



**SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.**

**Provide an appropriate response.**

6) During the Fall Semester 2004 at the University of Georgia, the enrollment can be summarized as follows.

Enrollment	Count
Undergraduate	24,814
Graduate/Professional	8386
Independent Study	20

a. Construct a bar graph for these data.

b. Construct a pie chart for these data.

c. Would a dot plot or a stem-and-leaf plot make sense for these data? Explain.

7) In order to reduce pollutants from motor vehicle exhaust emissions, three-way catalytic converters have been installed in new vehicles. However, these converters increase the level of ammonia in the air. A study was published on the ammonia levels near the exit ramp of a San Francisco highway tunnel. The data below represent daily ammonia concentrations (parts per million) on eight randomly selected days during afternoon drive-time in the summer of 1999.

1.53	1.50	1.37	1.51	1.55	1.42	1.41	1.48
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Source: Environmental Science & Technology (Sept. 1, 2000)

a. Construct a dot plot for these data.

b. Construct a stem-and-leaf plot.

c. Construct a histogram.

d. Identify the shape of the histogram.

8) In order to reduce pollutants from motor vehicle exhaust emissions, three-way catalytic converters have been installed in new vehicles. However, these converters increase the level of ammonia in the air. A study was published on the ammonia levels near the exit ramp of a San Francisco highway tunnel. The data below represent daily ammonia concentrations (parts per million) on eight randomly selected days during afternoon drive-time in the summer of 1999.

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Source: Environmental Science & Technology (Sept. 1, 2000)

- a. Find the mean.
- b. Find the median.
- c. Find the mode.
- d. Find the range.
- e. Compute the standard deviation.
- f. Give the five number summary.
- g. Showing calculations, determine and list any outliers, or state that no outliers exist.
- h. Construct the boxplot.

**MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.**

- 9) According to The College Board, the mean score on the ACT reading section was 22 for the 2006 graduating class. Noting that this test is scored on a scale of 12 to 36, what is the most plausible value for the standard deviation of the scores?
- A) 15                      B) 30                      C) -10                      D) 4                      E) 0
- 10) SAT verbal scores are normally distributed with a mean of 433 and a standard deviation of 90. Use the Empirical Rule to determine what percent of the scores lie between 433 and 523.
- A) 49.9%                      B) 68%                      C) 51%                      D) 47.5%                      E) 34%

**SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.**

- 11) Test scores for a history class had a mean of 80 with a standard deviation of 4.5. Test scores for a physics class had a mean of 71 with a standard deviation of 3.7. Suppose a student gets a 73 on the history test and a 71 on the physics test. Calculate the z-score for each test. On which test did the student perform better relative to classmates?

**MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.**

**Identify the abuse of statistics.**

- 12) Which of the following is not a guideline to use for constructing effective graphs?
- A) Provide a heading for the graph.
  - B) Strive for clarity and simplicity.
  - C) Labels along the vertical axis should start with zero.
  - D) Freely use figures like people to make the graph more attractive.
  - E) Label both the x- and y-axes.

**SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.**

**Provide an appropriate response.**

- 13) For the following pairs of variables, which is more naturally the response variable and which is the explanatory variable?
- a. College grade point average and college entrance exam score
  - b. Students' interest and ability in studying a foreign language
  - c. Speed of professional advancement and standard of dress

**MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.**

- 14) The relationship between the number of games won by a minor league baseball team and the average attendance at their home games is analyzed. A regression to predict the average attendance from the number of games won has an  $r = 0.73$ . Interpret this statistic.
- A) Negative, fairly strong linear relationship. 53.29% of the variation in average attendance is explained by the number of games won.
  - B) No association
  - C) Positive, fairly strong linear relationship. 53.29% of the variation in average attendance is explained by the number of games won.
  - D) Positive, weak linear relationship. 7.29% of the variation in average attendance is explained by the number of games won.
  - E) Positive, fairly strong linear relationship. 73% of the variation in average attendance is explained by the number of games won.

- 15) A linear model for the relationship between the number of class absences a student has and final exam score is found. The regression has an  $R^2 = 88.9\%$ . Describe the relationship
- A) Positive, strong linear relationship. As the absences increase the exam score goes up.
  - B) Positive, weak linear relationship. As the absences increase the exam score goes down.
  - C) Negative, weak linear relationship. As the absences decrease the exam score goes down.
  - D) No association
  - E) Negative, strong linear relationship. As the absences increase the exam score goes down.

**SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.**

**Use your graphing calculator to find the following for the given data .**

- 16) Ten students in a graduate program were randomly selected. Their grade point averages (GPAs) when they entered the program were between 3.5 and 4.0. The following data were obtained regarding their GPAs on entering the program versus their current GPAs.

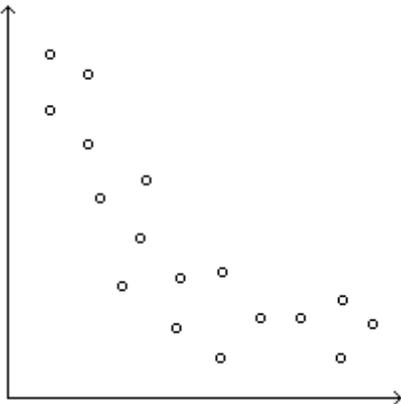
<u>x (entering GPA)</u>	<u>y (current GPA)</u>
3.5	3.6
3.8	3.7
3.6	3.9
3.6	3.6
3.5	3.9
3.9	3.8
4.0	3.7
3.9	3.9
3.5	3.8
3.7	4.0

- a. Draw the scatterplot, being sure to label and mark both axes.
  
  
  
  
  
  
  
  
  
  
- b. Find the regression equation, being sure to state it as an equation.
  
  
  
  
  
  
  
  
  
  
- c. Describe the correlation between entering and current GPA as positive or negative and describe the strength of the correlation.
  
  
  
  
  
  
  
  
  
  
- d. Predict a student's current GPA if his entering GPA had been 3.8.
  
  
  
  
  
  
  
  
  
  
- e. Would it be wise to predict a student's current GPA if his entering GPA had been 3.3? Why or why not? If we predicted, what would this type of prediction be called?

**MULTIPLE CHOICE.** Choose the one alternative that best completes the statement or answers the question.

**Determine the type of association apparent in the following scatterplot.**

17)



- A) Little or no association
- B) Moderately strong, negative association
- C) Positive, moderately strong association
- D) Perfect, negative association
- E) Negative, weak association

**SHORT ANSWER.** Write the word or phrase that best completes each statement or answers the question.

**Provide an appropriate response.**

18) A regression line for predicting the selling prices of homes in Chicago is

$\hat{y} = 168 + 102x$ , where  $x$  is the square footage of the house. A house with 1500 square feet recently sold for \$150,000. What is the residual for this observation?

19) A psychologist does an experiment to determine whether an outgoing person can be identified by his or her handwriting. She claims that the correlation of 0.89 shows that there is a strong causal relationship between personality type and handwriting. Explain what is wrong with her interpretation.

20) In order for a data point to be considered influential, which of the following must hold?

- I) the point has a large residual for the regression line fitted including that point
- II) its  $x$  value must be relatively low or high compared to the rest of the data
- III) the point has a large residual for the regression line fitted without using that data point

**MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.**

**Select the most appropriate answer.**

- 21) A study shows that attending private school and score on the SAT is positively related. Which of the following identifies a potential confounding variable?
- A) Test anxiety
  - B) Age of student
  - C) Time allowed on exam
  - D) Income level of parents
  - E) No confounding variable

**SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.**

- 22) The fact that the direction of an association between two variables can change after we include a third variable and analyze the data at separate levels of that variable is known as

**Provide an appropriate response.**

- 23) What is the difference between a confounding variable and a lurking variable?

- 24) Distinguish between an observational study and an experimental study.

**MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.**

**Identify the flaw(s) in the experiment or study described.**

- 25) A pharmaceutical company has developed a medication that they believe will help to reduce the pain of arthritis. They would like to test the medication at two different dosage levels. They design an experiment as follows to test the medication. They will obtain a group of volunteers who suffer from arthritis. A doctor from the pharmaceutical company will evaluate each patient's condition at the start of the experiment. Volunteers will be randomly assigned to one of three groups. Each day for the duration of the experiment, patients in group 1 will receive a low dose of the medication, patients in group 2 will receive a higher dose of the medication, and patients in group 3 will receive a placebo, with the doctor being aware of who was receiving which treatment. After a suitable amount of time (two months, for example), the same doctor will evaluate each patient's progress. Based on the amount of inflammation and the patient's report on the amount of pain, the doctor will give each patient a numerical score to represent their improvement. The amount of improvement for the three groups will then be compared. The researchers will have the technicians administering the medication made unaware of which dose patients receive. Identify the most serious flaw in this experiment.
- A) The volunteers should have been randomly selected.
  - B) Doctors should not be from the pharmaceutical company.
  - C) The volunteers should include non-arthritic patients.
  - D) There could be lurking variables.
  - E) The doctor evaluating the patients' progress should not be aware of which treatment patients received.

**Select the most appropriate answer.**

- 26) The potential for lurking variables to affect the results is
- A) less in an experimental study than in an observational study.
  - B) the same in both an experimental study and an observational study.
  - C) minimized in an observational study.
  - D) more in an experimental study than in an observational study.
  - E) maximized in an experimental study.

**SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.**

**Provide an appropriate response.**

- 27) The manager of a natural foods grocery is considering the addition of a play area and would like to know what percentage of its customers shop with children under the age of 8. To obtain an estimate of this percentage, one morning between 9:00 and 11:00 the cashiers record how many of their customers have children under the age of 8 with them. What type of sample does this represent? Is this a good or bad way to sample? What type of bias is this sample most subjected to?

28) A magazine publisher inserts a postage-paid survey into an issue of its magazine in order to collect information regarding reader satisfaction with the magazine. What type of sample is this? Is this a good or bad way to sample? Why?

29) Describe how to use random numbers to select a simple random sample?

30) After a hurricane, a disaster area is divided into 200 equal grids. Thirty of the grids are selected and every occupied household in the grid is interviewed to help focus relief efforts. Select the numbers of the first five grids that belong to the sample using the random numbers given below.

16348 76938 90169 51392 55887 71015 09209 79157

**List all possible samples from the specified population.**

31) The candidates on a Lost island are Kwon (K), Shephard (S), Jarrah (J), Ford (F), and Reyes (R). Consider these candidates to be a population of interest. List the 15 possible samples (without replacement) of size two from this population of six candidates.

**MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.**

**Identify the bias.**

32) Inside the boxes of a new brand of cereal is a short survey that can be mailed back for free to the manufacturer. The survey asks the consumer if he or she likes the cereal or not. What, if any, will be the most noticeable bias for this survey?

- A) Both nonresponse bias and response bias
- B) No perceivable bias
- C) Sampling bias
- D) Response bias
- E) Nonresponse bias

**SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.**

**Identify the specified elements of the experiment.**

- 33) In a clinical trial, 780 participants suffering from high blood pressure were randomly assigned to one of three groups. Over a one-month period, the first group received a low dosage of an experimental drug, the second group received a high dosage of the drug, and the third group received a placebo. The diastolic blood pressure of each participant was measured at the beginning and at the end of the period and the change in blood pressure was recorded. Identify:
- a. the experimental unit,
  - b. the explanatory variable,
  - c. the response variable, and
  - d. the treatments.

**MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.**

**Determine whether the experiment is blind, double blind, or neither.**

- 34) A researcher wants to investigate whether different amounts of exercise can be used to increase the attention span of children who have been diagnosed with ADHD. A group of 45 children aged 6–12 who have been diagnosed with ADHD are randomly selected to participate in the study. The children are evaluated at the beginning of the study, and their attention span is measured. The children are then randomly assigned to one of three exercise groups. The first group will not engage in any exercise outside of their typical daily routine. The second group will attend an exercise class after school 3 days a week (moderate activity). The third group will attend a more strenuous exercise class every day after school as well as Saturday afternoon (strenuous). At the end of a six week period the students will be re-evaluated and their attention spans re-measured. The person evaluating the children is not aware of which exercise group the child was a member.

- A) Double blind
- B) Neither
- C) Subjects are blinded
- D) Investigators are blinded

**Identify which type of sampling is used.**

- 35) To avoid working late, a quality control analyst simply inspects the first 100 items produced in a day.
- A) Simple random sample
  - B) Stratified random sample
  - C) Cluster random sample
  - D) Convenience sample
  - E) Matched pair sample

**SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.**

**Provide an appropriate response.**

- 36) Explain the difference between stratified random sampling and cluster random sampling.

**MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.**

**Identify the type of observational study.**

- 37) A researcher plans to obtain data by interviewing 500 children born with fetal alcohol syndrome twice a year until they reach 8 years of age.
- A) Case-control
  - B) Cross-sectional
  - C) Retrospective
  - D) Census
  - E) Prospective

**Provide an appropriate response.**

- 38) An educational researcher used school records to determine that, in one school district, 84% of children living in two-parent homes graduated high school while 75% of children living in single-parent homes graduated high school. Identify the cases and the controls.
- A) cases = children in the district living in a two-parent home;  
controls = children in the district living in a single parent home
  - B) cases = children in the district who graduated high school;  
controls = children in the district who did not graduate high school
  - C) cases = children in the district who graduated high school and lived in a two-parent home;  
controls = children in the district who did not graduate high school and lived in a two parent home
  - D) cases = children in the district living in a two-parent home who graduated high school;  
controls = children in the district living in a single parent household who graduated high school

**Determine whether the situation proposed is a relative frequency definition or a subjective definition.**

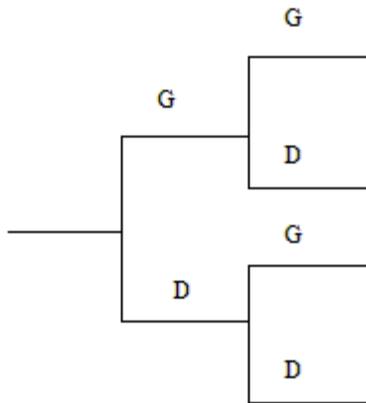
- 39) If both parents are carriers for Tay-Sachs, the probability that their child will have Tay-Sachs is 25%.
- A) Subjective definition
  - B) Relative frequency definition

**Provide an appropriate response.**

- 40) You have flipped a coin 5 times in a row and gotten heads on each flip. What is your next flip most likely to be and why?
- A) Either heads or tails, the probability of heads (tails) remains constant from one flip to the next
  - B) Heads because the coin is obviously not balanced
  - C) Heads because the probability of heads is 1 based on the first 5 throws
  - D) Tails since the probability of 5 tails in 10 throws is 50% so the next five throws are likely to be tails
  - E) Tails because the probability of six heads in a row is very small

**SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.**

- 41) A sample of two light bulbs is selected in succession, without replacement, from among 6 good ones and 4 defective ones. What is the probability of obtaining exactly one defective bulb?



**List the outcomes comprising the specified event.**

- 42) When a quarter is tossed four times, 16 outcomes are possible.

HHHH	HHHT	HHTH	HHTT
HTHH	HTHT	HHTH	HTTT
THHH	THHT	THTH	THTT
TTHH	TTHT	TTHH	TTTT

Here, for example, HHTH represents the outcome that the first toss is heads, the next two tosses are tails, and the fourth toss is heads. The events A and B are defined as follows.

A = event exactly two tails are tossed

B = event the first and last tosses are the same

List the outcomes that comprise the event (A and B).

**Provide an appropriate response.**

- 43) A student is taking two pass/fail courses over the summer break. What is the sample space for the student's grades?

- 44) Among the 12 applicants for managerial positions at a chain of movie theaters, 8 are college graduates and 4 are high school graduates. If three of the applicants are randomly selected,
- Identify the possible outcomes in terms of whether a selected applicant is a college graduate (C) or a high school graduate (H).
  - Find the probability for each possible outcome and verify that these probabilities follow the two basic rules of the probabilities for the outcomes in a sample space.

**Determine whether the events are disjoint.**

- 45) The age distribution of students at a community college is given below.

<u>Age (years)</u>	<u>Number of students (f)</u>
Under 21	2890
21-24	2190
25-28	1276
29-32	651
33-36	274
37-40	117
Over 40	185

A student from the community college is selected at random. The events A, B, and C are defined as follows.

A = event the student is at most 28

B = event the student is at least 40

C = event the student is between 21 and 24 inclusive

Are the events A, B, and C disjoint?

**Draw a Venn diagram and shade the described events.**

- 46) From a finite sample, events A and B are not disjoint; however, event C is disjoint from events A and B. Draw a venn diagram with the three events as described, and shade the collection **(A and B) or C**.

**Suppose  $P(C) = 0.048$ ,  $P(M \text{ and } C) = 0.044$ , and  $P(M \text{ or } C) = 0.524$ . Find the indicated probability.**

- 47)  $P[(M \text{ and } C)^c]$

**Find the indicated probability.**

48) If two balanced die are rolled, the possible outcomes can be represented as follows.

- (1, 1) (2, 1) (3, 1) (4, 1) (5, 1) (6, 1)
- (1, 2) (2, 2) (3, 2) (4, 2) (5, 2) (6, 2)
- (1, 3) (2, 3) (3, 3) (4, 3) (5, 3) (6, 3)
- (1, 4) (2, 4) (3, 4) (4, 4) (5, 4) (6, 4)
- (1, 5) (2, 5) (3, 5) (4, 5) (5, 5) (6, 5)
- (1, 6) (2, 6) (3, 6) (4, 6) (5, 6) (6, 6)

Determine the probability that the sum of the dice is 3 or 8.

**MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.**

49) A group of three must to be formed to fight the werewolves. The three will be selected at random from a list of five possible members: Alice, Bella, Carlisle, a Denali, and Edward (A, B, C, D, E). A simple random sample is taken, without replacement, from the group of five. Using the letters A, B, C, D, E to represent the five, list the possible samples of size three and use your list to determine the probability that both Bella and Edward are included in the sample.

(Hint: There are 10 possible samples.)

- A)  $\frac{2}{5}$                       B)  $\frac{1}{5}$                       C)  $\frac{3}{5}$                       D)  $\frac{3}{10}$                       E)  $\frac{7}{10}$

**SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.**

50) In 2006, the General Social Survey asked subjects whether they favored or opposed the death penalty for persons convicted of murder and whether they favored or opposed a law requiring a person to obtain a permit before he or she could buy a gun. The results are summarized in the table below:

Frequency Distribution

		GUNLAW		
		1: Favor	2: Oppose	TOTAL
DEATH PENALTY	1: Favor	979	280	1259
	2: Oppose	500	99	599
	TOTAL	1479	379	1858

What is the probability that a randomly selected respondent opposes the death penalty for persons convicted of murder?

**Provide an appropriate response.**

51) When entering data into a computer, the probability that a student will make at most three mistakes per 1,000 keystrokes is 0.71, and the probability of making anywhere from 4 to 6 mistakes per 1,000 keystrokes is 0.22. Find the probabilities that in 1,000 keystrokes the student will make

- a. at most 5 mistakes
  
  
- b. more than 4 mistakes

52) As part of a sales promotion, a soda manufacturer places winning symbols under the caps of 7% of its bottled drinks. If you purchase a 6-pack, what is the probability that none of the caps will have a winning symbol? What is the probability that you will win something?

**Find the probability of the given event.**

53) A random spinner has equal-sized regions numbered 1 through 18. The spinner stops on an even number or a multiple of 3.

**MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.**

**Provide an appropriate response.**

54) According to the Center for Disease Control, 12% of US citizens got infected with a flu virus this past year. If we randomly select three people, what is the probability that none of them had the flu this past year?

- A) none of these
- B) 0.68
- C) 0.002
- D) 0.998
- E) 0.88

**SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.**

**Find the indicated probability.**

- 55) In 2006, the General Social Survey asked subjects whether they favored or opposed the death penalty for persons convicted of murder and whether they favored or opposed a law requiring a person to obtain a permit before he or she could buy a gun. According to the survey results, 79.6% of respondents favored the gun law, 67.8% favored the death penalty for those convicted of murder and 52.7% were in favor of both. What is the probability that a randomly selected respondent was in favor of either the gun law or the death penalty for persons convicted of murder?

**MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.**

**Select the most appropriate answer.**

- 56) For two events A and B,  $P(A) = 0.8$ ,  $P(B) = 0.2$ , and  $P(A \text{ and } B) = 0.16$ . It follows that A and B are
- A) disjoint but not independent.
  - B) both disjoint and independent.
  - C) complementary.
  - D) independent but not disjoint.
  - E) neither disjoint nor independent.

**Provide an appropriate response.**

- 57) Ten white balls, 20 blue balls and 20 red balls are placed in an urn. If two balls are drawn, with replacement, what is the probability of drawing two white balls?
- A) 0.04                      B) 0.01                      C) 0.36                      D) 0.037
- 58) According to the Center for Disease Control, in 2004, 65.7% of all adults between the ages of 18 and 44 were considered current drinkers. Based on this estimate, if two randomly selected adults between the ages of 18 and 44 are selected, what is the probability that at least one is a current drinker?
- A) 0.57
  - B) cannot be determined from the information given
  - C) 0.43
  - D) 1
  - E) 0.88

**Select the most appropriate answer.**

59) The first baseman in a baseball game is thrown two balls during an inning. Define  $A = \{\text{catches both balls}\}$ ,  $B = \{\text{catches at least one ball}\}$ ,  $C = \{\text{misses both balls}\}$ .

Which of the following is **false**?

A)  $P(A) + P(B) + P(C) \neq 1$

B) A and B are independent

C) B and C are disjoint

D) A and C are disjoint

**SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.**

**Provide an appropriate response.**

60) Of the 30 college students who visited the campus health center yesterday, 9 received prescriptions while the remaining 21 did not. The following table further categorizes these 30 students by gender:

	Male (M)	Female (F)
Prescription (P)	6	3
No Prescription (N)	12	9

a. What is the sample space of possible outcomes for a randomly selected college student who visited the campus health center yesterday?

b. Using these data, estimate  $P(N)$  and  $P(F)$ .

c. Estimate  $P(N \text{ and } F)$ .

d. Based on (b), what would the answer to (c) have been if the events N and F were independent? Are N and F independent? Explain.