

Math 1530 Exam
December 11, 2006

Name _____
Student ID _____

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.

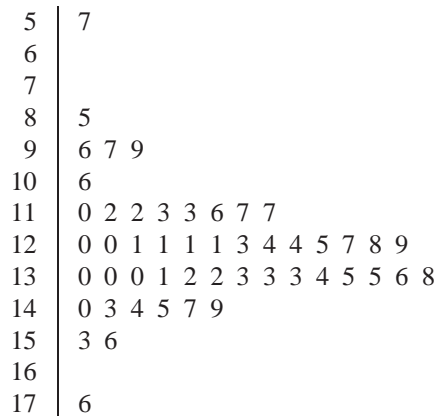
Final Exam

1. The Insurance Institute for Highway Safety publishes data on the total damage caused by compact automobiles in a series of controlled, low-speed collisions. The following costs are for a sample of 9 cars, in hundreds of dollars.

10 6 8 10 4 3.5 7.5 8 9

The mean and median of the total damage suffered for this sample of cars are

- (A) \$239 and \$400, respectively. (C) \$950 and \$400, respectively.
(B) \$660 and \$800, respectively. (D) \$7 and \$8, respectively.
(E) \$733 and \$800, respectively.
2. The mean and standard deviation are good descriptions for
(A) categorical variables. (C) bimodal distributions.
(B) any quantitative variable. (D) symmetric distributions with no outliers.
(E) skewed distributions.
3. Suppose that you are interested in investing some money in the stock market. Before you buy some shares of a certain company’s stock, you decide to look at the fluctuations in the price of the stock over the past five years. What type of graphical display is suitable for this purpose?
(A) histogram (B) pie chart (C) bar chart (D) stemplot (E) time plot
4. 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.

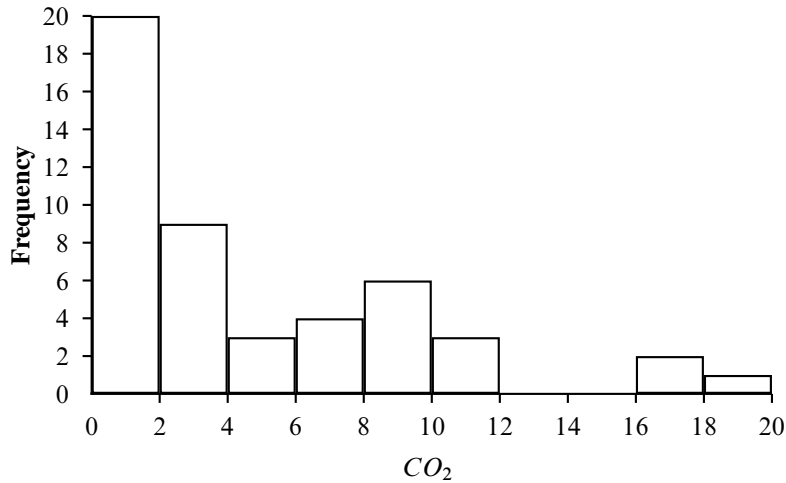


The center of the distribution is close to

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

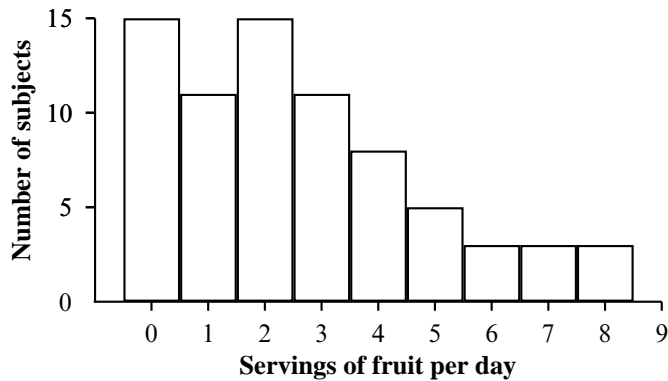
5. Burning fuels in power plants or motor vehicles emits carbon dioxide (CO_2), which contributes to global warming. The following descriptive statistics and histogram represent CO_2 emissions per person from countries with populations of at least 20 million.

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?

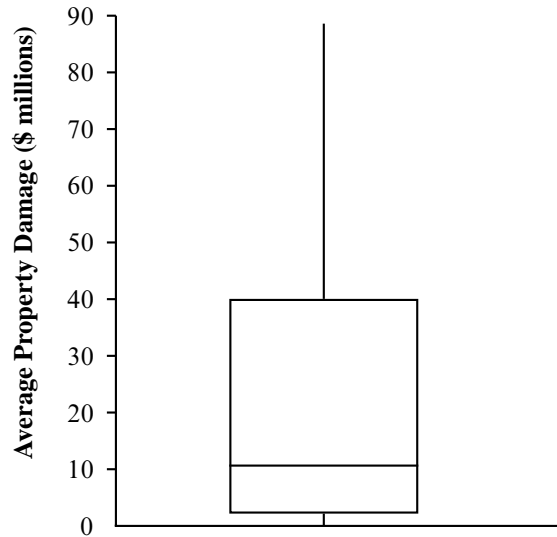
- (A) Somewhat symmetric
 - (B) Strongly skewed left
 - (C) Strongly skewed right with an outlier
 - (D) The five-number summary
 - (E) Mean = 4.596, Median = 3.200, and standard deviation = 2.144
6. The histogram below represents the number of servings of fruit per day claimed by 74 seventeen-year-old girls in a study in Pennsylvania.



What percent of these girls ate fewer than two servings per day?

- (A) About 35%
- (B) About 26%
- (C) About 41%
- (D) About 55%
- (E) About 20%

Use the following for the next 2 questions. The states differ greatly in the kinds of severe weather that afflict them. The graphical display shows the average property damage (\$ millions) caused by tornadoes per year over the period from 1950 to 1999 (adjusted) in each of the 50 states and Puerto Rico.

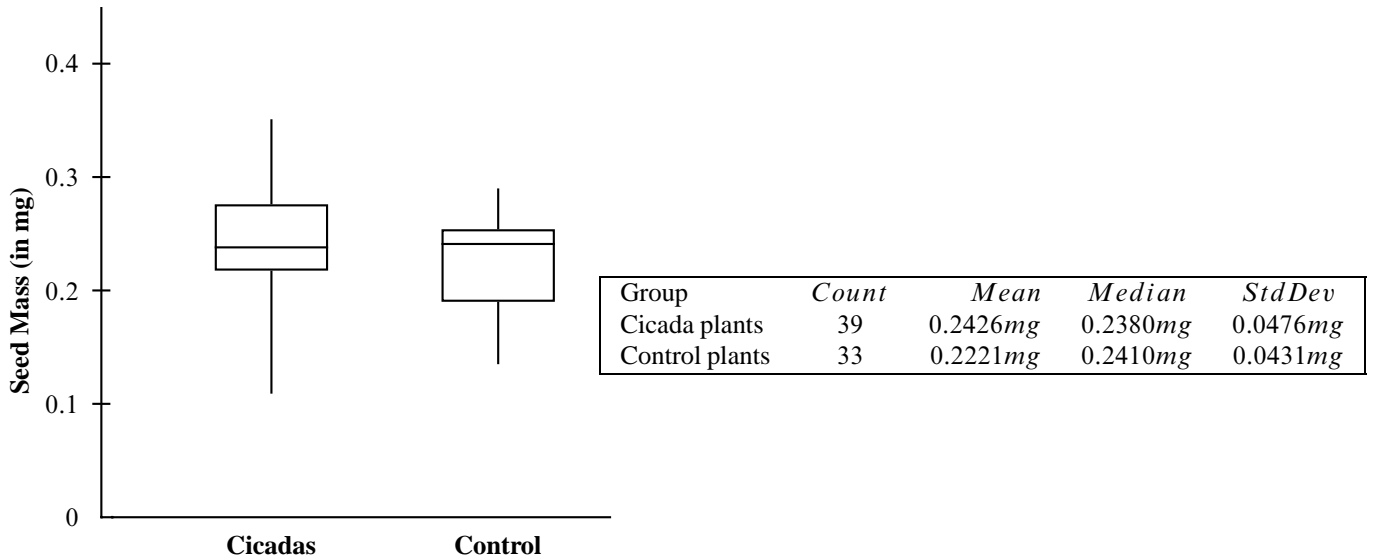


7. Suppose that we call the variable of interest “Average Property Damage.” What type of variable is this?
 (A) categorical (B) quantitative (C) boxplot (D) qualitative (E) timeplot
8. The middle half of this distribution of tornado damage lies approximately between which two values?
 (A) 0 and 90 million (B) 0 and 10 million (C) about 38 million (D) 13 and 38 states (E) 2 and 40 million
9. Forty-two miniature Clark bars were purchased and weighed (in grams) yielding the following weights:
- | | | | | | | | | | | | | | |
|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 14.1 | 14.2 | 14.9 | 15.0 | 15.1 | 15.2 | 15.2 | 15.3 | 15.4 | 15.4 | 15.4 | 15.5 | 15.5 | 15.6 |
| 15.7 | 15.7 | 15.8 | 15.9 | 16.0 | 16.0 | 16.0 | 16.1 | 16.4 | 16.6 | 16.7 | 16.8 | 17.0 | 19.4 |
| 19.6 | 19.8 | 19.8 | 19.9 | 20.0 | 20.0 | 20.2 | 20.3 | 20.4 | 20.5 | 20.5 | 20.6 | 21.3 | 21.8 |

Which of the following best describes the shape of the distribution of weights?

- (A) Normal distribution
 (B) Bimodal
 (C) Strongly skewed right
 (D) Uniform distribution
 (E) Strongly skewed left
- Use the following for the next 2 questions. The heights of women aged 20 to 29 varies according to a distribution that is approximately normal with mean, μ , equal to 64 inches and standard deviation, σ , equal to 2.7 inches.
10. Between what heights do the middle 95% of young women fall?
 (A) 61.3 to 66.7 inches (B) 62 to 66 inches (C) below 64 inches (D) 58.6 to 69.4 inches (E) 55.9 to 72.1 inches
11. Approximately what percent of young women are taller than 61.3 inches?
 (A) 68% (B) 16% (C) 84% (D) 32% (E) 97.5%

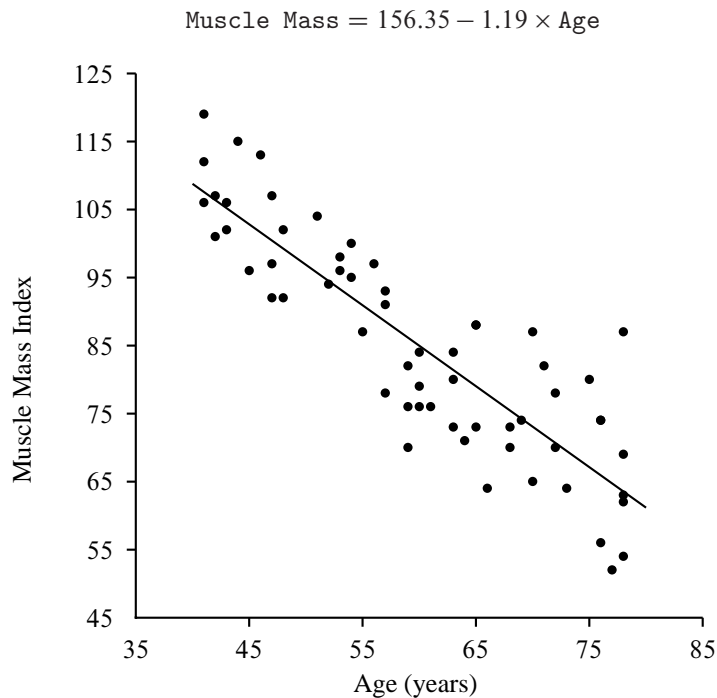
12. The length of human pregnancies from conception to birth varies according to a distribution that is approximately normal with mean, μ , equal to 266 days and standard deviation, σ , equal to 16 days. The longest 10% of pregnancies last at least how many days?
 (A) 245 (B) 282 (C) 300 (D) 286 (E) 234
13. Every 17 years, swarms of cicadas emerge from the ground in the eastern United States, live for about six weeks, then die. There are so many cicadas that their dead bodies can serve as fertilizer and increase plant growth. In an experiment, a researcher added 10 cicadas under some plants in a natural plot of American bellflowers in a forest, leaving other plants undisturbed. One of the response variables was the size of seeds produced by the plants. Below are some summary statistics and comparative boxplots of the seed mass in milligrams for the two groups.



Do the data support the idea that dead cicadas can serve as fertilizer?

- (A) No, the boxplots show little difference; the means (0.2426 mg for cicada, 0.2221 mg for control) and medians (0.2380 mg for cicada, 0.2410 mg for control) are also similar. The variability in seed mass for the cicada group is slightly larger than the control group.
- (B) Yes, the dead cicadas are significantly better than the control group.
- (C) Yes, the distribution of seed mass for the cicada group is fairly symmetric and the distribution of seed mass for the control group is slightly skewed left.
- (D) Yes, there is more variability in the control group.
- (E) No, the mean and the median disagree.
14. A criminologist is interested in studying the relationship between level of education and crime rate in medium-sized U.S. counties. What type of graphical display is best suitable for this purpose?
 (A) scatterplot (B) side-by-side boxplots (C) back-to-back stemplots (D) bar charts (E) histograms
15. For which of the following situations would it be appropriate to calculate r , the correlation coefficient?
 (A) Income for county employees and their respective counties.
 (B) Time spent studying for statistics exam and score on the exam.
 (C) Eye color and hair color of selected participants.
 (D) Party affiliation of senators and their vote on presidential impeachment.
 (E) None of the above.

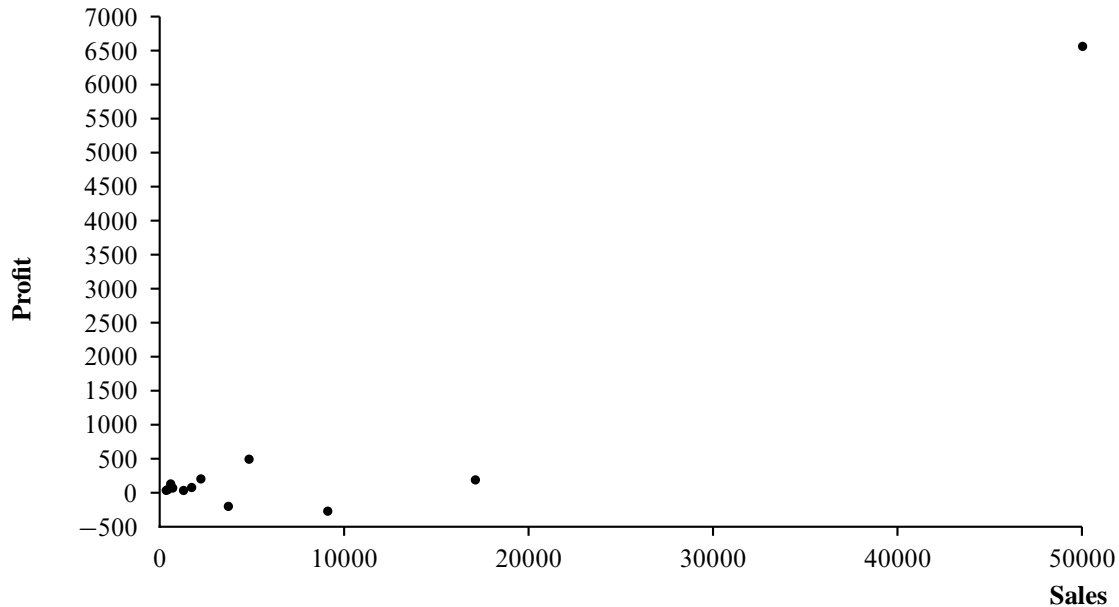
Use the following for the next 4 questions. A person's muscle mass is expected to decrease with age. To explore this relationship in women, a nutritionist randomly selected 15 women from each 10-year age group, beginning with age 40 and ending with age 79. The observations and least-squares regression line appear in the scatterplot. The correlation between the two variables is $r = -0.866$ and the least-squares regression line for predicting muscle mass index (MMI) from age (years) is



16. Describe the association between muscle mass and age.
- For each additional year of age the estimated mean muscle mass increases and decreases.
 - The relationship between age and muscle mass is weak because the correlation is negative. Higher muscle mass goes with both lower and higher age.
 - The scatterplot shows a negative direction, with higher muscle mass going with lower age. The plot is generally straight with a moderate amount of scatter. The correlation of -0.866 indicates a strong linear association.
 - The relationship between age and muscle mass is weak because -0.866 is a small number compared to 156.35.
 - The correlation between age and muscle mass is -0.866 MMI per year. This an indication that age is causing muscle mass to decrease with time.
17. Which is the most appropriate interpretation of the slope?
- For each additional year of age the estimated mean muscle mass increases by approximately 1.19 MMIs.
 - For each additional year of age the estimated mean muscle mass increases by approximately 156.35 MMIs.
 - For each additional year of age the estimated mean muscle mass decreases by approximately 1.19 MMIs.
 - For each additional year of age the estimated mean muscle mass decreases by 0.866 MMIs.
 - For each additional muscle mass index age decreases by approximately 1.19 years.
18. Which is the most appropriate statement regarding the interpretation of the intercept?
- For each additional year of age the estimated mean muscle mass decreases by approximately 1.19 MMIs.
 - The average muscle mass is 156.35 MMI for women at age 0.
 - The minimum muscle mass is 156.35 MMI.
 - For each additional year of age muscle mass decreases by approximately 156.35 MMIs.
 - We cannot interpret the intercept here since it does not make sense that a newborn female child would have a muscle mass index of 156.35.

19. The estimated muscle mass index for a female who is 60 years old is
 (A) 60. (B) 85. (C) 96. (D) 86.6. (E) 80.

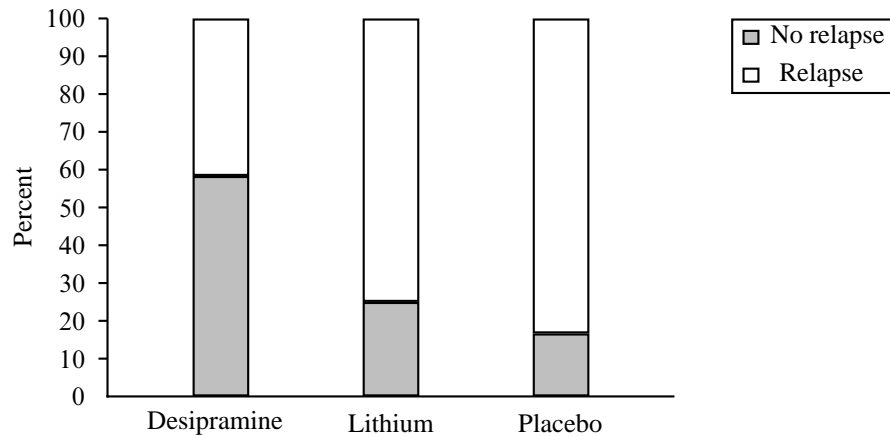
20. Below is the scatterplot of the sales vs. profits (in tens of thousands of dollars) for companies selected from the Forbes 500 list for 1986. This is a random sample of 1.5% of the companies. The Forbes 500 includes all companies rated in the top 500 on any of the criteria, and thus has almost 800 companies on the list. It seems reasonable to use Sales to predict Profits. The correlation between Sales and Profits is 0.934.



From this information we see

- (A) profits can be accurately predicted from sales.
 (B) there is a clear error since profits cannot be negative.
 (C) that there is a strong relationship between sales and profits.
 (D) there is a very influential observation in the data.
 (E) that the observation in the upper right corner of the graph is a lurking variable.
21. 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.
22. A study of elementary school children, ages 6 to 11, finds a high positive correlation between shoe size x and score y on a test of reading comprehension. The observed correlation is most likely due to
- (A) the effect of a lurking variable, such as age.
 (B) a mistake, since the correlation must be negative.
 (C) outliers and influential observations.
 (D) cause and effect (larger shoe size causes higher reading comprehension).
 (E) "reverse" cause and effect (higher reading comprehension causes larger shoe size).

23. 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 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.
- (B) 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.
- (C) There aren't any differences between the treatments since the bars are of equal height.
- (D) 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.
- (E) 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.
24. In a large city school system with 20 elementary schools, the school board is considering the adoption of a new policy that would require elementary students to pass a test in order to be promoted to the next grade. The PTA wants to find out whether parents agree with this plan. They randomly select 20 parents from each elementary school and send them a survey. Identify the sampling method.
- (A) Stratified random sampling (C) Attempted census
- (B) Cluster sampling (D) Voluntary response
- (E) Simple random sampling
25. *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) voluntary response sampling
- (B) systematic sampling (D) stratified random sampling
- (E) census

26. The police department plans to do a study about the use of cell phones while driving. They have the list of all Johnson City residents holding driver licenses. They plan to select 1000 names at random from the list, call them by phone and ask them about their use of cell phones while driving. From the 1000 people contacted, 25 admitted using a cell phone while driving during the past week. Actually 3% of all Johnson City drivers use a cell phone while driving. The sampling frame is
- (A) the phone book.
 - (B) the Johnson City residents that own cell phones.
 - (C) the list of Johnson City residents that hold driver licenses.
 - (D) all the drivers in Johnson City that used a cell phone this past week.
 - (E) the list of all homes in Johnson City.
27. A public opinion poll in Tennessee wants to determine how registered voters think about the following question, “Given that 18-year-olds are old enough to vote and to serve in the military, is it fair to set the drinking age at 21?” You can conclude that
- (A) the results will most likely be unbiased.
 - (B) the sample is too small to draw any conclusion.
 - (C) the poll will reflect how all Tennesseans think if the sample is an SRS.
 - (D) the margin of error will most likely be large since the poll suffers from a number of potential problems.
 - (E) the poll is probably biased towards no.

Use the following for the next 3 questions. A recent study gave evidence that the drug lovastatin can reduce fat deposits in arteries that are linked to heart attacks. In the study, 270 subjects with moderate blood cholesterol levels were assigned at random to take either lovastatin or a placebo. Fat deposits in arteries were measured using X-rays. After two years, the lovastatin group had less arterial fat.

28. The design of this study is called a
- (A) simple random sample. (C) randomized comparative experiment.
 - (B) stratified random sample. (D) least squares regression.
 - (E) block design.
29. The response variable in the study is
- (A) how much fat is deposited in arteries. (C) lovastatin or placebo.
 - (B) X-ray. (D) blood cholesterol.
 - (E) heart attacks.
30. The study was *double-blind*. This means that
- (A) a placebo was used.
 - (B) the treatment lovastatin was used.
 - (C) neither the subjects nor the medical personnel working with them knew who took lovastatin and who took the placebo.
 - (D) subjects were randomly (blindly) assigned to groups.
 - (E) results about individual subjects were not released, only statistical summaries for the groups.

31. Do antioxidants prevent cancer? People who eat lots of fruits and vegetables have lower rates of colon cancer than those who eat little of these foods. Fruits and vegetables are rich in “antioxidants” such as vitamin A, C, and E. Will taking antioxidants help prevent colon cancer? A medical experiment studied this question with 864 people who were at risk of colon cancer. The subjects were divided into four groups: daily beta-carotene, daily vitamins C and E, all three vitamins every day, or daily placebo. After four years, the researchers were surprised to find no significant difference in colon cancer among the groups. What does “no significant difference” mean in describing the outcome of the study?
- (A) The observed differences were no more than what might reasonably occur by chance if there is no effect due to the four treatments.
 - (B) The observed effect was too large to attribute plausibly to chance.
 - (C) The study resulted in a small P-value.
 - (D) People who eat lots of fruits and vegetables do not have lower rates of colon cancer than those who eat little of these foods.
 - (E) A type I error is most likely.
- Use the following for the next 2 questions.** According to a recent (Nov. 9-12) USA Today/Gallup poll, New York Sen. Hillary Rodham Clinton is the Democratic Party’s clear front-runner for the nomination of president in 2008. Telephone interviews were conducted on a sample of 544 Democrats or Democrat leaners and it was found that 167 of these adults support Sen. Clinton for the Democratic Party’s nomination.
32. The population is
- (A) the 167 people who support Sen. Clinton.
 - (B) all adults who identify as a Democrat or Democrat leaner.
 - (C) the 554 Democrats.
 - (D) all voters.
 - (E) the telephone interviews.
33. Gallup said that “one can say with 95% confidence that the margin of sampling error is ± 5 percentage points.” If the poll had interviewed 1000 Democrats or Democrat leaners rather than 544, the margin of error for 95% confidence would be
- (A) greater than ± 5 percentage points.
 - (B) less than ± 5 percentage points.
 - (C) equal to ± 5 percentage points.
 - (D) equal to $\pm 0.05/1000$.
 - (E) equal to $\pm 0.95/\sqrt{1000}$.
34. The scores of students on the ACT college entrance examination in 2001 had mean 21 and standard deviation 4.7. The distribution of scores is roughly Normal. What is the approximate probability that the average ACT score of an SRS of 50 students is 23 or higher?
- (A) .3336
 - (B) 3.01
 - (C) .0013
 - (D) .9987
 - (E) .1103
35. The idea of insurance is that we all face risks that are unlikely but carry high cost. Think of a fire destroying your home. Insurance spreads the risk: we all pay a small amount, and the insurance policy pays a large amount to those few of us whose homes burn down. An insurance company looks at the records for millions of homeowners and sees that the mean loss from fire in a year is $\mu = \$250$ per person. The company plans to sell fire insurance for \$250 plus enough to cover its costs and profit. The law of large numbers says that
- (A) the insurance company should sell a few policies since the probability would be small to pay for a total loss for 1 or more claims and the probability will be 1 if they sell many policies.
 - (B) if a large number of policies is sold the mean would be much larger than \$250.
 - (C) the best situation would be to sell 250 policies.
 - (D) the insurance company should sell thousands of policies because the average claim on many policies will be close to \$250, so the insurance company can be assured that the premiums they collect will (almost certainly) cover the claims.
 - (E) each claim will be exactly \$250.
36. Suppose we roll a pair of fair six-sided dice. The faces on each die have 1, 2, 3, 4, 5, or 6 spots on them. What is the probability that the sum of the spots on the up-faces is 3, 6, or 9?
- (A) 1/4
 - (B) 1/12
 - (C) 3/11
 - (D) 11/36
 - (E) 7/36

37. 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) .05 (B) .04 (C) .10 (D) .95 (E) 0.15
38. The common test for the presence in the blood of antibodies to HIV, the virus that causes AIDS, gives a positive result with probability about .006 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 expected number of positive tests?
- (A) 60 (B) 600 (C) 500 (D) .006 (E) 6
39. Suppose that for a randomly selected high school student who has taken a college entrance exam, the probability of scoring above a 650 is $p = 0.30$. A random sample of $n = 4$ students was selected. What is the probability that exactly one of the students scored over 650 points?
- (A) 0.3000 (B) 0.7000 (C) 0.2500 (D) 0.3483 (E) 0.4116

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.

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

40. 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
41. What is the probability that a randomly chosen child is below average academically, given that the child chosen had a poor nutritional status?
- (A) 0.2414 (B) 0.3500 (C) 0.2000 (D) 0.2900 (E) 0.0700
42. From a computer simulation of rolling a fair die ten times, the following data were collected on the showing face:

5 5 1 3 2 1 5 6 5 1

What is a correct conclusion to make about the next ten rolls of the same die?

- (A) The probability of rolling a 5 is greater than the probability of rolling anything else.
- (B) We will see exactly three faces showing a 1 since it is what we saw in the first experiment.
- (C) The probability of rolling a 4 is 0, and therefore we will not roll it in the next ten rolls.
- (D) Each face has exactly the same probability of being rolled.
- (E) The probabilities of rolling each face are: $P(1) = .3$, $P(2) = .1$, $P(3) = .1$, $P(4) = 0$, $P(5) = .4$, $P(6) = .1$

Use the following for the next 2 questions. A consumer advocate is interested in evaluating the claim that a new granola cereal contains “4 ounces of cashews in every bag.” The advocate recognizes that the amount of cashews will vary slightly from bag to bag, but she suspects that the mean amount of cashews per bag is less than 4 ounces.

43. The null and alternative hypotheses are
- (A) $H_0 : p = 4$ $H_a : p < 4$ (C) $H_0 : \mu = 4$ $H_a : \mu \neq 4$
- (B) $H_0 : \bar{x} = 4$ $H_a : \bar{x} < 4$ (D) $H_0 : \mu > 4$ $H_a : \mu = 4$
- (E) $H_0 : \mu = 4$ $H_a : \mu < 4$
44. To check the claim, the advocate purchases a random sample of 40 bags of cereal and calculates a sample mean of 3.68 ounces of cashews. Assume that the amount of cashews in every bag follows a Normal distribution with standard deviation $\sigma = .78$ ounces. In a test of statistical hypotheses, the p - value is equal to
- (A) 0.9950. (B) 0.0048. (C) 2.59. (D) 0.3409. (E) 0.0100.
45. A noted psychic is going to be tested for ESP. The psychic will be presented with n cards face down and asked to determine if the card was one of five symbols: a star, cross, circle, square or three wavy lines. Let p represent the probability that the psychic correctly identifies the symbol on the card in a random trial. How large a sample n would you need to estimate p with margin of error 1% with 95% confidence? Use the guess $p = 0.20$ as the value for p .
- (A) $n = 4330$ (B) $n = 7203$ (C) $n = 9604$ (D) $n = 6147$ (E) $n = 984$
46. When an opinion poll states with 95% confidence the margin of error for the sample percentage is plus or minus 3 percentage points, this means that
- (A) 95% of all samples chosen using the same method will give a sample percent within 3 percentage points of the true population value.
- (B) between 92% and 98% of the people chosen for the sample were contacted.
- (C) the percentage of people who said “Yes” to the question was between 92% and 98%.
- (D) 95% of the time, the sample percentage differs from the true population value by exactly 3 percentage points.
- (E) there is a small chance, (i.e, 3%), that the 95% confidence interval doesn't contain the true population value.
47. A sociologist is studying the effect of having children within the first two years of marriage on the divorce rate. Using hospital birth records, she selects a random sample of 200 couples that had a child within the first two years of marriage. Following up on these couples, she finds that 80 are divorced within five years. A 90% confidence interval for the proportion of couples who had a child within the first two years of marriage and are divorced within five years is
- (A) 0.40 ± 0.035 . (B) 0.40 ± 0.044 . (C) 0.40 ± 0.057 . (D) 0.40 ± 0.068 . (E) 80 ± 0.068 .
48. 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 added 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. (C) the test of hypotheses is not rejected.
- (B) the p-value is large. (D) The size of the sample doesn't have any effect on the significance of the test.
- (E) it is based on a very large random sample.

49. 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) the sample size is small.
 - (C) that although the survival time has doubled, in reality the actual increase is really two years.
 - (D) the calculation was in error. The researchers forgot to include the sample size.
 - (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

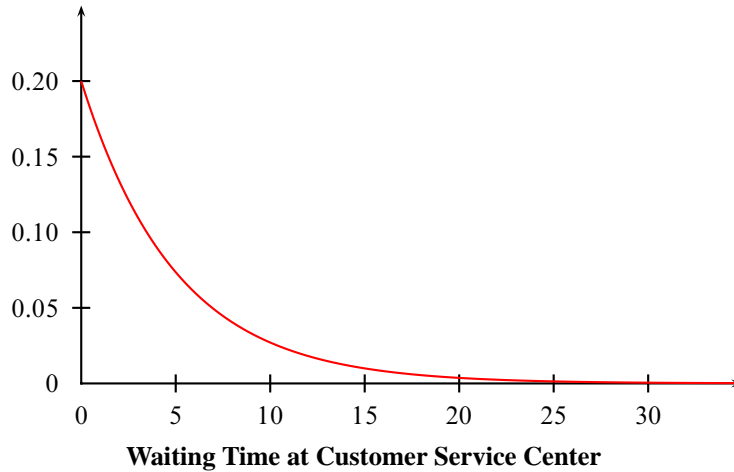
```

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

50. Is there good evidence the mean age at first word among all “normal” children is greater than one year?
- (A) There doesn't appear to be enough evidence to suggest the mean age at first word is greater than one year.
 - (B) Yes, there is strong evidence that the mean age at first word is greater than one year.
 - (C) Since the sample mean is 13 months we should reject the null hypothesis.
 - (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.
51. 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 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.
 - (E) Yes, the sample size needs to be at least 30 in order to use the t-procedure.

52. The following density curve represents waiting times at a customer service counter at a national department store. The mean waiting time is 5 minutes with standard deviation 5 minutes. If we took all possible samples of size $n = 100$, how would you describe the sampling distribution of the \bar{x} 's?



- (A) Shape = right skewed, mean = 5, standard deviation = 5
 - (B) Shape = same as above graph, mean = 5, standard deviation = 0.5
 - (C) Shape = approximately normal, mean = 5, standard deviation = 0.5
 - (D) Shape = approximately normal, mean = 5, standard deviation = 5
 - (E) Shape = binomial, $n = 100$, $p = .05$
53. Enzyme immunoassay tests are used to screen blood specimens for the presence of antibodies to HIV, the virus that causes AIDS. Antibodies indicate the presence of the virus. The test is quite accurate but is not always correct. Here are approximate probabilities of positive and negative test results when the blood tested does and does not actually contain antibodies to HIV.

	Test Result	
	+	-
Antibodies present	0.9985	0.0015
Antibodies absent	0.0060	0.9940

Suppose that 1% of a large population carries antibodies to HIV in their blood. What is the probability that the test is positive for a randomly chosen person from this population? (Hint: Draw a tree diagram for selecting a person from this population (outcomes: antibodies present or absent) and for testing his or her blood (outcomes: test positive or negative).)

- (A) 0.01000 (B) 0.015925 (C) 0.99850 (D) 0.00150 (E) 0.009985

Binomial Probability Table

		<i>p</i>											
<i>n</i>	<i>x</i>	.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	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
2	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	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
3	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
3	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	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
4	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
4	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
4	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	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
5	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
5	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
5	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
5	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	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
6	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
6	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
6	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
6	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
6	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	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
7	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
7	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
7	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
7	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
7	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
7	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	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
8	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
8	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
8	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
8	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
8	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
8	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
8	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	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	<i>z</i> *
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