Math 1530 Final Exam
April 26, 2008

Name _____
Section # _____
Instructor _____

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 should use a calculator, but it is not required. A calculator manual cannot be used. A binomial table and a confidence level table are on the last page of this exam.

FORM A

1. An investigator has a computer file showing family incomes for 1,000 subjects in a certain study. These range from $5,800 a year to $98,600 a year. By accident, the highest income in the file gets changed to $986,000. Which of the following is correct?

   (A) The mean, median, standard deviation and the IQR will all be affected.

   (B) The mean, median, standard deviation and IQR will not be affected.

   (C) The median and IQR will increase but the mean and standard deviation will not be affected.

   (D) The mean and standard deviation will increase but the median and the IQR will not be affected.

   (E) The five-number summary will not be affected.

2. The Educational Testing Service reported that the mean Graduate Record Exam (GRE) for all individuals who have taken the exam was 529. A student with a GRE score of 600 wants to know her relative standing in relation to the mean GRE. A numerical summary that would be useful for this purpose is the

   (A) median. (C) number of individuals that took the exam.

   (B) interquartile range. (D) standard deviation.

   (E) correlation coefficient.

   Use the following for the next 3 questions. Environmental Protection Agency fuel economy estimates for automobile models tested predicted a mean of 24.8 miles per gallon (mpg) and a standard deviation of 6.2 mpg for highway driving. Assume that mpg can be approximated by the Normal distribution.

3. About what percent of autos should get more than 31 mpg?

   (A) 16% (B) 32% (C) 84% (D) 68% (E) 50%

4. About what percent of autos should get between 18.6 and 31 mpg?

   (A) 95% (B) 32% (C) 50% (D) 68% (E) 99.7%

5. Describe gas mileage of the worst 2.5% of all cars.

   (A) above 37.2 mpg (C) less than 18.6 mpg

   (B) less than 12.4 mpg (D) between 12.4 and 37.2 mpg

   (E) less than 6.2 mpg

6. The following data (sorted) are sales of the Palm M515 PDA auctioned on eBay. The prices (in dollars) at which the items sold are

178	199	200	210	210	225	225	225	225	228	232	235
240	240	240	245	246	246	246	249	250	250	250	255

   Which of the following best describes the distribution of sales of the Palm M515 PDA?

   (A) double peaked (C) strongly skewed left, bimodal with a possible outlier

   (B) 255 is an outlier (D) roughly symmetric

   (E) 5-number summary with an outlier

7. Joe DeMaggio played center field for the Yankees for 13 years. Here is the number of home runs hit by DiMaggio each of those years: 29, 46, 32, 30, 31, 30, 21, 25, 20, 39, 14, 32, 12. The approximate mean, median, and standard deviation, in that order, of DiMaggio's number of home runs per year are

   (A) 28, 30, and 9. (B) 30, 28, and 9. (C) 21, 30, and 32. (D) 28, 9, and 89. (E) 28, 30, and 89.

8. In general, which of the following is **not true** about the sample standard deviation s?

   (A) s is always less than or equal to zero.

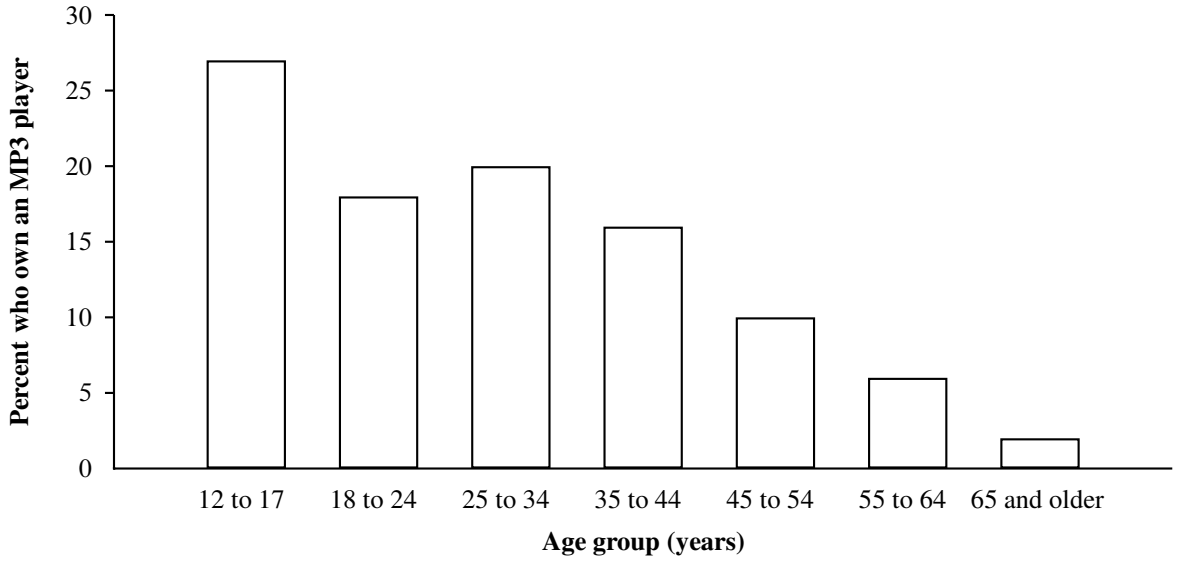
   (B) s is always greater than or equal to zero.

   (C) s is equal to zero only when all the observations are identical.

   (D) s is not resistant to outliers

   (E) s is the square root of the sample variance

   Use the following for the next 2 questions. Portable MP3 music players, such as Apple iPod, are popular–but not equally popular with people of all ages. The following bar graph shows the percents of several age groups who own portable MP3 players.



9. What feature best describes the association between age group and MP3 players?

   (A) The distribution of ages looks skewed right with a center at the 35 to 44 age group.

   (B) The distribution of MP3 players is centered at the 35 to 44 age group.

   (C) MP3 players are popular mainly among young people.

   (D) The distribution is bimodal, skewed right with an outlier at 65 and older.

   (E) The distribution is slightly skewed right, but it is hard to tell without knowing the mean and median.

10. To help you plan advertising for a Web site for downloading MP3 music files, you want to know what percent of owners of portable MP3 players are 18 to 24 years old. Which of the following statements is true?

    (A) Your planning should be based on 18% of 18 to 24 year old owners of MP3s.

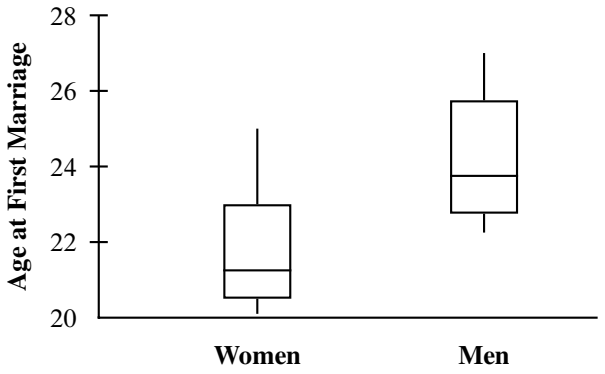
    (B) We need to construct a pie chart of the above data to help us with planning.

    (C) We need to take 18% and divide by the sum of all the above percentages.

    (D) Adding all percentages we get 99% which tells us a lot about MP3 ownership.

    (E) Unable to determine since the data tell us neither the number of people who own MP3 players nor the number of those in that age group.

11. The following boxplots are the ages at first marriage for a sample of U.S. citizens.



Which of the following best describes what these data show?

(A) Women appear to marry about 3 years younger than men, but the two distributions are very similar in shape and spread.

(B) Both distributions are skewed left.

(C) Men and women appear to marry about the same age.

(D) Men appear to marry about 3 years younger than women, but the two distributions are very similar.

(E) Both distributions are skewed to the right since the medians are closer to the first quartiles. Hence, this is an indication that both men and women are marrying at later ages.

12. The population of the United States is aging, though less rapidly than in other developed countries. Here is a stemplot of the percents of residents aged 65 and older in the 50 states, according to the 2000 census. The stems are whole percents and the leaves are tenths of a percent.

5	7
6	
7	
8	5
9	6 7 9
10	6
11	0 2 2 3 3 6 7 7
12	0 0 1 1 1 1 3 4 4 5 7 8 9
13	0 0 0 1 2 2 3 3 3 4 5 5 6 8
14	0 3 4 5 7 9
15	3 6
16	
17	6

The center of the distribution is close to

(A) 12.7% (B) 14.0% (C) 5.7% to 17.6% (D) 138% (E) 11.0%

13. To display the distribution of grades (A, B, C, D, F) in a course, it would be correct to use

(A) a histogram.

(B) a bar graph but not a pie chart.

(C) a pie chart but not a bar graph.

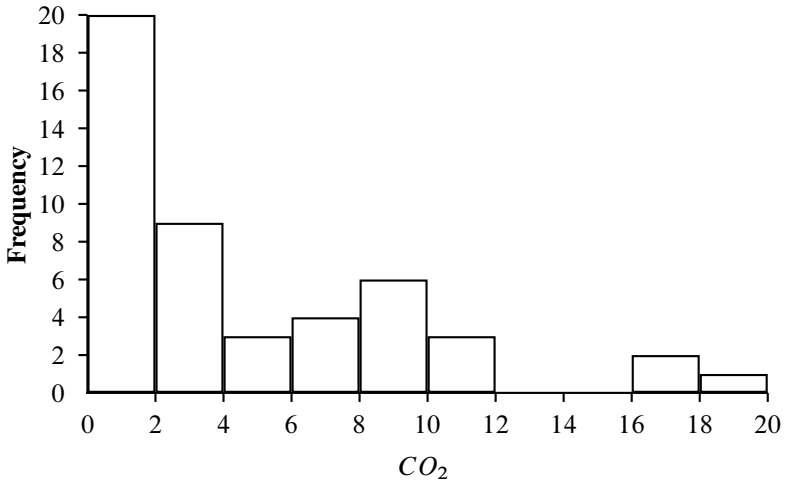
(D) a scatterplot.

(E) either a pie chart or a bar graph.

14. Burning fuels in power plants or motor vehicles emits carbon dioxide (CO_2), which contributes to global warming. The following represents CO_2 emissions per person from countries with populations of at least 20 million.

Descriptive Statistics: CO_2 (metric tons per person)

Variable	N	Mean	Variance	Minimum	Q1	Median	Q3	Maximum
CO_2 emissions	48	4.596	23.253	0	0.750	3.200	7.800	19.900



Which of the following best describes the shape of the distribution of CO_2 emissions?

(A) Somewhat symmetric

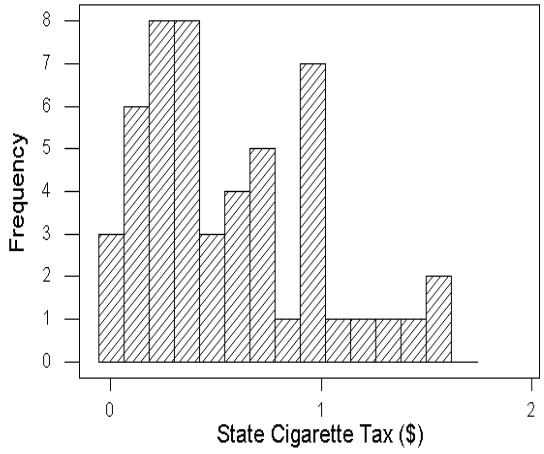
(B) Strongly skewed right

(C) Strongly skewed left

(D) The five-number summary

(E) Mean = 4.596, Median = 3.200, and standard deviation = 2.144

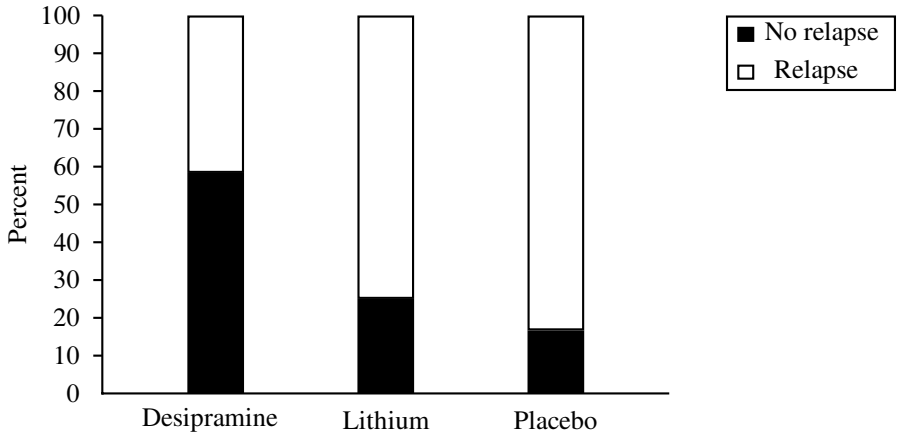
15. In an article printed July 14, 2002, the *Kingsport Times News* reported current rates in cigarette taxes (dollars per pack) for all 50 states and the District of Columbia. A histogram showing the distribution in cigarette tax rate per state is shown below.



What is a plausible value for the median cigarette tax?

(A) \$0.025 (B) \$0.45 (C) \$0.20 (D) \$1.00 (E) \$1.50

16. Cocaine addiction is hard to break. Addicts need cocaine to feel any pleasure, so perhaps giving them an antidepressant drug will help. An experiment assigned 72 chronic cocaine users to take either an antidepressant drug called desipramine, lithium, or a placebo. (Lithium is a standard drug to treat cocaine addiction. A placebo is a dummy drug, used so that the effect of being in the study but not taking any drug can be seen.) One-third of the subjects, chosen at random, received each drug. Here are the results after three years of the three treatments in preventing relapse.



What can this study conclude?

(A) Nearly 60% of the desipramine users did not have a relapse, while 25% of the lithium users and about 17% of those who received placebos succeeded in breaking their addictions. Desipramine seems to be effective.

(B) Nearly 40% of the desipramine users did not have a relapse, while 75% of the lithium users and about 83% of those who received placebos succeeded in breaking their addictions. Desipramine seems to be ineffective.

(C) Nearly 60% of the desipramine users did have a relapse, while 25% of the lithium users and about 17% of those who received placebos did not succeed in breaking their addictions.

(D) There aren't any differences between the treatments since the bars are of equal height.

(E) Treatment and recovery rate are negatively correlated. In other words, as the treatment level decreases so does the percent of the addicts that have no relapse.

17. A survey of the world's nations in 2004 shows a strong positive correlation between percentage of the country using cell phones and life expectancy in years at birth. The observed correlation is most likely due to

(A) cause and effect (cell phones are good for your health).

(B) a mistake, since the correlation must be negative.

(C) "reverse" cause and effect (longer life causes more people to use cell phones).

(D) a large R^2.

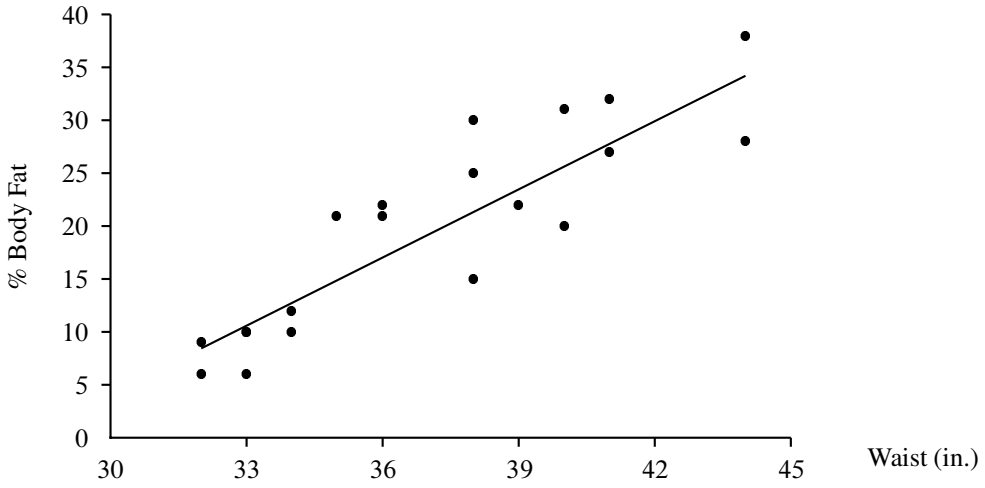
(E) the effect of a lurking variable, such as general economic conditions.

18. In 2002, a Census Bureau survey reported that the mean total earnings that a full-time worker in the United States can expect to earn between ages 25 and 64 is \$1.2 million for those with only a high-school education and \$2.1 million for those with a college degree but no advanced degree. The analysis of the survey revealed that "for every year of college a full-time worker's earnings increases by \$5,600 on the average." Assuming four years of college and a straight-line regression, what is the slope?

(A) \$2.1 million (B) \$.9 million (C) 4 years (D) \$1400 (E) \$5,600

19. It is difficult to determine a person's body fat percentage accurately without immersing him or her in water. Researchers hoping to find ways to make a good estimate immersed 20 male subjects, then measured their waists. The observations and least-squares regression line appear in the scatterplot. The correlation between the two variables is $r = 0.887$ and the least-squares regression line for predicting % Body Fat from Waist (in.) is

$$\texttt{\% Body Fat} = -62.6 + 2.22 \times \texttt{Waist}$$



The estimated % body fat for a male with a waist size of 38 inches is about

(A) 15%. (B) 25%. (C) 22%. (D) 30%. (E) 44%.

20. At Eastern University there are 1200 freshman, 900 sophomores, 1100 juniors, 1000 seniors. The school's vice president of research randomly selects 50 students from each of the four classes and interviews all of the students selected. Identify the type of sampling used in this example.

(A) Cluster sampling (C) Voluntary response

(B) Attempted census (D) Stratified sampling

(E) Simple random sampling

21. Suppose you were to read about a study showing that people who sleep less than five hours a night have twice as much risk of premature death as people who sleep seven or eight hours a night. Can you conclude that sleeping the fewer hours causes a higher risk of premature death?

(A) Yes, because the result was clearly based on a randomized experiment.

(B) The answer depends on whether the research was based on an observational study or a randomized experiment, and it isn't obvious which was used.

(C) The answer depends on the level of significance which was not provided.

(D) No, because the result was clearly based on an observational study.

(E) The answer depends on the P-value which was not provided.

22. Researchers interviewed a group of women with knee pain awaiting knee replacement surgery. They also interviewed a group of women from the same geographical area with no knee pain. These researchers reported that wearing high-heeled shoes caused the knee pain which required surgery. As a savvy consumer of statistics, you conclude that:

(A) Because the study was a valid experiment, the researchers were valid in their claim about high heels causing pain.

(B) The p-value of the test must have been small to conclude a cause and effect outcome.

(C) Because this was only an observational study, the researchers should not make claims that the knee pain was caused by high heels.

(D) The correlation between wearing high-heeled shoes and knee pain must be 1.

(E) This is a classic example of Simpson's Paradox, i.e., the association between high-heeled shoes and knee pain would not hold if the data were combined to form a single group.

23. *Byte* magazine chooses its "best-brand of printer" by looking at responses from readers who mail in a survey printed in the magazine. Identify the type of sampling used in this example.

    (A) simple random sampling (C) stratified random sampling

    (B) systematic sampling (D) voluntary response sampling

    (E) census

24. The National Weather Service has the following model for the random variable X = the number of hurricanes that hit North Carolina in a year:

Number of hurricanes X	0	1	2	3	4	5
Probability	.30	.35	.20	.10	.04	?

    What is the probability that there will be more than three hurricanes in a year?

    (A) 0.04 (B) 0.05 (C) 0.10 (D) 0.95 (E) 0.15

    Use the following for the next 2 questions. The nutritional status of 1000 elementary school children was assessed and recorded as "poor," "adequate," or "excellent." The academic performance for those children was rated as "below average," "average," or "above average." The data are displayed below.

		Nutritional Status			
		Poor	Adequate	Excellent	Totals
Academic Performance	Below Average	70	95	35	200
	Average	130	450	30	610
	Above Average	90	30	70	190
	Totals	290	575	135	1000

25. If you choose a elementary school child at random, what is the probability that the child you choose is below average academically?

    (A) 0.2414 (B) 0.3500 (C) 0.2000 (D) 0.2900 (E) 0.0700

26. What is the probability that a randomly chosen child is below average academically, given that the child chosen had a poor nutritional status?

    (A) 0.3500 (B) 0.2000 (C) 0.2414 (D) 0.2900 (E) 0.0700

27. Vigorous exercise helps people live several years longer (on the average). Whether mild activities like slow walking extend life is not clear. Suppose that the additional life expectancy from regular slow walking is just 2 months. A statistical test is more likely to find a significant increase in mean life if

    (A) it is based on a very small random sample.

    (B) the p-value is large.

    (C) the test of hypotheses is not rejected.

    (D) it is based on a very large random sample.

    (E) The size of the sample doesn't have any effect on the significance of the test.

28. A medical researcher is working on a new treatment for a certain type of cancer. The average survival time after diagnosis on the standard treatment is two years. In an early trial, she tries the new treatment on three subjects who have an average survival time after diagnosis of four years. Although the survival time has doubled, the results are not statistically significant even at the 0.10 significance level. The explanation is

    (A) the placebo effect is present, which limits statistical significance.

    (B) that although the survival time has doubled, in reality the actual increase is really two years.

    (C) the calculation was in error. The researchers forgot to include the sample size.

    (D) the sample size is small.

    (E) that the p-value is smaller than the 0.10 significance level.

Use the following for the next 2 questions. At what age do infants speak their first word of English? Here are the data on 20 children (ages in months):

15	26	10	9	15	20	18	11	8	20
7	9	10	11	11	10	12	17	11	10

In fact, the sample contained one more child, who began to speak at 42 months. Child development experts consider this abnormally late, so it was dropped to get a sample of "normal" children.

Minitab output:

Stem-and-leaf of age $N = 20$
Leaf Unit = 1.0

1	0	7
4	0	899
(8)	1	00001111
8	1	2
7	1	55
5	1	7
4	1	8
3	2	00
1	2	
1	2	6

One-Sample T: age

Test of mu = 12 vs > 12

Variable	N	Mean	StDev	SE Mean	95% Lower Bound	T	P
age	20	13.0000	4.9311	1.1026	11.0934	0.91	0.188

29. Is there good evidence the mean age at first word among all "normal" children is greater than one year?

(A) Yes, there is strong evidence that the mean age at first word is greater than one year.

(B) Since the sample mean is 13 months we should reject the null hypothesis.

(C) There doesn't appear to be enough evidence to suggest the mean age at first word is greater than one year.

(D) Yes, since we are 95% confident that the mean age at first word is at least 11.0934 months.

(E) Yes, since there is only an 18.8% chance that the null hypothesis ($\mu = 12$) is correct.

30. Any reason(s) why we should question the use of the t-procedure?

(A) No, the use of the t-procedure is appropriate when σ is unknown.

(B) Yes, the z-test should have been used instead of the t-test.

(C) No, the above analysis is appropriate to answer the research question since the data are based on a sample of "normal" children.

(D) Yes, the sample size needs to be at least 30 in order to use the t-procedure.

(E) Yes, the use of the t-procedure should be questioned because the stemplot shows that the data are right-skewed with a high outlier. In addition, it is important that the data are an SRS.

31. A Tennessee state senator wants to know what the voters of Tennessee think of proposed legislation regarding an increase in state sales tax. He mails a questionnaire to a simple random sample of 3000 voters in Tennessee. His staff reports that 789 questionnaires have been returned, of which 678 are against the legislation. This is an example of

(A) a survey with little bias because a large SRS was used.

(B) a survey with little bias because it was the voters that elected the senator.

(C) a survey that is representative of the voters thinking.

(D) a survey containing nonresponse.

(E) All of the above.

32. The results of an experiment are said to be statistically significant if

    (A) the observed effect is too large to attribute plausibly to chance.
    (B) the results are important to statisticians, regardless of their importance to the researchers.
    (C) both researchers and statisticians agree that the results are meaningful and important.
    (D) they support the findings of previous, similar studies.
    (E) a null hypothesis has to be accepted.

33. In order to select a sample of voters in Tennessee, I select a simple random sample of 10 of the 95 counties in the state. From each of the selected counties I choose a simple random sample of registered voters. This resulting sample would be classified as a

    (A) simple random sample. (C) systematic sample.
    (B) stratified sample. (D) multistage sample.
    (E) convenience sample.

34. A radio talk show host in Chicago 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 question 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 1000 people who phoned in 700 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 $n\widehat{p}$ and the count of failures $n(1-\widehat{p})$ are ten or more.
    (D) Each observation falls into one of just two categories.
    (E) There appear to be no violations.

Use the following for the next 4 questions. *Time* Magazine wants to know the opinion of adult Americans to the question "If you or your spouse were pregnant, would you want the unborn child tested for genetic defects?" Specifically, they wanted to known what proportion of all adult Americans who would say yes to this question. They conducted a survey and selected a simple random sample of 1600 adult Americans. In the sample, 928 people answered "yes."

35. What is the population of interest in this survey?

    (A) The 1600 adults interviewed
    (B) All adult Americans
    (C) The 928 adults who answered yes to the question.
    (D) The people who conducted the survey.
    (E) The proportion of adults that answered yes in the survey.

36. What is the parameter to be estimated?

    (A) 1600
    (B) The proportion of adult Americans who would want their unborn child tested for genetic defects.
    (C) 0.58
    (D) All adult Americans
    (E) 928

37. Based on the sample collected, what is the estimated value of the parameter?

    (A) 928 (B) 1600 (C) 1.72 (D) Unknown, we need to take a census. (E) 0.58

38. With 95% confidence, estimate the proportion of the adult Americans who would want their unborn child tested for genetic defects.

    (A) 1600 ± 0.9674 (B) 1.72 ± 0.0242 (C) 0.58 ± 2.42 (D) 0.58 ± 0.0242 (E) 928 ± 0.0242

39. Suppose that a statistics class is being given an 8 question multiple choice quiz; there are 4 choices for each question with only 1 correct answer. If I. M. Lucky guesses on each question, what is the probability that he gets at most 4 questions correct?

    (A) 0.97 (B) 0.03 (C) 0.09 (D) 0.50 (E) 0.11

40. A rapid test for the presence in the blood of antibodies to HIV, the virus that causes AIDS, gives a positive result with probability about 0.004 when a person who is free of HIV antibodies is tested. A clinic tests 1000 people who are all free of HIV antibodies. What is the mean number of positive tests?

    (A) 0.004 (B) 4 (C) 996 (D) 1/1000 (E) 40

41. Is caffeine dependence real? A study was conducted with 11 individuals diagnosed as being dependent on caffeine. Each subject was barred from coffee, colas, and other substances containing caffeine. Instead, they took capsules containing their usual caffeine intake. During a different time period they took placebo capsules. It was a blind experiment. Depression was measured after each period using the Beck Depression Inventory. Higher scores show more symptoms of depression. We have a depression score for each individual while using caffeine (Depr Caffeine) and a depression score for each individual while using the placebo (Depr Placebo).

	N	Mean	StDev
Depr Placebo	11	11.3636	7.9028
Depr Caffeine	11	4.0000	3.3764
Difference P-C	11	7.3636	6.9177

The research question is *'Are caffeine dependent people more depressed when they don't use caffeine?'*. Below you see two outputs obtained with the matched pairs t-test.

```
-----------------------------------------------------------------------
output 1) Paired T for Depr Placebo - Depr Caffeine
          T-Test of mean difference = 0 (vs not = 0): T-Value = 3.53  P-Value = 0.005
-----------------------------------------------------------------
output 2) Paired T for Depr Placebo - Depr Caffeine
          T-Test of mean difference = 0 (vs > 0): T-Value = 3.53  P-Value = 0.003
-----------------------------------------------------------------------
```

Which of the outputs would you select and what would your answer be to the research question?

(A) Output 1; caffeine dependents are significantly more depressed on average when they don't take caffeine.

(B) Output 2; caffeine dependents are more depressed on average when they don't take caffeine.

(C) Output 1; we can not conclude that there is a difference in depression level when caffeine dependents don't take caffeine.

(D) Output 2; we can not conclude that depression level is higher on average for caffeine dependents when they don't take caffeine.

(E) Output 2; caffeine dependents are less depressed on average when they don't take caffeine.

42. Coin collecting is a popular hobby but some older coins can be very rare. If you examine the coins carried by ordinary individuals in their pockets or purses you will find that most of the coins have relatively recent dates but occasional coins will be much older. Suppose the variable X is the 'date on individual coins' found in a random person's possession. Which of these descriptions of the distribution of X is likely to be closest to the truth?

(A) skewed to the right with mean date more recent than the median

(B) skewed to the right with median date more recent than the mean

(C) symmetric with mean date less recent than median

(D) symmetric with mean date equal to the median

(E) skewed to the left with mean date less recent than the median

43. The question "Do you think there should be a law that would ban possession of handguns except for the police and other authorized persons? (YES, NO)" was asked to a random sample of 1201 adults from different educational backgrounds. The results appear in the table below. Expected counts are printed below observed counts.

	Handgun Law		
Education level	YES	NO	Total
Less than high school	58 46.94	58 69.06	116
High school graduate	84 86.19	129 126.81	213
Some college	169 187.36	294 275.64	463
College graduate	98 94.29	135 138.71	233
Postgraduate degree	77 71.22	99 104.78	176
Total	486	715	1201

$$Chi - Sq = 8.525, DF = 4, P - Value = 0.074$$

What is the correct conclusion of this analysis? (Use $\alpha = 0.05$.)

(A) The opinion about possession of handguns definitely depends on the educational level of the person, less educated people tend to favor handguns.

(B) We can not arrive at a conclusion because the table has more than two rows.

(C) The results are statistically significant.

(D) The opinion about possession of handguns definitely depends on the educational level of the person.

(E) There is not enough evidence to claim that the opinion about possession of handguns is related to the educational level of the person.

Use the following for the next 2 questions. The accompanying table lists, for a random sample of states, the number of registered automatic weapons (in thousands), along with the murder rate (in murders per 100,000 of population).

Automatic Weapons	11.6	8.3	3.6	0.6	6.9	2.5	2.4	2.6
Murder Rate	13.1	10.6	10.1	4.4	11.5	6.6	3.6	5.3

Descriptive Statistics: Automatic Weapons, Murder Rate

Variable	N	Mean	StDev	Minimum	Q1	Median	Q3	Maximum
Automatic Weapons	8	4.81	3.74	0.60	2.42	3.10	7.95	11.60
Murder Rate	8	8.15	3.60	3.60	4.63	8.35	11.28	13.10

Pearson correlation of Automatic Weapons and Murder Rate = 0.885

44. The association between a state's murder rate and the number of registered automatic weapons is best described as:

(A) weak and negative (C) strong and positive

(B) strong and negative (D) weak and positive

(E) uncorrelated

45. If we are interested in predicting a state's murder rate (y), what is the value of the slope for the equation of least squares regression that uses number of registered automatic weapons per state as the explanatory variable?

(A) 4.05 (B) 0.78 (C) 88.5 (D) 8.15 (E) 0.85

Use the following for the next 4 questions. Students in a large statistics class were randomly divided into two groups. The first group took the midterm exam with soft music playing in the background while the second group took the midterm exam with no music playing. The scores of the two groups on the exam were compared.

46. In this experiment the response variable is

    (A) whether or not music was playing during the exam.
    (B) the placebo.
    (C) the score on the midterm exam.
    (D) the scores of the students on the final exam.
    (E) a lurking variable.

47. The experimental design for this experiment is

    (A) a simple random sample design.
    (B) a completely randomized design.
    (C) a randomized blocks design.
    (D) a matched pairs design.
    (E) an observational study.

48. This experiment was not double-blind because

    (A) the students were allowed to keep their eyes open while taking the exam.
    (B) the exam might have been too long.
    (C) some of the students did not study for the exam.
    (D) students were randomized into two group.
    (E) the students knew whether or not music was playing during the exam.

49. To make this a good experiment, one part of it should be done in a blind way. To do this we would

    (A) make the students take the exam in a dark room.
    (B) let the students in the music group have extra time for the exam if they need it.
    (C) not allow the person grading the exam to know which student listened to music and which student did not.
    (D) not allow the students to find out their grades on the exam.
    (E) tell all students that they will receive a grade of A on the exam if they agree to participate.

50. A large automobile repair shop has found that repair costs have a mean of \$1530 and standard deviation of \$789. Suppose that the next 100 cars that come in for repairs can be regarded as a simple random sample from the long-run group of cars to be repaired at this shop. The mean and standard deviation of the average, $\bar{X}$, of simple random samples of repair costs for 100 cars is:

    (A) mean = \$1530.00 and standard deviation = \$78.90.
    (B) mean = \$1530.00 and standard deviation = \$7.89.
    (C) mean = \$153.00 and standard deviation = \$78.90.
    (D) mean = \$153.00 and standard deviation = \$7.89.
    (E) mean = \$153.00 and standard deviation = \$789.00.

51. A pack of a certain brand of cigarettes displays the statement "1.5 mg nicotine average per cigarette." Let μ denote the mean nicotine content per cigarette for all cigarettes of this brand. People who smoke this brand would probably be disturbed if it turned out that the true average nicotine content exceeded the claimed value. We carry out a test of the hypotheses: $H_0 : \mu = 1.5$ and $H_a : \mu > 1.5$. Which is a correct description of the Type I error?

    (A) The true average nicotine content is 1.5 mg but we decide that it is lower.

    (B) The true average nicotine content is 1.5 mg but we decide that it is different.

    (C) We believe the advertisement but the true average content is above 1.5 mg.

    (D) The p-value of the test must be smaller than α.

    (E) The true average nicotine content is 1.5 mg but we decide that it is higher.

52. The national mean IQ test score for seventh grade girls is 100. An educator wonders if seventh grade girls who attend charter schools have a mean IQ different from the national mean IQ score. She selects a simple random sample of 50 seventh grade girls from charter schools and finds that the mean IQ of those 50 girls is 102 and the standard deviation is 13. She calculates a 95% confidence interval for the mean IQ of all seventh grade girls in charter schools and finds it to be $(98.305, 105.695)$. Which of these statements IS TRUE?

    (A) The study does not provide enough evidence as to claim that charter school seventh grade girls have a mean IQ different from the national mean of 100 at the 0.05 level.

    (B) The study definitely concludes that charter school seventh grade girls have a mean IQ score higher than the national mean of 100 at the 0.05 level.

    (C) We are 95% confident that all charter school girls have their IQ scores between 98.305 and 105.695.

    (D) The sample mean is equal to the population mean and this can be stated with 95% confidence.

    (E) 95% of girls in charter schools have their IQ scores between 98.305 and 105.695.

53. The Pepsi Company designed a study to demonstrate that Coke drinkers prefer Pepsi when they taste both colas blind. The subjects, all people who said that they were Coke drinkers, tasted both colas using cups without brand identification and said which they liked better. Because responses depend on which cola is tasted first, the order of tasting was chosen at random for each subject. This experiment uses

    (A) a factorial design.
    (B) a matched pair design.
    (C) double blinding.
    (D) random placebos.
    (E) double replication.

54. Nielsen Media Research wishes to estimate the mean number of hours μ that high school students spend watching TV on a weekday. Past studies suggest that a population standard deviation σ of 1.7 hours is reasonable. The sample size of high school students needed to estimate the mean number of hours μ for watching TV on a weekday within ± 0.25 hours with 99% confidence is closest to

    (A) 18 (B) 307 (C) 47 (D) 180 (E) 417

Binomial Probability Table

		p											
n	*x*	.01	.05	.10	.15	.20	.25	.30	1/3	.35	.40	.45	.50
1	0	0.9900	0.9500	0.9000	0.8500	0.8000	0.7500	0.7000	0.6667	0.6500	0.6000	0.5500	0.5000
	1	0.0100	0.0500	0.1000	0.1500	0.2000	0.2500	0.3000	0.3333	0.3500	0.4000	0.4500	0.5000
2	0	0.9801	0.9025	0.8100	0.7225	0.6400	0.5625	0.4900	0.4444	0.4225	0.3600	0.3025	0.2500
	1	0.0198	0.0950	0.1800	0.2550	0.3200	0.3750	0.4200	0.4444	0.4550	0.4800	0.4950	0.5000
	2	0.0001	0.0025	0.0100	0.0225	0.0400	0.0625	0.0900	0.1111	0.1225	0.1600	0.2025	0.2500
3	0	0.9703	0.8574	0.7290	0.6141	0.5120	0.4219	0.3430	0.2963	0.2746	0.2160	0.1664	0.1250
	1	0.0294	0.1354	0.2430	0.3251	0.3840	0.4219	0.4410	0.4444	0.4436	0.4320	0.4084	0.3750
	2	0.0003	0.0071	0.0270	0.0574	0.0960	0.1406	0.1890	0.2222	0.2389	0.2880	0.3341	0.3750
	3	0.0000	0.0001	0.0010	0.0034	0.0080	0.0156	0.0270	0.0370	0.0429	0.0640	0.0911	0.1250
4	0	0.9606	0.8145	0.6561	0.5220	0.4096	0.3164	0.2401	0.1975	0.1785	0.1296	0.0915	0.0625
	1	0.0388	0.1715	0.2916	0.3685	0.4096	0.4219	0.4116	0.3951	0.3845	0.3456	0.2995	0.2500
	2	0.0006	0.0135	0.0486	0.0975	0.1536	0.2109	0.2646	0.2963	0.3105	0.3456	0.3675	0.3750
	3	0.0000	0.0005	0.0036	0.0115	0.0256	0.0469	0.0756	0.0988	0.1115	0.1536	0.2005	0.2500
	4	0.0000	0.0000	0.0001	0.0005	0.0016	0.0039	0.0081	0.0123	0.0150	0.0256	0.0410	0.0625
5	0	0.9510	0.7738	0.5905	0.4437	0.3277	0.2373	0.1681	0.1317	0.1160	0.0778	0.0503	0.0313
	1	0.0480	0.2036	0.3280	0.3915	0.4096	0.3955	0.3601	0.3292	0.3124	0.2592	0.2059	0.1562
	2	0.0010	0.0214	0.0729	0.1382	0.2048	0.2637	0.3087	0.3292	0.3364	0.3456	0.3369	0.3125
	3	0.0000	0.0011	0.0081	0.0244	0.0512	0.0879	0.1323	0.1646	0.1811	0.2304	0.2757	0.3125
	4	0.0000	0.0000	0.0005	0.0022	0.0064	0.0146	0.0283	0.0412	0.0488	0.0768	0.1128	0.1562
	5	0.0000	0.0000	0.0000	0.0001	0.0003	0.0010	0.0024	0.0041	0.0053	0.0102	0.0185	0.0313
6	0	0.9415	0.7351	0.5314	0.3771	0.2621	0.1780	0.1176	0.0878	0.0754	0.0467	0.0277	0.0156
	1	0.0571	0.2321	0.3543	0.3993	0.3932	0.3560	0.3025	0.2634	0.2437	0.1866	0.1359	0.0938
	2	0.0014	0.0305	0.0984	0.1762	0.2458	0.2966	0.3241	0.3292	0.3280	0.3110	0.2780	0.2344
	3	0.0000	0.0021	0.0146	0.0415	0.0819	0.1318	0.1852	0.2195	0.2355	0.2765	0.3032	0.3125
	4	0.0000	0.0001	0.0012	0.0055	0.0154	0.0330	0.0595	0.0823	0.0951	0.1382	0.1861	0.2344
	5	0.0000	0.0000	0.0001	0.0004	0.0015	0.0044	0.0102	0.0165	0.0205	0.0369	0.0609	0.0938
	6	0.0000	0.0000	0.0000	0.0000	0.0001	0.0002	0.0007	0.0014	0.0018	0.0041	0.0083	0.0156
7	0	0.9321	0.6983	0.4783	0.3206	0.2097	0.1335	0.0824	0.0585	0.0490	0.0280	0.0152	0.0078
	1	0.0659	0.2573	0.3720	0.3960	0.3670	0.3115	0.2471	0.2048	0.1848	0.1306	0.0872	0.0547
	2	0.0020	0.0406	0.1240	0.2097	0.2753	0.3115	0.3177	0.3073	0.2985	0.2613	0.2140	0.1641
	3	0.0000	0.0036	0.0230	0.0617	0.1147	0.1730	0.2269	0.2561	0.2679	0.2903	0.2918	0.2734
	4	0.0000	0.0002	0.0026	0.0109	0.0287	0.0577	0.0972	0.1280	0.1442	0.1935	0.2388	0.2734
	5	0.0000	0.0000	0.0002	0.0012	0.0043	0.0115	0.0250	0.0384	0.0466	0.0774	0.1172	0.1641
	6	0.0000	0.0000	0.0000	0.0001	0.0004	0.0013	0.0036	0.0064	0.0084	0.0172	0.0320	0.0547
	7	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0002	0.0005	0.0006	0.0016	0.0037	0.0078
8	0	0.9227	0.6634	0.4305	0.2725	0.1678	0.1001	0.0576	0.0390	0.0319	0.0168	0.0084	0.0039
	1	0.0746	0.2793	0.3826	0.3847	0.3355	0.2670	0.1977	0.1561	0.1373	0.0896	0.0548	0.0312
	2	0.0026	0.0515	0.1488	0.2376	0.2936	0.3115	0.2965	0.2731	0.2587	0.2090	0.1569	0.1094
	3	0.0001	0.0054	0.0331	0.0839	0.1468	0.2076	0.2541	0.2731	0.2786	0.2787	0.2568	0.2187
	4	0.0000	0.0004	0.0046	0.0185	0.0459	0.0865	0.1361	0.1707	0.1875	0.2322	0.2627	0.2734
	5	0.0000	0.0000	0.0004	0.0026	0.0092	0.0231	0.0467	0.0683	0.0808	0.1239	0.1719	0.2187
	6	0.0000	0.0000	0.0000	0.0002	0.0011	0.0038	0.0100	0.0171	0.0217	0.0413	0.0703	0.1094
	7	0.0000	0.0000	0.0000	0.0000	0.0001	0.0004	0.0012	0.0024	0.0033	0.0079	0.0164	0.0312
	8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0002	0.0002	0.0007	0.0017	0.0039

CONFIDENCE LEVEL	*TAIL AREA*	z^*
80%	0.1000	1.282
90%	0.0500	1.645
95%	0.0250	1.960
96%	0.0200	2.054
98%	0.0100	2.326
99%	0.0050	2.576
99.5%	0.0025	2.807