.1423
   d. 0.1449
   e. 0.2846

65. Which of the following best describes what it would mean if Janice and Linda's test resulted in a Type I error?
   a. Concluding that there is a difference in the proportion of rainy days in the two cities when there is no difference.
   b. Concluding that there is no difference in the proportion of rainy days in the two cities when there is a difference.
   c. Choosing the wrong test procedure, such as using a *z*-test instead of a *t*-test.
   d. Accepting the alternative hypothesis instead of rejecting the null hypothesis.
   e. Accepting the null hypothesis instead of rejecting the alternative hypothesis