Math 1530 Final Exam
April 28, 2007

Name _____
Student ID _____
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. People with diabetes must monitor and control their blood glucose level. The goal is to maintain "fasting plasma glucose" between about 90 and 130 milligrams per deciliter (mg/dL). Here are the fasting plasma glucose levels for 7 diabetics enrolled in a diabetes control class, five months after the end of the class.

   141 158 112 153 134 95 148

   The mean fasting plasma glucose level for these 7 diabetics is

   (A) 141 mg/dL. (B) 134.4 mg/dL. (C) 130 mg/dL. (D) 153 mg/dL. (E) 941 mg/dL.

2. Data from a medical study contain values of many variables for each of the people who were the subjects of the study. Which of the following variables are categorical and which are quantitative?

   `Age (years), Race (Asian, black, white, or other), Smoker (yes or no), Systolic blood pressure (millimeters of mercury), Level of calcium in the blood (micrograms per milliliter)`

   (A) Quantitative: Race, Smoker; Categorical: Age, Systolic blood pressure, Level of calcium in the blood

   (B) Categorical: Asian, black, white, other, yes, no; Quantitative: years, millimeters of mercury, micrograms per milliliter

   (C) Categorical: Race, Smoker; Quantitative: Age, Systolic blood pressure, Level of calcium in the blood

   (D) The categorical variables use bar charts and the quantitative variables use histograms.

   (E) All variables are quantitative.

3. Last month, the mean and standard deviation of the paychecks of 10 employees of a small company were \$1250 and \$150, respectively. This month, each one of the 10 employees received a \$125 raise on his/her check. What is the mean and standard deviation of their paychecks this month?

   (A) \$1375 and \$150 (B) \$1375 and \$275 (C) \$1250 and \$150 (D) Unable to determine. (E) \$1262.50 and \$162.50

4. The total fat(g) for sandwiches, french fries, chicken McNuggets and chicken selects at McDonald's is displayed in the stem plot below. Which of the alternatives is the '`Five-number summary`'?

   Stem-and-leaf of total fat(g) $N = 21$
   Leaf Unit = 1.00

0	9
1	0125668
2	02334559
3	033
4	0
5	
6	6

   (A) Min = 0.9 Q1 = 1 Median = 2 Q3 = 3 Max = 6.6

   (B) Min = 90 Q1 = 155 Median = 230 Q3 = 295 Max = 660

   (C) Q1 = 15 Median = 23 Q3 = 30 Mean = 23.8 S = 12.7

   (D) N = 21 Leaf Unit = 1.00 Q1 = 15.5 Median = 23 Q3 = 30

   (E) Min = 9 Q1 = 15.5 Median = 23 Q3 = 29.5 Max = 66

5. There are two major tests of readiness for college, the ACT and SAT. SAT scores are reported on a scale from 400 to 1600. The distribution of SAT scores for more than 1 million students in a recent high school graduating class was roughly Normal with mean $\mu = 1026$ and standard deviation $\sigma = 209$. What SAT scores make up the top 10% of all scores?

   (A) 758 and lower (B) 758 and higher (C) 1294 and higher (D) 1444 and higher (E) 1047 and higher

6. Ali H. Mokdad, Ph.D., and colleagues from the Centers for Disease Control and Prevention, Atlanta, conducted a study to identify and quantify the leading causes of death in the United States. The study included a comprehensive MEDLINE search of English-language articles that identified epidemiological, clinical and laboratory studies linking risk behaviors and mortality (death). The researchers used 2000 mortality data reported to the Centers for Disease Control and Prevention to identify the causes and number of deaths. The leading causes of death in 2000 are given below. Which type of graph is appropriate for these data?

Leading Causes of Death	Counts
Tobacco	435,000
Poor Diet & Physical Inactivity	400,000
Alcohol Consumption	85,000
Microbial Agents	75,000
Toxic Agents	55,000
Motor Vehicle Crashes	43,000
Incidents Involving Firearms	29,000
Sexual Behaviors	20,000
Illicit Use of Drugs	17,000

   (A) histogram (B) stem plot (C) scatterplot (D) boxplot (E) bar chart

7. The Gallup Poll conducted a representative telephone survey of 1180 American voters during the first quarter of 2005. Among the reported results were the voter's region (Northeast, South, etc.), age, party affiliation, and whether or not the person had voted in the 2004 midterm Congressional election. Who are the individuals in this survey?

   (A) Region, age, political affiliation, and whether or not the person voted in the 2004 midterm Congressional election.
   (B) The Gallup Poll
   (C) The first quarter of 2005
   (D) The list of all telephone numbers
   (E) The 1180 Americans surveyed

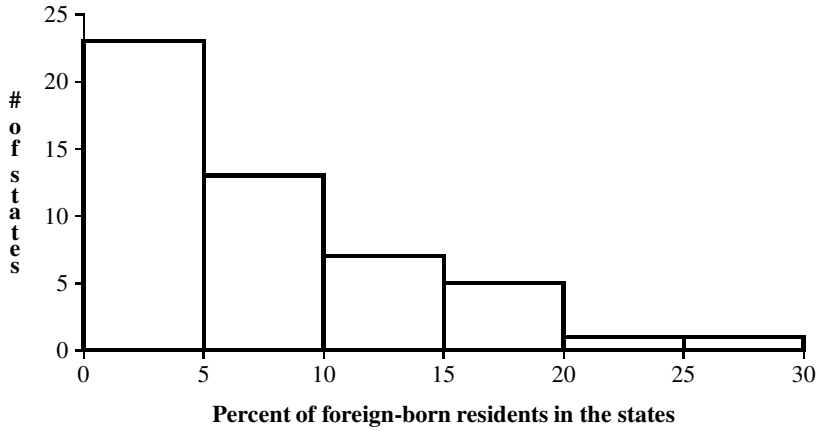
8. Some people think that drinking wine (in moderation) offers some protection against heart attacks. Here are the data on wine consumption (in liters) from 19 developed Western countries.

   0.7 0.8 0.8 0.8 1.2 1.3 1.6 1.8 1.9 2.4 2.5 2.7 2.9 2.9 3.9 5.8 6.5 7.9 9.1

   Which of the following best describes the distribution of wine consumption?

   (A) double peaked
   (B) 1 is an outlier
   (C) roughly symmetric
   (D) strongly skewed left with a possible outlier
   (E) strongly skewed right with possible outlier(s)

9. The states differ greatly in the percent of their residents who were born outside the United States. California leads with 26.5% foreign-born. The figure below is a histogram of the distribution of percent foreign-born residents in the states. Which summary statistics are preferable for describing this distribution?



(A) The mean and standard deviation should always be used to describe data.

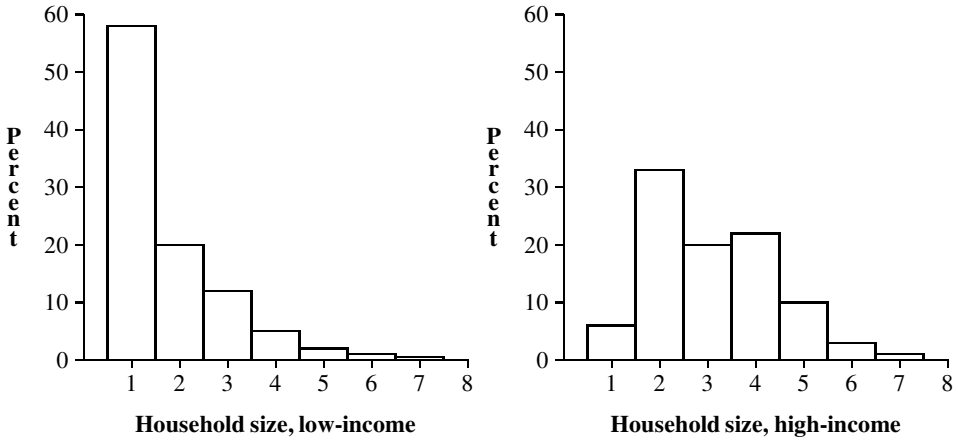
(B) The median and standard deviation because of the skewed distribution.

(C) The five-number summary is preferable for this skewed right distribution.

(D) The mean since it will be larger than the median and the standard deviation since it is smaller than the range.

(E) The correlation, means, and standard deviations since we have percent of foreign-born residents on the x-axis and number of states on the y-axis.

Use the following for the next 2 questions. Rich and poor households differ in ways that go beyond income. The figure below displays histograms that compare the distributions of household size (number of people) for low-income and high-income households in 2002. Low-income households had incomes less than $15,000, and high-income households had incomes of at least $100,000.



10. Describe the distribution of household size for the low-income households.

(A) Somewhat symmetric, center is about 3 to 4, spread is from 1 to 7.

(B) Strongly skewed right, median household size is about 1, spread is from 1 to 7.

(C) Strongly skewed left, center is about 3 to 4, spread is from 1 to 7.

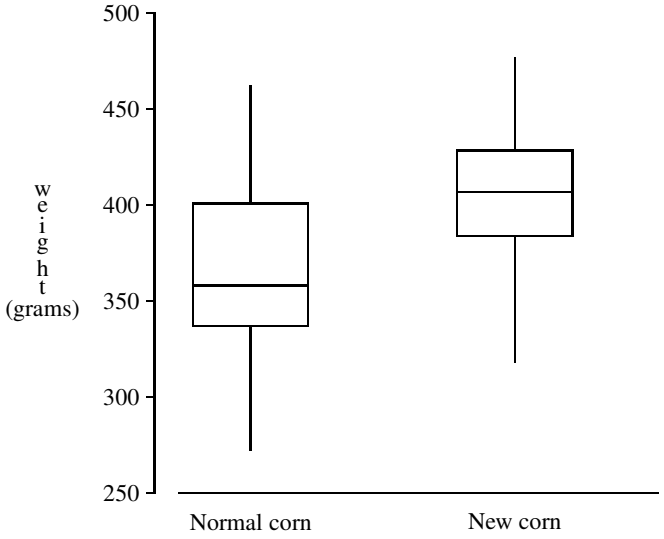
(D) Strongly skewed right, median is about 3 to 4, spread is from 1 to 7.

(E) The high-income group tends to have larger households than the low-income group.

11. What percent of the high-income households had a household size of 5 or more?

(A) about 10% (B) about 5% (C) about 13% (D) about 3% (E) about 85%

Use the following for the next 3 questions. Corn is an important animal food. Normal corn lacks certain amino acids, which are the building blocks for protein. Plant scientists have developed new corn varieties that have more of these amino acids. To test a new corn as an animal food, a group of 20 one-day-old male chicks was fed a ration containing the new corn. A control group of another 20 chicks was fed a ration that was identical except that it contained normal corn. Below are some summary statistics and comparative boxplots of the weight gains (in grams) after 21 days for the two groups.



Group	*Count*	*Mean*	*Median*	*StdDev*
Normal Corn	20	366.30*g*	358.0*g*	50.80*g*
New Corn	20	402.95*g*	406.5*g*	42.73*g*

12. How many of the chicks that were fed the new corn had a weight gain that was less than 406.5 grams?
(A) about 75% (B) about 15 (C) about 20 (D) about 10 (E) about 25%

13. If the Normal model was appropriate for the distribution of the weight gains for the chicks that were fed the new corn, what interval would we expect the central 95% of the weights to be found?
(A) 317.5 g to 488.4 g (B) 360.2 g to 445.7 g (C) 321.0 g to 492.0 g (D) 383.9 g to 422.1 g (E) 402.95 g

14. What do the data show about the effect of the new corn?

(A) There doesn't seem to be much of an effect in weight gains due to the new corn since the median is nearly equal to the mean.

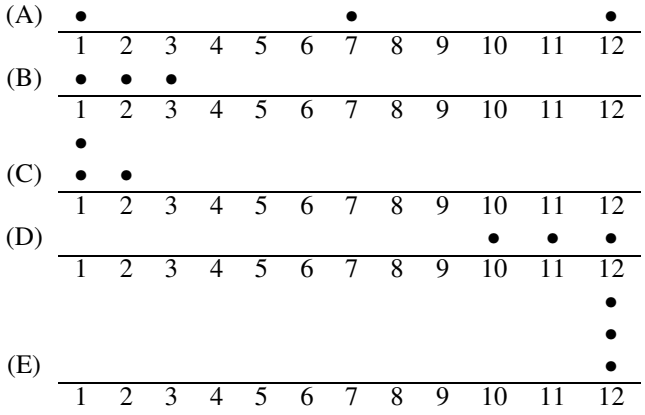
(B) An effect of the new corn cannot be evaluated since it is confounded with the normal corn.

(C) The effect of feeding the chicks the new corn is that the distribution of weight gains becomes normalized.

(D) 75% of the chicks in the normal corn group have weight gains that are smaller than the majority of the weight gains for the chicks in the new corn group. There is more variation in the weight gains for the chicks that were fed the normal corn.

(E) There is a positive correlation (r) between weight gains and corn.

15. This is a standard deviation contest. We have five sets of data that have been plotted with a dot representing an observation. Which of the following sets of three numbers has the largest possible standard deviation?



16. Which of the following statements is correct about the correlation coefficient?

    (A) Faculty who are good researchers tend to be poor teachers and vice-versa, so the correlation between teaching and research is 0.

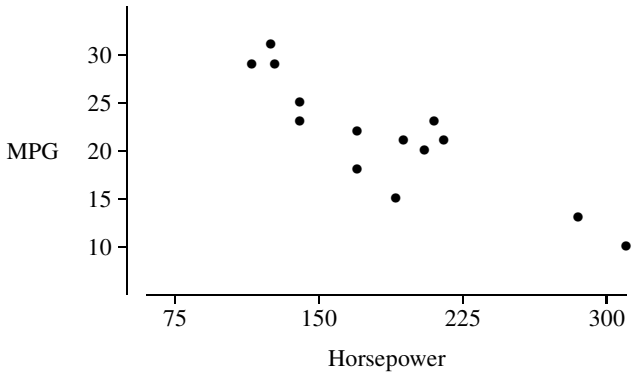
    (B) Women tend to be, on average, about 3.5 inches shorter than the men they marry, so the correlation between the heights of spouses must be negative.

    (C) A researcher finds the correlation between the shoe size of children and their score on a reading test to be 0.22. The researcher must have made a mistake since these two variables are clearly unrelated and must have correlation 0.

    (D) If people with larger heads tend to be more intelligent, then we would expect the correlation between head size and intelligence to be positive.

    (E) The correlation between planting rate and yield of corn was found to be $r = 0.23$ bushel.

Use the following for the next 2 questions. The scatterplot below displays the advertised horsepower ratings and expected gas mileage (mpg) for several vehicles.



17. Which of the following is a plausible value for the correlation between mpg and horsepower in this sample of vehicles?

    (A) -90% (B) 0.9 (C) 81% (D) -0.9 (E) -1.00

18. Which of the following phrases best describes the association between horsepower and mpg?

    (A) Strong and positive (C) Negative and no association

    (B) Strong and negative (D) Little or no association

    (E) Weak and positive

19. The auto insurance industry crashed some test vehicles into a cement barrier at speeds of 5 to 25 mph to investigate the amount of damage to the cars. They found a correlation of $r = 0.60$ between speed (MPH) and damage (in hundreds of \$). How can we interpret the correlation value?

    (A) 60% of the time predicted damage (\$) is equal to actual damage (\$).

    (B) The amount of damage seems to be positively related to the speed at which a car hits the barrier, with higher speeds tending to correspond to larger amounts of damage (\$).

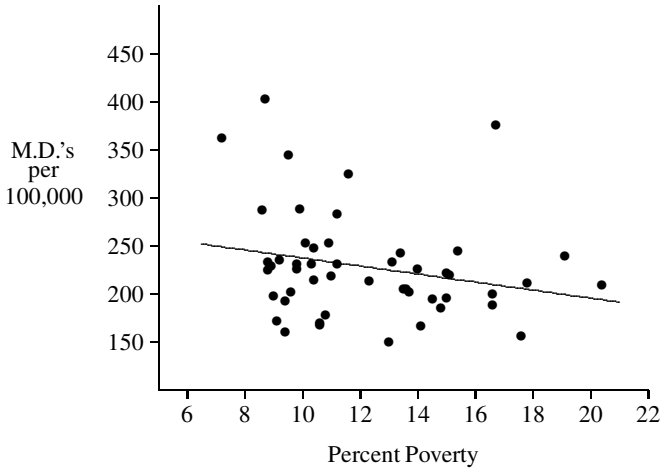
    (C) Predicted damage (\$) changes 600 dollars for every one MPH increase in speed.

    (D) We would expect the damage to be equal to 60% of the mean damage.

    (E) At 5 mph we would expect $(.6 * 5) \times \$100 = \$300$ damage and at 25 mph we would expect $(.6 * 25) \times \$100 = \$1500$ damage.

Use the following for the next 4 questions. The scatterplot below displays information for 50 states for the year 2000 with regard to the variables: **M.D.'s per 100,000**. The number of doctors per 100,000 residents **Percent Poverty**: The percentage of the population considered to be living in poverty. The correlation between the two variables is $r = -0.237$ and the least-squares regression line is

$$\texttt{M.D.'s per 100,000} = 279.3 - 4.175 \times \texttt{Percent Poverty}$$



20. Which of these options better interprets the value of the slope?

(A) For each additional percent in poverty the estimated number of M.D.'s per 100,000 goes down by 4.175 on the average.
(B) For each additional percent in poverty the estimated number of M.D.'s per 100,000 goes up by 4.175 on the average.
(C) For each additional M.D. the estimated percent in poverty goes down by 4.175% on the average.
(D) For each additional M.D. the estimated percent in poverty goes up by 4.175% on the average.
(E) For every 1 M.D. the percent in poverty goes down by 4.175%.

21. In the year 2000 the percent in poverty for Tennessee was 13.4. According to the model (or regression equation), how many doctors would we have expected per 100,000 people?

(A) About 279 (B) About 275 (C) About 223 (D) About 335 (E) About 250

22. Which of these statements is the best interpretation of r-Squared (r^2) in this example?

(A) The strength of the correlation between percent poverty and the number of M.D.'s per 100,000 people is 5.6%.
(B) 5.6% of the people living in poverty have enough M.D.'s
(C) Only 5.6% of the variability in the number of M.D.'s per 100,000 is explained by the percent of the population living in poverty.
(D) Only 5.6% of the M.D.'s live in poverty.
(E) Only 5.6% of the people living in poverty have no M.D.'s

23. In the year 2000 the District of Columbia had 23.5% in poverty and 702 M.D.'s per 100,000. If this data point was added to the scatterplot, it would be

(A) a residual.
(B) negatively correlated with the data.
(C) an outlier and influential observation.
(D) a weak influence on the least-squares regression line.
(E) a lurking variable.

24. Suppose a farmer wishes to work out the average milk yield of each cow type in his herd which consists of Ayrshire, Friesian, Galloway and Jersey cows. He divides up his herd into the four sub-groups and takes a sample from each. This is an example of

(A) a simple random sample.
(B) a multistage sample.
(C) an observational study.
(D) a stratified sample.
(E) an experiment.

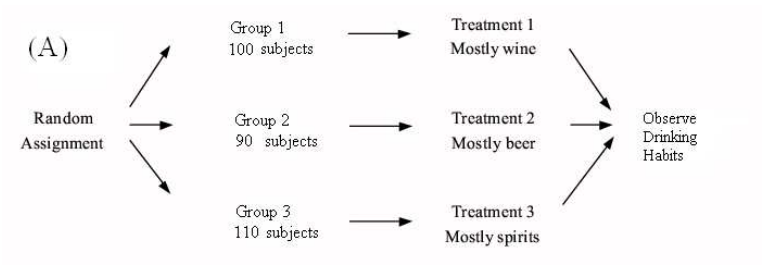
25. In a recent article it was reported that in a random sample of children in grades 2-4, a significant negative relationship was found between the amount of homework assigned and student attitudes. The amount of homework assigned is

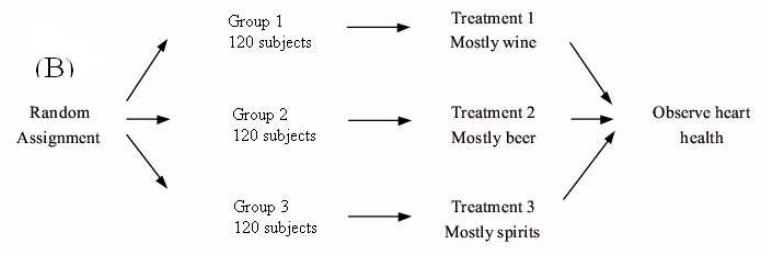
    (A) the response variable. (C) the explanatory variable.

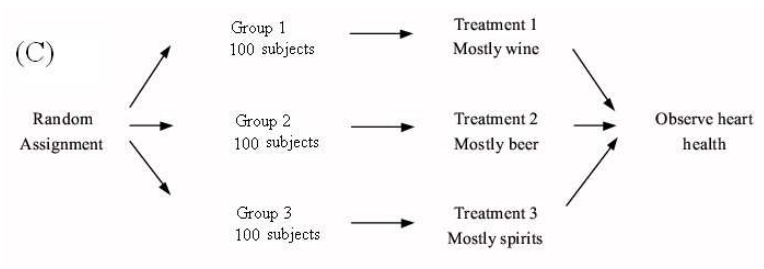
    (B) the lurking variable. (D) a categorical variable.

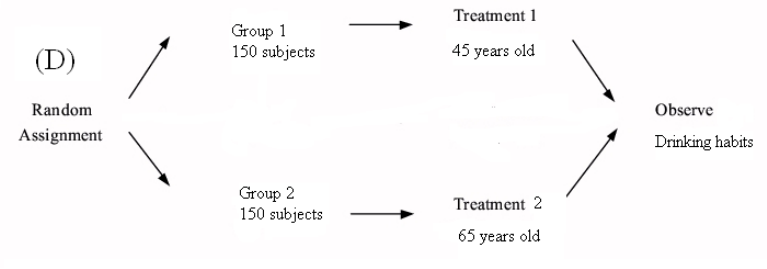
    (E) the confounding variable.

26. You have recruited 300 adults aged 45 to 65 who are willing to follow your orders about alcohol consumption over the next five years. You want to compare the effects of moderate drinking of just wine, just beer, or just spirits on heart disease. Outline the design of a completely randomized experiment to do this. (No such experiment has been done because subjects aren't willing to have their drinking regulated for years.) Which of the following diagrams best describes the given design?









Use the following for the next 2 questions. One hundred volunteers who suffer from severe depression are available for a study. Fifty are selected at random and are given a new drug that is thought to be particularly effective in treating severe depression. The other fifty are given an existing drug for treating severe depression. A psychiatrist evaluates the symptoms of all volunteers after four weeks in order to determine if there has been substantial improvement in the severity of the depression.

27. The factor in this study is

    (A) the use of randomization and the fact that this was a comparative study.

    (B) the extent to which the depression was reduced.

    (C) the use of a psychiatrist to evaluate the severity of depression.

    (D) the one hundred volunteers who suffer from severe depression.

    (E) the drug.

28. This study would be double blind if

    (A) neither the volunteers nor the psychiatrist knew which treatment any person had received.

    (B) neither drug had any identifying marks on it.

    (C) all volunteers were not allowed to see the psychiatrist nor the psychiatrist allowed to see the volunteers during the session during which the psychiatrist evaluated the severity of the depression.

    (D) the final results are "statistically significant."

    (E) the subjects did not know whether they received the new drug or the existing drug.

Use the following for the next 2 questions. A study published in the *New England Journal of Medicine* (Aug. 2001) suggested that it's dangerous to enter a hospital in Ontario, Canada on a weekend. Researchers tracked over 4 million emergency admissions to hospitals over a 10-year period and found that patients admitted on weekends had a much higher risk of death than those who went to the emergency room on weekdays.

29. What kind of study was this?

(A) an observational study (B) an experiment (C) a sample survey (D) a matched-pair design (E) a cluster design

30. The researchers said the difference in death rates was "statistically significant." What does this mean?

(A) The difference in death rates was important.

(B) The null hypothesis is true.

(C) The difference in death rates is higher than they would expect from sampling variability.

(D) The P-value of the test must have been large.

(E) Stay away from the emergency room on the weekends since it is causing deaths.

31. A national fitness chain is considering opening a new fitness club in Johnson City (JC). They contact a marketing research firm to help them determine if adults in JC would be interested in joining such a club. From a list of all residential addresses in JC, the firm selects a simple random sample of 100 and mails a brief questionnaire to each. The population of interest is

(A) adults in JC who are physically unfit. (C) the 100 addresses to which the survey was mailed.

(B) all adults in JC. (D) all residential addresses in JC.

(E) the new fitness club members.

32. To test the effects of drugs and alcohol on driving performance, 20 volunteers were asked to each take a driving test under three conditions: sober, after two drinks and after smoking marijuana. The order under which they took these was randomized. An evaluator watched them drive on a test course and rated their accuracy on a scale from 1 to 10, without knowing which condition they were under each time. What kind of study is this?

(A) an observational study (C) a sample survey

(B) a completely randomized experiment (D) a randomized block design

(E) a double-blind study

33. Over the past 50 years in the United States, there is a strong positive correlation between yearly beer sales and yearly per capita income. What does this mean?

(A) There is strong evidence to suggest that increasing a person's income will cause him or her to drink more beer.

(B) The explanatory variable (income) is indeed causing a change in the response variable (yearly beer sales.)

(C) People will drink when they are happy and also drink to drown their sorrows.

(D) Above average yearly beer sales are associated with below average yearly income.

(E) There is no causation. The association is probably explained by how the variables are both affected by other variables.

34. An educational software company wants to assess the usefulness of its software. It runs a poll on the Internet, asking users to indicate whether they like or dislike the software. Of 900 respondents, 610 said they liked the software. The results of the sample are probably

(A) biased, because it is a voluntary response sample.

(B) unbiased, because of the large sample size.

(C) unbiased, because it is a simple random sample.

(D) unbiased, but a larger sample should be used.

(E) a binomial experiment since the respondents either responded yes or no.

Use the following for the next 2 questions. A study of 928 women were asked about their smoking habits during pregnancy and then again five years later. The data are summarized in the table below.

		During Pregnancy: Yes	During Pregnancy: No
5 yrs. later	Yes	230	95
	No	41	562

35. What is the approximate probability that a randomly chosen woman smoked 5 years after pregnancy?
(A) 0.25 (B) 0.35 (C) 0.29 (D) 0.71 (E) 0.85

36. If a randomly selected woman smoked during pregnancy, what is the probability that she smoked 5 years after pregnancy?
(A) 0.35 (B) 0.85 (C) 0.25 (D) 0.29 (E) 0.71

Use the following for the next 2 questions. A majority of email messages are now "spam." Choose a spam email message at random. Here is the distribution of topics.

Topic	Adult	Financial	Health	Leisure	Products	Scams
Probability	0.145	0.162	0.073	0.078	0.210	0.142

37. What is the probability that a spam email does not concern one of these topics?
(A) 1 (B) 0.19 (C) 0 (D) -0.19 (E) 0.81

38. Wits End is particularly annoyed by spam offering "adult" content (that is, pornography) and "scams." What is the probability that a randomly chosen spam email falls into one or the other of these categories?
(A) $(0.145)(0.142) = 0.0206$ (C) $0.145 + 0.142 = 0.287$
(B) $0.287 - 0.0206 = 0.2664$ (D) Either 0.145 or 0.142
(E) $1 - 0.287 = 0.713$

39. Spell-checking software catches "nonword errors" that result in a string of letters that is not a word, as when "the" is typed as "teh." When undergraduates are asked to write a 250-word essay (without spell-checking), the number X of nonword errors has the following distribution:

Value of X	0	1	2	3	4
Probability	0.1	0.2	0.3	0.3	0.1

Find the probability of having no more than 2 nonword errors.
(A) 0.3 (B) 0.6 (C) 0.2 (D) 0.4 (E) 0.7

40. According to the Census Bureau, 10% of American adults (age 18 and over) are Hispanics. An opinion poll plans to contact an SRS of 1200 adults. What is the expected number of Hispanics in such a sample?
(A) 100 (B) 120 (C) 12000 (D) 10 (E) 2

41. A student takes an eight question true-false quiz and guesses on each question. Find the probability of passing if the lowest passing grade is six out of eight.
(A) 6/8 (B) 0.1094 (C) 50-50 (D) 0.1445 (E) 0.8555

42. The average age of cars owned by residents of a small city is 4 years with a standard deviation of 2.2 years. A simple random sample of 400 cars is to be selected, and the sample mean age of these cars is to be computed. What is the approximate probability that the average age of the 400 cars is less than 4.1 years old?
(A) 0.3183 (B) 0.1814 (C) 0.6817 (D) 0.9091 (E) 0.8186

43. The weather reporter predicts that there is a 90% chance of rain tomorrow for a certain region. What is meant by this phrase?

    (A) Rain occurs 90% of the time in this region.

    (B) It will rain 90% of the day tomorrow.

    (C) 90% of the time it rains on this date.

    (D) In circumstances "like this," rain occurs 90% of the time.

    (E) The occurences of rain is "truly random" and will occur 90% of the time.

44. The mean area of the several thousand apartments in a new development is advertised to be 1250 square feet. A tenant group thinks that the apartments are smaller than advertised. They hire an engineer to measure a sample of apartments to test their suspicion. Which of the following is the appropriate null hypothesis H_0 and alternative hypothesis H_a?

    (A) $H_0 : \mu = 1250$ $H_a : \mu < 1250$ (C) $H_0 : \bar{x} = 1250$ $H_a : \bar{x} < 1250$

    (B) $H_0 : \mu = 1250$ $H_a : \mu > 1250$ (D) $H_0 : p = 1250$ $H_a : p < 1250$

    (E) $H_0 : 1250$ $H_a :< 1250$

45. Statistics can help decide the authorship of literary works. Sonnets by a certain Elizabethan poet are known to contain an average of $\mu = 6.9$ new words (words not used in the poet's other works). Now a manuscript with 25 new sonnets has come to light, and scholars are debating whether it is the poet's work. The new sonnets contain an average of $\bar{x} = 8.78$ words not used in the poet's work. We expect poems by another author to contain new words, so to see if we have evidence that the new sonnets are not by our poet we test

    $$H_0 : \mu = 6.9 \;\; H_a : \mu > 6.9.$$

    Assume that the sonnets are a simple random sample from the population of sonnets. This condition is very important. The distribution of the number of new words is fairly symmetric with no outliers.

    Here is the Minitab output:

One-Sample T

Test of mu = 6.9 vs > 6.9

N	Mean	StDev	SE Mean	95% Lower Bound	T	P
25	8.7800	2.7000	0.5400	7.85612	3.48	0.001

    What do you conclude about the authorship of the new poems?

    (A) There is a .1% chance that the sonnets came from another author.

    (B) We would conclude that there is strong evidence that these 25 sonnets come from a population with a mean number of new words that is equal to 6.9, and thus we have evidence that the new sonnets are from our poet.

    (C) We would conclude that there is strong evidence that these 25 sonnets come from a population with a mean number of new words that is larger than 6.9, and thus we have evidence that the new sonnets are not by our poet.

    (D) Since the P-value is small we fail to reject H_0.

    (E) 95% of these sonnets have at least 7.85612 new words.

46. *Time* on July 9, 1990 reported on a survey of 1000 adult Americans who favor a law requiring a teenager to have their parents' consent before having an abortion. In the survey, 690 adults answered "yes." With 95% confidence, estimate the proportion of the adult Americans who would favor such a law.

    (A) $.690 \pm .05$ (B) $.690 \pm .214$ (C) .661 to .719 (D) .638 to .743 (E) 40% to 98%

47. 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 II error?

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

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

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

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

    (E) The P-value of the test must be smaller than α.

48. A recent poll was conducted to determine the percent of U.S. citizens that approve of the president's job performance. A random sample of 1006 citizens was drawn and 453 citizens said that they approve of his job performance. The margin of error was $\pm 3\%$ with 95% confidence. Which of the following statements is true?

    (A) An approximate 95% confidence interval for the percentage in the sample that approve of his job performance is 42% to 48%.

    (B) An approximate 95% confidence interval for the percentage of U.S. citizens that approve of his job performance is 42% to 48%.

    (C) We are 95% confident that 45% of the U.S. citizens approve of his job performance.

    (D) We can be 95% confident that 45% is between 42% and 48%.

    (E) 95% of the U.S. citizens approve of his job performance with a margin of error of $\pm 3\%$.

49. Insurance companies track life expectancy information to assist in determining the cost of life insurance policies. The insurance company will only increase their premium structure if there is evidence that people who buy their policies are living longer than 77 years on the average. For the following null and alternative hypothesis

    H_0 : `The average life expectancy of the insurance company's policy holders is 77 years.`
    H_a : `The average life expectancy of the insurance company's policy holders is more than 77 years.`

    which of the statements is a correct conclusion of the test if H_0 is rejected?

    (A) The insurance company should not increase their premiums.

    (B) The average life expectancy is less than 77 years.

    (C) The insurance company needs to increase their premiums.

    (D) Increase the premiums when the average age is 77 years.

    (E) The life expectancy of all policy holders is more than 77 years.

50. 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 sample size is small.

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

    (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.

51. The 2008 presidential election is approaching. We would like to estimate ahead of time what percent of the registered voters plans to vote for Candidate X. We plan to take a simple random sample from the list of registered voters in the state and ask them who they plan to vote for. How many people should we have in the sample if we want to estimate that percent with a margin of error of 3% and we want to feel 95% confident in our estimation?

(A) 33 (B) 534 (C) 1068 (D) 400 (E) 251

52. How are the smoking habits of students related to their parents' smoking? Here are data from a survey of 5375 students in eight Arizona high schools. Students were asked the following questions.

- Do you smoke? YES NO
- Do any of your parents smoke? BOTH ONE NONE

Expected counts are printed below observed counts.

Parents smoke	Student smokes	Student does not smoke	Total
Both	400 332.49	1380 1447.51	1780
One	416 418.22	1823 1820.78	2239
None	188 253.29	1168 1102.71	1356
Total	1004	4371	5375

$$Chi - Sq = 37.566, DF = 2, P - Value = 0.000$$

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

(A) Smoking behavior of students is definitely associated with the smoking habits of their parents. If parents smoke, adolescents are more likely to not smoke.

(B) Smoking behavior of students is definitely associated with the smoking habits of their parents. If parents smoke, adolescents are more likely to smoke.

(C) Smoking behavior of students is definitely independent of the smoking behavior of their parents.

(D) There is no association what so ever between the smoking habits of parents and adolescents.

(E) The test is inconclusive because the number of degrees of freedom is 2.

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 negative 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) 0.99000 (B) 0.984075 (C) 0.000015 (D) 0.015925 (E) 0.9954

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