

Name _____

There are five possible responses to each of the following multiple choice questions. There is only one “BEST” answer. Be sure to read all possible choices before selecting your answer. You may mark on this examination. You can use a calculator but a calculator manual cannot be used.

Stat Comp

CONFIDENCE LEVEL	90%	95%	99%
z^*	1.645	1.96	2.576

1. Which of these questions from a class survey produced variables that are categorical?
- i. What gender do you identify with?
 - ii. Do you agree with ETSU faculty and staff being able to carry concealed weapons on campus? (Agree or Disagree)
 - iii. How many schools have you attended (including elementary, middle school, high school, trade school, college, etc...)?
 - iv. If a student is caught on campus with marijuana, how much should that student be fined? (Enter in \$0.00 format)
 - v. How many U.S. states have you visited?
- (A) i (B) iii (C) i, ii (D) iii, iv, v (E) i, ii, iii, iv, v

2. A class survey asked “How many U.S. states have you visited?” The table below represents the responses of 959 students.

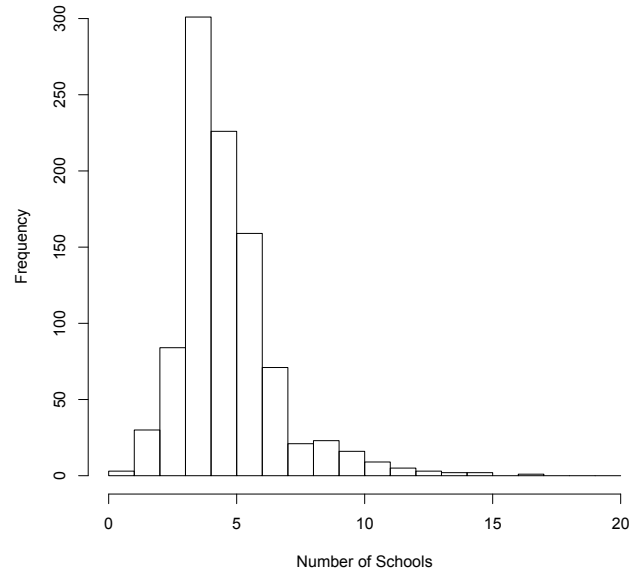
Number of U.S. states visited	1	2	3	4	5	6	7	8	9	10	11	12	13 or more
Number of Students	4	8	13	37	62	68	87	63	62	121	36	77	321

Estimate the median number of different states that the 959 students have visited.

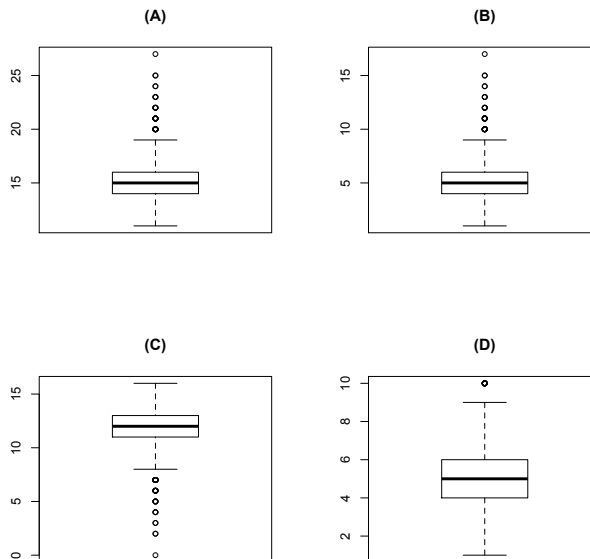
- (A) 7 (B) 10 (C) 50% (D) 121 (E) 479.5
3. The scores of a hard test range from 0 to 100. There are many scores below 50, some scores ranging from 50 to 80, and a few scores above 80. The distribution of test scores will be
- (A) roughly normal. (C) skewed to the right.
- (B) correlated to age of the student. (D) skewed to the left.
- (E) roughly symmetric.

Use the following for the next 2 questions. A class survey asked “How many schools have you attended (including elementary, middle school, high school, trade school, college, etc.)?” The figure below represents the responses of 957 students.

Histogram of the number of schools attended



4. Which of the following best describes this distribution? This distribution is
- (A) multi-peaked with the bulk of data from 3 to 7.
 - (B) symmetric around 3, very little variation, and many outliers.
 - (C) slightly right-skewed, with the center around 5 schools and spread from 0 to 17 schools, with possible outlier(s).
 - (D) left-skewed with outliers.
 - (E) evenly-spaced from 0 to 17.
5. Which of the following boxplots corresponds to the above histogram?



6. Which of the following is FALSE when interpreting the standard deviation?
- (A) The smallest possible value for the standard deviation is 0, and that happens only in contrived situations where every single number in the data set is exactly the same (no deviation).
 - (B) The standard deviation has the same units as the original data.
 - (C) The standard deviation measures how concentrated the data are around the mean; the more concentrated, the smaller the standard deviation.
 - (D) The standard deviation can never be a negative number, due to the way its calculated and the fact that it measures a distance (distances are never negative numbers).
 - (E) The standard deviation is not affected by outliers (extremely low or extremely high numbers in the data set). That's because the standard deviation is based on the distance from the median. And remember, the median is not affected by outliers.
7. The following data represent scores (out of 100 points) of 50 students in a math test.

51	53	56	57	57	58	59	61	61	61	64	65	65	65	66
67	68	68	68	69	70	71	72	72	72	72	72	73	73	74
74	74	74	75	75	76	76	77	78	79	80	81	81	82	83
84	84	87	90	93										

Which of the following best describes the distribution of the math test scores?

- (A) The scores are evenly spaced from 51 to 93.
- (B) The distribution is single-peaked, right skewed, and has possible outliers.
- (C) The distribution of test scores is fairly symmetric about 72.
- (D) The distribution is single-peaked, left skewed, and has possible outliers.
- (E) The distribution is multimodal with no outliers. There are many centers and the variability in the scores is quite small.

8. In a study of exercise, a large group of male runners walk on a treadmill for 6 minutes. Their heart rates in beats per minute at end vary from runner to runner according to the Normal distribution with mean 130 and standard deviation 17. What percent of the runners have heart rates below 147? (Hint: Use the 68 – 95 – 99.7 rule.)
(A) 5% (B) 16% (C) 32% (D) 68% (E) 84%
9. A tire manufacturer states that the tread life of its tires can be described by a Normal model with a mean of 32,000 miles and standard deviation of 2500 miles. In planning a marketing strategy, a local tire dealer wants to offer a refund to any customer whose tires fail to last a certain number of miles. However, the dealer does not want to take too big a risk. If the dealer is willing to give refunds to no more than 1 of every 20 customers, for what mileage can he guarantee these tires to last?
(A) 27,100 miles (B) 27,888 miles (C) 36,112 miles (D) 36,900 miles (E) 37,816 miles

Use the following for the next 5 questions. Suppose you were to collect data for each pair of variables listed in I-V.

- I: The number of hours a plane is in flight and the number of miles flown.
- II: The number of hours in flight of a plane and the gallons of fuel remaining.
- III: The shoe size and grade point average of college freshmen.
- IV: The age and grip strength of adults.
- V: The weight of apples in grams and ounces.

10. Which of the following is the most effective display to show the relationship between each pair of variables listed in I-V?
(A) side-by-side boxplots (B) stem and leaf plots (C) scatterplot (D) histograms (E) bar charts
11. Which of the data sets would you expect to see a positive association?
(A) I (B) III (C) IV (D) I,V (E) II, IV
12. Which of the data sets would you expect to see a negative association?
(A) I (B) II (C) V (D) III, V (E) II, IV
13. Which of the data sets would you expect to see very little relationship or no association?
(A) I (B) II (C) III (D) IV (E) V
14. Which of the data sets would you expect to see a perfect positive linear association?
(A) I (B) II (C) III (D) IV (E) V

15. A serious study found that people with two cars live longer than people who own one car. Owning three cars is even better, and so on. There is a substantial positive correlation between number of cars x and length of life y . Does having more cars make you live longer?
- (A) No, a negative correlation would allow that conclusion, but this correlation is positive.
 - (B) No. The study used number of cars as a quick indicator of affluence. Well-off people tend to have more cars. They also tend to live longer, probably because they are better educated, take better care of themselves, and get better medical care.
 - (C) No, this is reverse cause-and-effect. People who live longer would obviously have more cars.
 - (D) Yes, the data show that having more cars must be causing longer life since there is a substantial positive correlation. If the correlation was negative then life would have been shorter.
 - (E) Yes, the correlation can't be just by an accident. It is substantial and positive.
16. How does drinking beer affect the level of alcohol in our blood? The legal limit for driving in all states is 0.08%. Student volunteers at a university drank different numbers of cans of beer. Thirty minutes later, a police officer measured their blood alcohol content. The explanatory variable would be the _____.
- (A) percent alcohol in the blood
 - (B) student volunteers
 - (C) police officer
 - (D) number of beers
 - (E) thirty minutes
17. A radio talk show host with a large audience is interested in the proportion p of adults in his listening area who think the drinking age should be lowered to eighteen. To find this out, he poses the following questions to his listeners, "Do you think that the drinking age should be reduced to eighteen in light of the fact that eighteen-year-olds are eligible for military service?" He asks listeners to phone in and vote "yes" if they agree the drinking age should be lowered and "no" if not. Of the 100 people who phoned in, 70 answered "yes." Which of the following assumptions for inference about a proportion using a confidence interval are violated?
- (A) The data are an SRS from the population of interest.
 - (B) The population is at least ten times as large as the sample.
 - (C) n is so large that both the count of successes $n\hat{p}$ and the count of failures $n(1 - \hat{p})$ are fifteen or more.
 - (D) There appear to be no violations.
 - (E) All the assumptions are violated.
18. An advertising firm, interested in determining how much to emphasize television advertising in a certain county decides to conduct a sample survey to estimate the average number of hours each week that households within that county watch television. The county has two towns, A and B, and a rural area C. Town A is built around a factory and most households contain factory workers with school-aged children. Town B contains mainly retirees and the rural area C are mainly farmers. There are 155 households in town A, 62 in town B and 93 in the rural area, C. The firm decides to select 20 households from Town A, 8 households from Town B and 12 households from the rural area. This is an example of
- (A) a multistage random sample.
 - (B) a stratified random sample.
 - (C) an observational sample.
 - (D) a simple random sample.
 - (E) an experiment.

Use the following for the next 2 questions. A can of Coke displays the statement “12 FL OZ.” It was found that the contents of Coke follows the Normal distribution with a standard deviation of $\sigma = 2.0$ ounce. Let μ denote the mean amount of Coke in all cans. People who drink Coke would probably feel cheated if it turned out that the mean amount of Coke in all cans is less than the claimed value. Suppose that we sample 4 cans of coke and find the sample mean is $\bar{x} = 11$ ounces.

19. The hypotheses of interest are
- (A) $H_0 : \mu = 12$ vs. $H_a : \mu < 12$ (C) $H_0 : \mu = 12$ vs. $H_a : \mu > 12$
- (B) $H_0 : \mu = 11$ vs. $H_a : \mu < 11$ (D) $H_0 : \bar{x} = 11$ vs. $H_a : \bar{x} < 11$
- (E) $H_0 : z = -1$ vs. $H_a : z < -1$
20. You use software to carry out a test of significance. The program tells you that the P-value is $P = 0.16$. Although the results
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- (A) are not statistically significant at $\alpha = 0.05$, the explanation is that P-value was computed incorrectly.
- (B) are statistically significant at $\alpha = 0.05$, the explanation is that the sample size is small and it isn't surprising to find the results to be statistically significant.
- (C) are statistically significant at $\alpha = 0.05$, the explanation is that P-value was computed incorrectly.
- (D) are not statistically significant at $\alpha = 0.05$, the explanation is that the sample size is small and it isn't surprising to find the results to be not statistically significant.
- (E) are not of practical significance they are statistically significant at $\alpha = 0.05$.
21. Studies have shown that walnuts can reduce blood cholesterol. Walnuts are rich in polyunsaturated fatty acids, and they also help keep blood vessels healthy and elastic. Almonds appear to have a similar effect, resulting in a marked improvement within just four weeks. A statistical test is more likely to find a significant decrease in blood cholesterol if
- (A) it is based on a very small random sample. (C) the p-value is large.
- (B) it is based on a very large random sample. (D) the test of hypotheses is not rejected.
- (E) the size of the sample doesn't have any effect on the significance of the test.
22. An anthropologist suspects that color blindness is less common in societies that live by hunting and gathering than in settled agricultural societies. He tests a number of adults in two populations in Africa, one of each type. The proportion of color-blind people is significantly lower $P - value < 0.05$ in the hunter-gatherer population. What additional information would you want to help decide whether you accept the claim about color blindness?
- (A) What was the proportion of color-blind people in the hunter-gatherer population?
- (B) Was this a double-blind study?
- (C) Were these random samples and how big were the samples?
- (D) What is the Who, What, Where?
- (E) What does the side-by-side boxplots look like and were the samples normally distributed?
23. Which of the following questions does a test of significance answer?
- (A) Is the sample or experiment properly designed? (C) Is the observed effect important?
- (B) Is the null hypothesis true? (D) Is it based on a very small random sample?
- (E) Is the observed effect due to chance?

Use the following for the next 2 questions. A large representative random sample of 6906 U.S. adults collected over 20 years showed that “parents reported higher levels of life satisfaction than non-parents,” with the observed difference in life satisfaction between the two groups being statistically significant.

24. This is an example of
- (A) a matched pairs experiments.
 - (B) a block design.
 - (C) an observational study.
 - (D) a simple random sample.
 - (E) a randomized comparative experiment.
25. In this study, we can conclude
- (A) having children leads to higher levels of life satisfaction. We can reach this conclusion because we have a representative sample.
 - (B) having children leads to higher levels of life satisfaction. We can reach this conclusion because we have both a large and a representative sample.
 - (C) having children leads to higher levels of life satisfaction. We can reach this conclusion because this was an experiment.
 - (D) parents tend to have higher satisfaction in their lives than non-parents. Because this was a survey, we cannot make conclusions about cause-and-effect.
 - (E) that a practical significance exists also. We can reach this conclusion because the result was statistically significant.
26. The weather reporter predicts that there is a 90% chance of rain tomorrow for a certain region. What is meant by this phrase?
- (A) It will rain 90% of the day tomorrow.
 - (B) Rain occurs 90% of the time in this region.
 - (C) 90% of the time it rains on this date.
 - (D) In circumstances “like this,” rain occurs 90% of the time.
 - (E) The occurrence of rain is “truly random” and will occur 90% of the time.
27. To make a 500-piece jigsaw puzzle more challenging, a puzzle company includes 10 extra pieces in the box along with the 500 pieces, and those 10 extra pieces do not fit anywhere in the puzzle. If you buy such a puzzle box, break the seal on the box, and immediately select 1 piece at random, what is the probability that it will be 1 of the extra pieces?
- (A) $1/510$ (B) $1/500$ (C) $10/500$ (D) $10/510$ (E) $1/10$
28. The ACT is an exam used by colleges and universities to evaluate undergraduate applicants. In a recent year, the mean test score was 20.8 and the standard deviation was 4.8. Suppose 100 students from this population are randomly selected. The distribution of the sample mean ACT score is
- (A) approximately Normal, mean 20.8, standard deviation 0.048.
 - (B) approximately Normal, mean 20.8, standard deviation 4.8.
 - (C) approximately Normal, mean 20.8, standard deviation 0.48.
 - (D) approximately Normal, mean equal to the observed value of the sample mean, standard deviation 4.8.
 - (E) Cannot determine based on the information provided.

29. A political poll of Americans was conducted to investigate their opinions on gun control. Each person was asked if they were in favor of gun control or not in favor of gun control - no respondents were removed from the results. The survey found that 25% of people contacted were not in favor of gun control laws. These results were accurate to within 3 percentage points, with 95% confidence. Which of these conclusions is correct?
- (A) Between 22% and 28% of all Americans are not in favor of gun control laws.
 - (B) 95% of all random samples of Americans will show that 25% of people are not in favor of gun control laws.
 - (C) We are 95% confident that the true percent of Americans that are not in favor of gun control is between 22% and 28%.
 - (D) 95% of the polls, between 22% and 28% of the people are not in favor of gun control laws.
 - (E) We are 95% sure that between 22% and 28% of the people who were contacted are not in favor of gun control laws.
30. When we conduct a hypothesis test, we assume something is true and calculate the probability of observing the sample data under this assumption. What do we assume is true?
- (A) Null hypothesis
 - (B) P-value
 - (C) Alpha
 - (D) Alternative hypothesis
 - (E) \bar{X} and σ