

6 MULTIPLE-CHOICE ITEM TEST BANK

Most of these items are taken from examinations given at Purdue University. I thank my colleagues Stephen Lalley, George McCabe, and Stephen Samuels for their contributions. The items reflect varying individual tastes. You may wish to update or modify some items.

6.1 Examination I: Chapters 1 to 9

The next four questions concern this situation: Does using a cell phone while driving make an accident more likely? Researchers compared telephone company and police records to find 699 people who had cell phones and were also involved in an auto accident. Using phone billing records, they compared cell phone use in the period of the accident with cell phone use the same period on a previous day. Result: the risk of an accident was 4 times higher when using a cell phone.

1. This study is
 - (a) a randomized comparative experiment.
 - (b) an experiment, but without randomization.
 - (c) a simple random sample.
 - (d) an observational study, but not a simple random sample.
2. The explanatory variable in this study is
 - (a) whether or not the subject had an auto accident.
 - (b) whether or not the subject was using a cell phone.
 - (c) the risk of an accident.
 - (d) whether or not the subject owned a cell phone.
3. The researchers also recorded the manufacturer of each subject's cell phone (Motorola, Nokia, and so on). This variable is
 - (a) categorical.
 - (b) quantitative.
 - (c) response.
 - (d) not valid.
4. An example of a lurking variable that might affect the results of this study is:
 - (a) whether or not the subject had an auto accident.
 - (b) whether or not the subject was using a cell phone.
 - (c) whether or not the subject was talking to a passenger in the car.
 - (d) whether or not the subject owned a cell phone.

The next three questions concern this situation: A researcher studied whether friendship affects the prices people set for selling things. She had 80 students all imagine selling the same six items. Half the students, assigned at random, imagined selling the items to a stranger. The other half imagined selling the items to a friend. Then the students were asked to set the price of the items. On the average, those selling to friends set lower prices than those selling to strangers.

5. This study is
- (a) a randomized comparative experiment.
 - (b) an experiment, but without randomization.
 - (c) a simple random sample.
 - (d) an observational study, but not an SRS.
6. This study applies the principle of *replication* in
- (a) assigning subjects *at random*.
 - (b) having the students imagine selling *six* items.
 - (c) using *80 students* rather than just a handful.
 - (d) *comparing* two treatments (selling to friends or strangers).
7. To randomly assign 40 of the 80 students to the “friends” group, we must first label them, then use the table of random digits. Which of these are correct ways to label?
- (a) Label the 80 students 01 to 80.
 - (b) Label the 80 students 00 to 79 .
 - (c) Label the 40 students in the “friends” group 01 to 40.
 - (d) All three are correct.
 - (e) (a) and (b) are correct but (c) is not.
8. Scotland is considering independence from England. An opinion poll showed that 51% of Scots favor “independence.” Another poll taken at the same time showed that only 34% favored being “separate” from England. The reason these results differ by so much is that
- (a) samples will usually differ just by chance due to random sampling.
 - (b) the wording of questions has a big effect on poll results.
 - (c) more followup efforts reduced the nonresponse rate of the second poll.
 - (d) the sample sizes are different, so the margins of error are different.
9. The basic ethical requirements for any study of human subjects are
- (a) comparison, randomization, and replication.
 - (b) approval by a review board, informed consent, confidentiality of data.
 - (c) subjects are anonymous, subjects are randomly chosen, subjects cannot be harmed.
 - (d) data production, data analysis, inference.

This is a “fill in the blanks” exercise. The next three questions ask you to fill in the blanks in this statement:

BLANK A try to gather data without influencing the responses. **BLANK B**, on the other hand, impose some **BLANK C** in order to observe the response.

10. **BLANK A** should read
- (a) matched pairs designs.
 - (b) observational studies.

- (c) explanatory variables.
 - (d) experiments.
11. **BLANK B** should read
- (a) explanatory variables.
 - (b) observational studies.
 - (c) sample surveys.
 - (d) experiments.
12. **BLANK C** should read
- (a) randomization. (b) confounding. (c) response variable. (d) treatment.

This is a “fill in the blanks” exercise. The next three questions ask you to fill in the blanks in this statement:

BLANK A in a sampling method means that the sample results will systematically misrepresent the population in the same way when we take repeated samples. For example, if we contact only people listed in telephone directories, the sample suffers from **BLANK B**. If some people chosen for the sample refuse to participate, the sample suffers from **BLANK C**. Both **BLANK B** and **BLANK C** are common sources of **BLANK A**.

13. **BLANK A** should read
- (a) bias
 - (b) random sampling error
 - (c) high variability
 - (d) imprecise measurement
14. **BLANK B** should read
- (a) nonresponse (b) voluntary response (c) undercoverage (d) double-blindness
15. **BLANK C** should read
- (a) nonresponse (b) voluntary response (c) undercoverage (d) double-blindness
16. The Census Bureau proposed to use statistical sampling to supplement the door to door count for the 2000 Census. The Supreme Court ruled that
- (a) sampling would reduce bias, so it can be used in the Census
 - (b) sampling is against the law, so it cannot be used at all in the Census
 - (c) sampling is not an accepted scientific method, so it cannot be used at all in the Census
 - (d) sampling cannot be used to say how many seats in Congress each state has, but can be used for all other Census purposes
17. The student newspaper runs a weekly question that readers can answer online or by campus mail. One question was “Do you think the college is doing enough to provide student parking?” Of the 136 people who responded, 79% said “No.” The number 79% is a
- (a) margin of error (b) parameter (c) reliability (d) statistic

18. If we applied the quick method to the poll in the previous question, we would obtain this 95% confidence interval:
- (a) $79\% \pm 11.7\%$ (b) $79\% \pm 7.3\%$ (c) 136 ± 79 (d) $79\% \pm 8.6\%$
19. The newspaper poll in the previous problem does not give a trustworthy estimate of student opinion because of
- (a) bias due to nonresponse
(b) bias due to undercoverage
(c) bias due to the suggestive wording of the question
(d) bias due to relying on voluntary response
20. When we say that the newspaper poll is biased, we mean that
- (a) repeated polls would miss the truth about the population in the same direction
(b) repeated polls would give results that are very different from each other
(c) the question asked shows gender or racial bias
(d) faculty may have a different opinion from students
21. All statistical studies should follow the principle of confidentiality. This means that
- (a) information about individual subjects is never made public
(b) the identities of the subjects are not known even to the researchers
(c) information about who paid for the study is never made public
(d) the results and conclusions of the study are never made public

The next five questions concern this setting: Does coaching raise SAT scores? Because many students score higher on a second try even without coaching, a study looked at an SRS of 4200 students who took the SAT twice. Of these, 500 had taken coaching courses between their two attempts at the SAT. The study compared the average increase in scores (out of the total possible score of 1600) for students who were coached with the average increase for students who were not coached.

22. This study compares two groups, but it is not an experiment because
- (a) there is no explanatory variable
(b) there is no response variable
(c) random selection was not used to produce the data
(d) each student chose whether or not to take a coaching course
23. The report of the SAT study says, "With 95% confidence, we can say that students who are coached raise their average SAT scores by between 19 and 38 points more than students who are not coached." By "95% confidence" we mean
- (a) 95% of all students will increase their score by between 19 and 38 points if they are coached
(b) we are certain that the average increase is between 19 and 38 points
(c) we got the 19 to 38 point range by using a method that would give a correct answer in 95% of all samples

- (d) 95% of all adults would believe the statement
24. An earlier study of 1000 students found that the difference between the average increases in SAT scores for coached and uncoached students was not statistically significant. This means that
- (a) we cannot make a 95% confidence statement
 - (b) the increase makes no difference in getting into college
 - (c) a difference of the size observed in this study could easily occur just by chance even if coaching really has no effect
 - (d) the study was badly designed
25. The SAT study doesn't show that coaching *causes* a greater increase in SAT scores. One plausible explanation for the study finding is
- (a) more students were not coached than were coached
 - (b) 4200 students is too few to draw a conclusion
 - (c) students who chose coaching were different (in particular, they were richer) than students who had no coaching
 - (d) there was no random selection
26. We are 95% confident that the difference between average scores for coached and uncoached students is between 19 and 38 points. If we want to be 99% confident, the range of points would be
- (a) wider, because higher confidence requires a larger margin of error
 - (b) narrower, because higher confidence requires a smaller margin of error
 - (c) wider, because higher confidence requires a smaller margin of error
 - (d) narrower, because higher confidence requires a larger margin of error
27. A study of a drug to prevent hair loss showed that 86% of the men who took it maintained or increased the amount of hair on their heads. But so did 42% of the men in the same study who took a placebo instead of the drug. This is an example of
- (a) a sampling error: the study should not have included men whose hair grew without the drug
 - (b) the placebo effect: a treatment often works if you believe that it will work
 - (c) an error in calculating percentages
 - (d) failure to use the double-blind idea
28. The Dow Jones Industrial Average (DJIA) is the most common measure of stock market prices. Suppose that the DJIA starts at 9000 points and drops 300 points. This is a decrease of
- (a) 0.033% (b) 3.3% (c) 33.3% (d) 333%
29. A 300 point drop in the DJIA was a big drop when the DJIA was at 2000 and a much smaller drop when the DJIA reached 9000. The percent by which stock prices fall is a more meaningful measure. The lesson here is that
- (a) rates are often more meaningful than counts

- (b) it is easy to make a mistake calculating a percent
 - (c) the DJIA is a categorical variable.
 - (d) confidentiality has been violated
30. The telephone company says that 62% of all residential phone numbers in Los Angeles are unlisted. A telephone survey contacts a random sample of 1000 Los Angeles telephone numbers, of which 58% are unlisted. In this setting,
- (a) 62% is a parameter and 58% is a statistic
 - (b) 58% is a parameter and 62% is a statistic
 - (c) 62% and 58% are both parameters
 - (d) 58% and 62% are both statistics
31. The monthly government sample survey that produces the unemployment rate and other data about employment and earnings is called
- (a) the National Household Survey
 - (b) the General Social Survey
 - (c) the Survey of Employment
 - (d) the Current Population Survey
32. On January 6, just after the National Basketball Association labor dispute was settled, the Gallup Poll asked a random sample of 671 adults “How much have you missed watching NBA basketball since the dispute started?” 60% answered “Not at all.” Gallup says that the margin of error for this result is plus or minus 4 percentage points. This means that
- (a) we can be 95% confident that between 56% and 64% of all adults did not miss watching NBA games
 - (b) we can be certain that between 56% and 64% of all adults did not miss watching NBA games
 - (c) in many samples, all the results would fall between 56% and 64%
 - (d) we are 95% confident that if we take one more sample the result will fall between 56% and 64%
33. Gallup conducts its polls by telephone, so people without phones are always excluded from the Gallup sample. Any errors in the final result due to excluding people without phones
- (a) are included in Gallup’s announced margin of error
 - (b) are in addition to the announced margin of error
 - (c) can be ignored, because these people are not part of the population
 - (d) can be ignored, because this is a nonsampling error

Here is a shortened version of the summary of a paper in the *New England Journal of Medicine* that compares the fate of heart attack victims in three types of hospitals. (“Acute myocardial infarction” is medical jargon for a heart attack.) The next four questions concern this summary.

Background. "America's Best Hospitals," published annually by *U.S. News & World Report*, assesses the quality of hospitals. It is not known whether patients admitted to hospitals ranked at the top in cardiology have lower short term mortality from acute myocardial infarction than those admitted to other hospitals.

Methods. Using data from the Cooperative Cardiovascular Project on 149,177 elderly Medicare beneficiaries with acute myocardial infarction in 1994 or 1995, we examined the care and outcomes of patients admitted to three types of hospitals: those ranked high in cardiology (top ranked hospitals); hospitals not in the top rank that had onsite facilities for cardiac catheterization, coronary angioplasty, and bypass surgery (similarly equipped hospitals); and the remaining hospitals (non-similarly equipped hospitals). We compared 30-day mortality . . .

Results. Admission to a top ranked hospital was associated with lower adjusted 30-day mortality (odds ratio, 0.87; 95 percent confidence interval, 0.76 to 1.00).

34. The design of this study is
- (a) a completely randomized experiment
 - (b) a randomized block experiment
 - (c) a multistage national sample survey
 - (d) an observational study that compares several treatments
35. The explanatory and response variables are:
- (a) explanatory = elderly Medicare beneficiaries; response = 30-day mortality
 - (b) explanatory = type of hospital; response = 30-day mortality
 - (c) explanatory = 30-day mortality; response = type of hospital
 - (d) explanatory = type of hospital; response = heart attack or not
36. The "odds ratio" compares two death rates. So the finding "odds ratio 0.87" means that on the average the chance of dying at a highly ranked hospital is only 87% as great as at other hospitals. The summary then gives a confidence statement about this odds ratio. "95 percent confidence" means that
- (a) the interval 0.76 to 1.00 came from a method that catches the true ratio in 95% of all samples
 - (b) 95% of all the hospitals had a mortality rate between 0.76 and 1.00
 - (c) the mortality rate at highly ranked hospitals varies between 76% and 100% of the rate at other hospitals
 - (d) we can be between 76% and 100% confident that the study results are correct
37. The population about which the study draws conclusions is
- (a) all adult residents of the U.S.
 - (b) all heart attack victims
 - (c) elderly Medicare beneficiaries who are heart attack victims
 - (d) doctors 40 years old or older

38. A psychologist says that scores on a test for “authoritarian personality” can’t be trusted because the test counts religious belief as authoritarian. The psychologist is attacking the test’s
- (a) validity
 - (b) reliability
 - (c) margin of error
 - (d) confidence level
39. Confounding often defeats attempts to show that one variable causes changes in another variable. Confounding means that
- (a) this was an observational study, so cause and effect conclusions are not possible
 - (b) the effects of several variables are mixed up, so we cannot say which is causing the response
 - (c) we don’t know which is the response variable and which is the explanatory variable
 - (d) we would get widely varied results if we repeated the study many times
40. In a table of random digits,
- (a) each pair of digits 00, 01, 02, . . . , 99 appears exactly once in any row of the table
 - (b) any pair of entries is equally likely to be any of the 100 possible pairs 00, 01, 02, . . . , 99
 - (c) a specific pair such as 00 cannot be repeated until all other pairs have appeared
 - (d) the pair 00 can appear, but 000 is not random and can never appear in the table

A recent Gallup poll asked “Do you consider pro wrestling to be a sport, or not?” Of the people asked, 81% said “No.” Here is what Gallup says about the accuracy of this poll:

The results below are based on telephone interviews with a randomly selected national sample of 1,028 adults, 18 years and older, conducted August 16–18, 1999. For results based on this sample, one can say with 95 percent confidence that the maximum error attributable to sampling and other random effects is plus or minus 3 percentage points. In addition to sampling error, question wording and practical difficulties in conducting surveys can introduce error or bias into the findings of public opinion polls.

The next eight questions concern this situation.

41. The population for this poll appears to be
- (a) all adults, 18 years and older.
 - (b) 95% of adults, 18 years and older.
 - (c) the 1028 adults who were interviewed.
 - (d) 95% of the 1028 adults who were interviewed.
42. The sample for this poll is
- (a) all adults, 18 years and older.
 - (b) 95% of adults, 18 years and older.
 - (c) the 1028 adults who were interviewed.
 - (d) 95% of the 1028 adults who were interviewed.
43. In Gallup’s statement, “95% confidence” means

- (a) We know that 95% of all adults would give the same answer that this poll found.
 - (b) If Gallup repeated this poll many times, 95% of all the polls would find that 81% of the people interviewed think pro wrestling is not a sport.
 - (c) This poll is one of the 95% of all Gallup polls that give correct results.
 - (d) If Gallup repeated this poll many times, 95% of the results would be within plus or minus three percentage points of the truth about the population.
44. Which of these sources of possible errors in the poll result are covered by the margin of error of plus or minus three points?
- (a) The poll left out people without telephones.
 - (b) Some people chosen for the sample refused to answer.
 - (c) Some people did not tell the truth because they were embarrassed to admit they like pro wrestling.
 - (d) None of these.
 - (e) (b) and (c) but not (a).
45. Which of these sources of possible errors in the poll result are examples of nonsampling errors?
- (a) The poll left out people without telephones.
 - (b) Some people chosen for the sample refused to answer.
 - (c) Some people did not tell the truth because they were embarrassed to admit they like pro wrestling.
 - (d) None of these.
 - (e) (b) and (c) but not (a).
46. Which of these is a correct confidence statement based on this Gallup poll?
- (a) We are 95% confident that between 78% and 84% of all adults think that pro wrestling is not a sport.
 - (b) We are 95% confident that between 78% and 84% of the 1028 people interviewed think that pro wrestling is not a sport.
 - (c) There is a 95% chance that the opinions of the 1028 people interviewed fairly represent the opinions of all adults.
 - (d) In many samples, 95% will find that 81% of the people interviewed think pro wrestling is not a sport.
47. In all, 151 people in the sample of 1028 adults said they were fans of pro wrestling. Gallup asked these 151 people, "Who is your favorite pro wrestler?" Twenty-four percent said Steve Austin was their favorite. Gallup gave a margin of error for this result. This margin of error is
- (a) plus or minus three percentage points, just as for the overall poll.
 - (b) less than plus or minus three points because the sample for this question is smaller.
 - (c) greater than plus or minus three points because the sample for this question is smaller.
 - (d) less than plus or minus three points because the population of wrestling fans is smaller than the population of all adults.

48. Applying the quick method, we find that the margin of error for 95% confidence changes as follows when the sample size drops from 1028 to 151:
- (a) 8.1% to 3.1%. (b) 3.1% to 8.1%. (c) 3% to 2%. (d) 3% to 5%.

The next six questions concern this situation: Want to stop smoking? Nicotine patches may help, and so may taking a drug that fights depression. A report in a recent issue of the *New England Journal of Medicine* describes a study of what works best. Here is part of the summary:

Use of nicotine replacement therapies and the antidepressant bupropion helps people stop smoking. We conducted a double-blind, placebo-controlled comparison of sustained-release bupropion (244 subjects), a nicotine patch (244 subjects), bupropion and a nicotine patch (245 subjects), and placebo (160 subjects) for smoking cessation.

Results. The abstinence rates at 12 months were 15.6 percent in the placebo group, as compared with 16.4 percent in the nicotine patch group, 30.3 percent in the bupropion group, and 35.5 percent in the group given bupropion and the nicotine patch.

49. How many treatments did this experiment compare?
- (a) two. (b) three. (c) four.
(d) can't tell from the information given.
50. The response variable in this experiment is
- (a) the combination of drug (bupropion or placebo) and nicotine patch.
(b) 893 people who want to quit smoking.
(c) bupropion.
(d) whether or not a subject was able to abstain from smoking for a year.
51. One group received a placebo. Why not just give this group no treatment at all?
- (a) It is not ethical to give no treatment at all in this setting.
(b) Just thinking you are getting a treatment may have an effect, and we want to see if the real treatments do better than this.
(c) A placebo is the same thing as no treatment at all.
(d) Subjects would be disappointed if not given a pill.
52. The experiment was "double-blind." This means that
- (a) neither the subjects nor the people who worked with them knew whether they were taking bupropion or placebo.
(b) the subjects did not know that the treatments were intended to reduce their smoking.
(c) the subjects did not know whether they were taking bupropion or placebo.
(d) subjects were not allowed to see cigarette ads.
53. The subjects of the study included both men and women. All of the subjects were randomly assigned among all the treatments with one use of the table of random digits. This design is called

- (a) a simple random sample
 - (b) a completely randomized design.
 - (c) a matched pairs design.
 - (d) a block design.
54. The subjects of the study included both men and women. If the men and women were separately assigned to treatments, using the table of random digits twice, the design would be
- (a) a simple random sample
 - (b) a completely randomized design.
 - (c) a matched pairs design.
 - (d) a block design.
55. Studies with human subjects must be approved in advance by an Institutional Review Board. The Board's main purpose is to
- (a) be sure that the study is scientifically interesting.
 - (b) be sure that the study uses good statistical techniques.
 - (c) be sure that the study will have some benefit to society.
 - (d) be sure that the subjects of the study are safe.
56. Each month, the head of the Bureau of Labor Statistics appears before Congress. Her most recent testimony (September 3, 1999) began, "Good morning. I am pleased to have this opportunity to discuss the August employment and unemployment estimates that we released this morning. The unemployment rate, at 4.2 percent in August, was little changed over the month . . ." The large sample survey that produces monthly data on employment and unemployment is called the
- (a) Current Population Survey.
 - (b) General Social Survey.
 - (c) Federal Employment Survey.
 - (d) Gallup Poll.
57. An article in *USA Today* on August 9, 1999 said that "a nationally representative survey of 3,617 Americans" shows that "People who attend religious services at least once a month live significantly longer than those who don't." But churchgoers are more likely to be nonsmokers and to have good health habits. Does attending religious services cause longer life?
- (a) Yes, because this study is a comparative experiment.
 - (b) We can't say: the effects of going to church are confounded with the effects of other behavior such as not smoking.
 - (c) Yes, because a sample survey with a large sample size will have a small margin of error.
 - (d) No, we can be sure that only physical habits like not smoking can affect how long we live.

The next six questions concern this situation: Do doctors in managed care plans give less charity care? Researchers chose 60 communities at random, then chose doctors at random in each community. In all, they interviewed 10,881 doctors. Overall, 77.3% of the doctors said they had given some care free or at reduced rates because of the patient's financial need in the month before the interview. Doctors who received at least 85% of their practice income from managed care plans were significantly less likely than other doctors to provide charity care.

58. This study is
- (a) a randomized comparative experiment.
 - (b) an experiment, but there is no control group.
 - (c) a census.
 - (d) a sample survey.
59. The study design appears to be
- (a) a completely randomized experimental design.
 - (b) a block experimental design.
 - (c) a simple random sample.
 - (d) a multistage random sample.
60. The number 77.3% is
- (a) a statistic, because it describes a sample.
 - (b) a statistic, because it describes a population.
 - (c) a parameter, because it describes a sample.
 - (d) a parameter, because it describes a population.
61. The phrase “significantly less likely” means that when we compare the charity work of doctors with more than 85% of their practice in managed care with other doctors,
- (a) the difference in charity work is very large.
 - (b) the difference in charity work is so large that it would rarely occur just by chance in choosing a sample.
 - (c) the difference in charity work is large enough to affect doctors' income.
 - (d) the difference in charity work is less than we would expect just by chance in choosing a sample.
62. Some doctors who did not give any charity care may say that they did. If so, the study suffers from
- (a) a large margin of error to take account of possible failure to be truthful.
 - (b) sampling errors that require a better random sampling design.
 - (c) bias: the sample result will systematically underestimate the true percent of doctors who give charity care.
 - (d) bias: the sample result will systematically overestimate the true percent of doctors who give charity care.
63. For a simple random sample of size 10,881, the margin of error for 95% confidence is about

- (a) $\pm 9.6\%$. (b) $\pm 3\%$. (c) $\pm 0.96\%$. (d) $\pm 0.0096\%$.
64. A study of the effect of government job training programs finds that the pay of workers after training is higher than it was before training. A critic points out that workers often enroll for training when their pay has recently dipped. So the effect of training in raising pay is mixed up with the fact that pay would often rise when we measure from a low point. The statistical term for this effect is
- (a) confounding (b) control (c) nonresponse (d) stratification
65. In January of 1997, the price of Intel common stock rose from \$131 per share to \$162 per share. (Intel makes the processors for the computers you have been happily using.) What percent increase is this?
- (a) 19.1% (b) 23.7% (c) 80.9% (d) 123.7%
66. A Census Bureau report on the income of Americans says that with 95% confidence the median income of all U.S. households in 1997 was \$37,005 with a margin of error of $\pm \$342$. This means that
- (a) 95% of all households had incomes in the range $\$37,005 \pm \342 .
- (b) we can be sure that the median income for all households in the country lies in the range $\$37,005 \pm \342 .
- (c) 95% of the households in the sample interviewed by the Census Bureau had incomes in the range $\$37,005 \pm \342 .
- (d) the Census Bureau got the result $\$37,005 \pm \342 using a method that will cover the true median income 95% of the time when used repeatedly.
67. Suppose that many of the households asked their income by the Census Bureau give an answer that is too low because they fear that their answer will go to the Internal Revenue Service.
- (a) This is a sampling error that causes bias.
- (b) This is a sampling error that increases variability.
- (c) This is a nonsampling error that causes bias.
- (d) This is a nonsampling error that increases variability.
68. In fact, the Census Bureau never shares information about individuals with the IRS. To do so would violate a basic requirement of data ethics, namely
- (a) confidentiality of individual data.
- (b) informed consent by all subjects.
- (c) prior approval by an institutional review board.
- (d) avoid bias in sampling procedures.
69. The drug manufacturer Merck recently stopped testing a promising new drug to treat depression. It turned out that in a randomized, double-blind trial a dummy pill did almost as well as the new drug. The fact that many people respond to a dummy treatment is called
- (a) confounding. (b) nonresponse. (c) comparison. (d) the placebo effect.
70. When you drop your pencil point blindly into the middle of a table of random digits, what is the chance that the three digits to the right of where you land will be 999?

- (a) 1 in 100, because every three-digit group has the same chance to come up.
 - (b) 1 in 1000, because every three-digit group has the same chance to come up.
 - (c) no chance, because 999 is not a random group of digits.
 - (d) can't say—it is completely random.
71. In one of the first attempts to discover the speed of light, Simon Newcomb in 1882 made 66 measurements of the time light takes to travel between the Washington Monument and his laboratory on the Potomac River. Why did Newcomb repeat his measurement 66 times and then take the average of the 66 as his final result?
- (a) Averaging several measurements reduces any bias that is present in his instruments.
 - (b) The average of several measurements is more reliable (less variable) than a single measurement.
 - (c) Even if a measuring process is not valid, averaging several measurements made by this process will be valid.
 - (d) Both (a) and (b) but not (c).
 - (e) All of (a), (b), and (c).
72. A psychologist wants to know if adults with normal vision can be fooled by a certain optical illusion. She recruits 50 students from her PSY 120 class and finds that 42 of them are fooled by the illusion. The population in this study is
- (a) the 42 students who were fooled.
 - (b) the 50 students who served as subjects.
 - (c) all students in the PSY 120 class.
 - (d) all adults with normal vision.
73. As the study in the previous question illustrates, the biggest potential weakness of experiments is
- (a) they do not give good evidence for cause and effect.
 - (b) they only work when we can give a placebo.
 - (c) it can be hard to generalize conclusions beyond the actual subjects to a wider population.
 - (d) informed consent is often not possible.
74. Professor Iconu has developed a new college entrance test. Any such test must have several versions because some people take the test more than once. Unfortunately, it turns out that the same person often gets very different scores depending on which version of the test is offered. The test suffers from
- (a) large bias. (b) confounding. (c) large sampling errors. (d) low reliability.
75. The most important advantage of experiments over observational studies is
- (a) a well designed experiment can give good evidence that the treatments actually cause the response.
 - (b) an experiment can compare two or more groups.
 - (c) we can use randomization to avoid bias in designing an experiment.

- (d) we can study the relationship between two or more explanatory variables.
76. You might try to measure how rich a person is by looking at the car they drive. In fact, driving a fancy car has little to do with income (most luxury cars are leased). In statistical terms, measuring income by car model is
- (a) not reliable. (b) not valid. (c) biased. (d) not precise.
77. Your statistics recitation has 30 students. You want to call an SRS of 5 students from your recitation to ask where they use a computer for the online exercises. You label the students 01, 02, . . . , 30. You enter the table of random digits at this line:

14459 26056 31424 80371 65103 62253 22490 61181

- Your SRS contains the students labeled
- (a) 14, 45, 92, 60, 56
(b) 14, 31, 03, 10, 22
(c) 14, 03, 10, 22, 22
(d) 14, 03, 10, 22, 06
(e) 14, 03, 10, 22, 11
78. You take an SRS of size 500 from the 37,000 students at Purdue University. You then take an SRS of size 500 from the 4,400,000 adults in the state of Indiana. The margin of error in a 95% confidence statement for the Indiana sample is
- (a) the same as for the Purdue sample because both are samples of size 500.
(b) smaller than for the Purdue sample because the population is much larger.
(c) larger than for the Purdue sample because the population is much larger.
(d) either larger or smaller than for the Purdue sample because it changes at random when we take a sample.
79. Increasing the size of an SRS has these beneficial effects:
- (a) the bias of the sample is reduced relative to smaller SRSs.
(b) the margin of error is smaller than it is for smaller SRSs.
(c) nonsampling errors become less important
(d) (a) and (b) but not (c).
(e) all of (a), (b), and (c).
80. When we take a census, we attempt to collect data from
- (a) a stratified random sample
(b) every individual selected in a simple random sample
(c) every individual in the population
(d) a voluntary response sample
(e) a convenience sample
81. A table of random numbers is used to select 30 students from a statistics class to rate a statistics video. These 30 students are

- (a) the sampling frame
- (b) the population
- (c) a simple random sample of the class
- (d) a census
- (e) a voluntary response sample

82. A table of random numbers is used to select 30 students from a statistics class to rate a statistics video. The ratings that these students give are used to estimate the ratings that would be given if the entire class were asked to rate the video. The average of the ratings of all students in the class is
- (a) a population parameter
 - (b) a convenience sample
 - (c) a census
 - (d) the population
 - (e) a statistic that is an unbiased estimate of the class rating

83. An instructor has five sections of a course: A, B, C, D, and E. She wants to randomly select three sections for a special teaching evaluation. She labels the classes as follows: A = 1, B = 2, C = 3, D = 4 and E = 5. She starts at the beginning of this list of random digits:

15689 14227 06565 14374

Which classes did she select?

- (a) A, E, and A
 - (b) A and D
 - (c) A, B, and C
 - (d) B, C, and D
 - (e) A, D, and E
84. In a table of 500 random digits
- (a) the number one will appear exactly 50 times
 - (b) the number one will appear approximately 10 times
 - (c) the numbers from 1 to 10 are equally likely
 - (d) the chance that the first number is one is the same as the chance that the first number is two
 - (e) the average of these numbers will be 5
85. For a sample to be a simple random sample of size n ,
- (a) the variability must be small
 - (b) n must be a large number
 - (c) every item in the population must be selected
 - (d) every collection of n individuals must have the same chance to be the sample actually chosen

- (e) the size of the population must be smaller than n
86. Which of the following is correct
- (a) parameters describe population characteristics
 - (b) parameters describe sample characteristics
 - (c) the population is a subset of the sample
 - (d) statistics must be based on a simple random sample
87. If we take many simple random samples from the same population, we expect
- (a) the same values of the statistic for each sample
 - (b) the values of the statistic will vary from sample to sample
 - (c) a different value of the parameter for each sample
 - (d) a problem with voluntary response
 - (e) a problem with bias
88. Suppose that we take many simple random samples of size 20 from a large class and for each sample we compute the average height of the students in the sample. Which of the following statements is true?
- (a) the sample means are parameters
 - (b) the mean height of the class is a statistic
 - (c) $n = 460$
 - (d) there is always bias when we choose simple random samples
 - (e) the variation in the means of the samples is described by a distribution
89. If a sampling method is biased then
- (a) we need to improve the sampling method to remove the bias.
 - (b) we need to increase the sample size to remove the bias.
 - (c) we should sample from a larger population
 - (d) the sample statistic will be close to the population parameter.
 - (e) the center of the distribution of the statistic will be close to the population parameter.
90. If we take a simple random sample of size $n = 500$ from a population of size 5,000,000, the variability of our estimate will be
- (a) less than the bias.
 - (b) much less than the variability for a sample of size $n = 500$ from a population of size 50,000,000.
 - (c) approximately the same as the variability for a sample of size $n = 500$ from a population of size 50,000,000.
 - (d) plus or minus 5%.
 - (e) much greater than the variability for a sample of size $n = 500$ from a population of size 50,000,000.
91. To reduce the variability of estimates from a simple random sample, you should

- (a) use a smaller sample.
 - (b) increase the bias.
 - (c) use a count, not a percent.
 - (d) use a larger sample.
 - (e) use a percent, not a count.
92. The margin of error for a poll is 4%. This means that
- (a) 4% of those sampled did not answer the question asked
 - (b) we have 95% confidence that the sample statistic is within 4% of the population parameter
 - (c) 4% of those sampled gave the wrong answer to the question asked
 - (d) 4% of the population were in the sample
 - (e) the confidence we have in the statistic is 4%
93. Which of the following sources of error is included in the margin of error
- (a) chance variation in choosing a random sample.
 - (b) errors in entering the data into the computer.
 - (c) some of the subjects did not understand the questions.
 - (d) voluntary response.
 - (e) all of the above.
94. For what confidence level are margins of error usually reported?
- (a) 5% (b) 95% (c) 90% (d) 99% (e) 50%
95. A survey was sent to a simple random sample of college sophomores. The sample size was 300. When asked whether or not they liked Willie Nelson's music, 35 of these students did not give any answer. This is an example of
- (a) a stratified sample
 - (b) a census
 - (c) bias
 - (d) nonresponse
 - (e) the margin of error
96. We divide the class into two groups: first year students and others. We then take random samples from each group. This is an example of
- (a) simple random sampling
 - (b) clustered sampling
 - (c) multistage sampling
 - (d) stratified random sampling
 - (e) systematic random sampling
97. To take a sample of students in this class we make a list ordered by social security number and select every 20th student in this list to be in our sample. This is an example of

- (a) systematic sampling
- (b) simple random sampling
- (c) stratified random sampling
- (d) clustered sampling
- (e) multistage sampling

The next 6 questions refer to the following experiment. 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 exam with no music playing. The scores of the two groups on the exam were compared.

98. In this experiment the instrument is
- (a) whether or not music was playing during the exam
 - (b) the explanatory variable
 - (c) a CD player
 - (d) the method used to randomize the students to the two groups
 - (e) the midterm exam
99. In this experiment the response variable is
- (a) the score on the midterm exam
 - (b) whether or not music was playing during the exam
 - (c) the placebo
 - (d) the scores of the students on the final exam
 - (e) a lurking variable
100. In this experiment the explanatory variable is
- (a) the score on the midterm exam
 - (b) whether or not music was playing during the exam
 - (c) the placebo
 - (d) the scores of the students on the final exam
 - (e) a lurking variable
101. The study design for this experiment is called
- (a) a simple random sample design
 - (b) a randomized blocks design
 - (c) a matched pairs design
 - (d) a completely randomized design
 - (e) an observational study
102. This experiment was not double-blind because
- (a) students were allowed to keep their eyes open while taking the exam
 - (b) the exam was too long

- (c) the students knew whether or not music was playing while they were taking the exam
 - (d) some of the students did not study for the exam
 - (e) students were randomized into the two groups
103. To improve the design of this experiment, one part of it should be done in a blind way. That is, we should
- (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 students to find out their grades on the exam
 - (d) tell all of the students that they will receive a grade of A on the exam if they agree to participate
 - (e) be sure that the person grading the exam does not know which students listened to music and which did not
104. This exam is a measuring instrument. Which of the following ways is most likely to make it more reliable?
- (a) use fewer questions
 - (b) give the exam in the morning
 - (c) use more questions
 - (d) reduce the bias
 - (e) give the exam in the recitation sections
105. In an experiment to see if aspirin reduces the chance of having a heart attack, a placebo is
- (a) the place where the subjects go when they have a heart attack
 - (b) a dummy pill that looks like aspirin but has no active ingredients
 - (c) a procedure for deciding who gets the aspirin treatment
 - (d) the margin of error
 - (e) 95%
106. During a visit to the doctor, you are weighed on a very accurate scale. You are weighed five times and the five readings are essentially the same. When being weighed, you are wearing all of your clothes and a pair of hiking boots. As a measure of your weight without clothes, the reading on the scale is
- (a) unbiased and reliable
 - (b) unbiased and unreliable
 - (c) 95% accurate
 - (d) biased and unreliable
 - (e) biased and reliable
107. An exam has 40 multiple-choice questions, each with 5 choices. Only 1 of the 5 choices for each question is correct. If you used a table of random digits to randomly choose your answer on all questions, about how many answers would you expect to get correct?
- (a) 40 (b) 0 (c) 20 (d) 8 (e) 50