

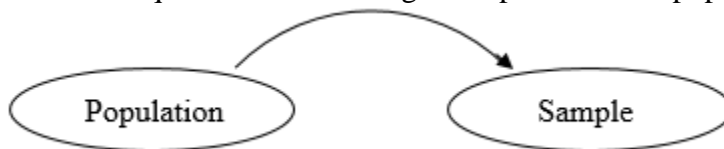
1. In 2004, the San Francisco police began using DNA evidence in unsolved homicides. The crime lab found evidence that suggested John Puckett was a DNA match for a crime committed three decades earlier, based on  $5^{1/2}$  genetic locations. Usually 13 genetic markers are used to distinguish between two different people. Jurors were told that the chance of randomly finding the defendant's DNA profile at the crime scene was 1 in 1.1 million. The jurors found the DNA evidence compelling and convicted Puckett of first-degree murder. This conclusion is an example of:
  - A) relative frequency and probability.
  - B) summary statistics.
  - C) probability and odds.
  - D) statistical likelihood and inference.
  
2. Descriptive statistics may be BEST defined as:
  - A) techniques and methods used to analyze a small, specific set of data in order to draw a conclusion about a large, more general collection of data.
  - B) graphical and numerical methods used to describe, organize, and summarize a statistically valid conclusion.
  - C) graphical and numerical methods used to describe, organize, and summarize data.
  - D) techniques and methods used to analyze a small data set in order to describe its usefulness in making general statements about a population.
  
3. Inferential statistics may be BEST defined as:
  - A) techniques and methods used to analyze a small, specific set of data in order to draw a conclusion about a large, more general collection of data.
  - B) graphical and numerical methods used to describe, organize, and summarize a statistically valid conclusion.
  - C) graphical and numerical methods used to describe, organize, and summarize data.
  - D) techniques and methods used to analyze a small data set to make inference concerning its accuracy.
  
4. In a study of crop rotation techniques, agricultural researchers are interested in making general statements concerning the effectiveness of a given technique for all corn fields in the state of Kansas. Using a cluster technique, they randomly choose 30 farms from across the state for their study. Some of the chosen farms are randomly selected to use the rotation technique whereas others are not. In this study, the **population** is best described as:
  - A) 30 farms chosen from across the state.
  - B) all corn fields in the state of Kansas.
  - C) the effectiveness of crop rotation.
  - D) whether the rotation technique was used or not.

5. The effect of different lighting levels on productivity is evaluated using a designed experiment. Two hundred office workers who have the same basic job assignments are randomly selected to participate. Each worker is randomly assigned a different lighting level at his or her desk. Ambient (background) lighting is held constant for all workers. A benchmark of productivity is recorded for each worker. In this study, the **sample** is best described as:
- A) 200 office workers.
  - B) the different lighting levels.
  - C) the amount of productivity.
  - D) all office workers with similar job assignments.
6. Mice are given a protein injection that is designed to promote physical growth. Fifty mice are randomly selected for evaluation in the study. Some of the mice are injected with high levels of the protein, some with low levels, and a third group receives a placebo (saline injection). The amount of growth of the mice is recorded and compared. In this study, the **variable** is best described as:
- A) 50 randomly selected mice.
  - B) all mice that receive a protein injection.
  - C) the type of protein used.
  - D) the amount of protein injected.
7. In a(n) \_\_\_\_\_, we merely observe the response for a specific variable for each individual or object.
- A) statistical setting
  - B) observational study
  - C) experimental study
  - D) population
8. In a(n) \_\_\_\_\_, we investigate the effects of certain conditions on individuals or objects in the sample.
- A) statistical setting
  - B) observational study
  - C) experimental study
  - D) population
9. A \_\_\_\_\_ sample has characteristics similar to those of the entire population and therefore can be used to draw a conclusion about the (general) population.
- A) general
  - B) descriptive
  - C) statistical
  - D) representative

10. A behavioral scientist wishes to know more about the walking habits of university students across a particular campus sidewalk. She positions herself out of sight of the students who are walking and records the time required for several of them to pass between two fixed points along the sidewalk. This study is best described as a(n) \_\_\_\_\_ study.
- A) observational
  - B) educational
  - C) experimental
  - D) scientific
11. Electrical engineers are attempting to maximize the efficiency of an experimental battery cell. They wish to determine the optimum charge rate that will provide maximum battery capacity. They sample 50 cells and randomly assign five different charge rates to the sample (10 cells for each charge rate). All cells are then discharged at the same rate with total battery capacity for each cell recorded in amp-hours. This is an example of a(n) \_\_\_\_\_ study.
- A) simple random
  - B) experimental
  - C) observational
  - D) probability
12. Electrical engineers are attempting to maximize the efficiency of an experimental battery cell. They wish to determine the optimum charge rate that will provide maximum battery capacity. They sample 50 cells and randomly assign five different charge rates to the sample (10 cells for each charge rate). All cells are then discharged at the same rate with total capacity recorded in amp-hours. The **variable** in this experiment is:
- A) all experimental battery cells.
  - B) the different charge rates.
  - C) the total capacity recorded in amp-hours.
  - D) the 50 sampled cells.

13. A psychologist wishes to test a behavioral modification therapy that is claimed to improve the behavior of pre-teen autistic children. She randomly selects 20 pre-teen autistic children and exposes half of the group to the behavioral modification therapy while the other half continue with their standard treatment regimen. A standardized behavioral test is administered to each child both before and after his/her respective treatment. The **population** in this experiment is:
- A) all pre-teen autistic children.
  - B) the behavioral modification therapy.
  - C) the standardized behavioral test scores.
  - D) the 20 selected pre-teen autistic children.
14. Nuclear power plants must discharge the excess heat generated in the nuclear process to the environment. Some plants exhaust this heat to nearby water sources. There is concern that this “thermal pollution” has an adverse effect on aquatic life near the plant. The EPA catches 100 fish from the discharge pond of a particular power plant. They track the growth rates and life span of these fish and compare them to fish from similar streams whose temperatures are not affected by the plant's thermal effluent. The **sample** in this experiment is:
- A) all nuclear power plants.
  - B) the selected nuclear power plant.
  - C) all fish in the discharge path.
  - D) the 100 fish caught by the EPA.
15. A sample of five people is analyzed to make a general statement concerning the population from which the people were sampled. This is an example of using:
- A) inferential statistics.
  - B) descriptive statistics.
  - C) simple random sampling analysis.
  - D) inferential random sampling analysis.
16. A group of 20 monitor lizards is observed over the course of the lizards' life spans. The total food consumption of each lizard is recorded and displayed on a bar graph. This presentation of raw information in a more user-friendly format is an example of:
- A) inferential statistics.
  - B) simple random sampling.
  - C) pictorial statistics.
  - D) descriptive statistics.

17. Two thousand people are surveyed and asked to indicate on a scale of 1 to 5 their preference for a particular brand of liquid dishwashing detergent. The responses are summarized using a bar graph that displays the total counts of each response (1 to 5). This is an example of:
- A) inferential statistics.
  - B) simple random sampling.
  - C) pictorial statistics.
  - D) descriptive statistics.
18. In September of 2000 the United Nations adopted an initiative known as the UN Millennium Declaration. The goal was to take active steps in eliminating poverty, HIV/AIDS, hunger, and other global issues adversely affecting humanity by 2015. The UN consistently tracks each country's progress by recording data on numerous markers that provide an indication of compliance with these "Millennium Development Goals." The data for each country is summarized by year in tabular format. The organization of this raw data into a more user-friendly table format is an example of:  
(See: <http://www.un.org/millenniumgoals/stats.shtml>)
- A) inferential statistics.
  - B) the scientific method.
  - C) descriptive statistics.
  - D) population statistics.
19. A random sample of 10 cars is analyzed to evaluate the effect of installing a computer chip modification on a vehicle's horsepower. Based on the sample, researchers conclude that there is a significant increase in vehicle horsepower associated with the computer chip. This is an example of:
- A) inferential statistics.
  - B) the scientific method.
  - C) descriptive statistics.
  - D) population statistics.
20. In a(n) \_\_\_\_\_ problem, certain characteristics of a population are assumed known. We then answer questions concerning a sample from that population.



- A) statistical inference
- B) inferential statistical
- C) probability
- D) statistics

21. In a \_\_\_\_\_ problem, we assume very little about a population. We use the information about a sample to answer questions concerning the population.



- A) statistically determined  
B) statistical differential  
C) probability  
D) statistics
22. In many real-world settings, it is not possible or feasible to know the characteristics of the population. Since we cannot safely assume these characteristics, we must use the information from a sample to answer questions concerning the population. In cases such as these, we are dealing with a(n) \_\_\_\_\_ problem.
- A) probability  
B) underdetermined  
C) statistics  
D) reality
23. We know that our population consists of equally likely numbers 1 to 6 inclusive (in other words, we know everything about the population). We wish to answer questions concerning a sample of two distinct numbers from this population. This is BEST described as a \_\_\_\_\_ problem.
- A) probability  
B) statistics  
C) major  
D) None of the above
24. A major pharmaceutical company is conducting clinical trials on a new drug they want to bring to market. They survey 2000 people who have a particular condition that the drug is designed to treat. A portion of the people surveyed receive a high dose of the drug, a portion of the people surveyed receive a medium dose of the drug, and the remaining portion of the people surveyed receive a placebo (sugar pill). The **variable** in this experiment is:
- A) the 2000 people surveyed.  
B) all people with the condition that the drug is intended to treat.  
C) the dosage of drug administered to each person.  
D) the placebo (sugar pill).

25. A quality control engineer oversees the production of rubber seals for aircraft manufacturing. In a standard production run, 25 seals are randomly selected for destructive testing. The seals are physically stressed to their common design limit while exposed to increasing temperature. Of interest is the temperature at which the seal fails. The **variable** in this experiment is:
- A) the 25 seals selected.
  - B) the common design stress to which each seal is exposed.
  - C) the temperature to which each seal is exposed.
  - D) all manufactured rubber seals.
26. Lenders base the eligibility of home loans on a prospective borrower's credit score. Recent failures of lending corporations have prompted study into the adherence of lenders in general to these lending guidelines. Two thousand home loans extended between the years 1995 and 2005 were randomly selected for audit. The borrower's credit score was recorded and compared with the normal benchmark for the loan offered. The **population** in this study is:
- A) the 2000 randomly selected home loans.
  - B) all home loans extended between 1995 and 2005.
  - C) the credit score of each loan selected.
  - D) all lending agencies that offer home loans.
27. A \_\_\_\_\_ of size  $n$  is a sample selected in such a way that every possible sample of size  $n$  has the same chance of being selected.
- A) circular random sample
  - B) simple random sample
  - C) systematic random sample
  - D) synchronized random sample
28. In a statistical inference procedure, the *claim* is BEST described as a statement:
- A) of what experimental process will be used in the inference.
  - B) that we will only accept as valid with sufficient proof.
  - C) that we want to be true regardless of the evidence.
  - D) of what we assume to be true.
29. An experiment that simply records the direction a rat turns at a particular junction in a maze is a(n) \_\_\_\_\_ study.
- A) observational
  - B) longitudinal
  - C) experimental
  - D) None of the above

30. An experiment that forces rats to take a particular direction at a junction in a maze and then observes the differences in times between the rats that went left to those who went right is a(n) \_\_\_\_\_ study.
- A) observational
  - B) longitudinal
  - C) experimental
  - D) None of the above
31. The time required to cure concrete is pivotal in the construction business. Insufficient curing time results in lower structural strength, which can create hazardous design conditions. Too much time wastes valuable resources and may result in greatly inflated building costs. To help ascertain the optimum curing time, a random sample of 80 poured concrete foundations is drawn. The total time to completely cure each foundation is recorded. This study is BEST described as a(n) \_\_\_\_\_ study.
- A) observational
  - B) longitudinal
  - C) experimental
  - D) inferential
32. State highway safety experts claim that the recent rise in highway fatalities involving tractor trailers is a result of truckers receiving insufficient rest. They randomly sample 200 truckers who are on interstate deliveries and record the total amount of non-driving time they have had over the past 72 hours. This study is BEST described as a(n) \_\_\_\_\_ study.
- A) observational
  - B) longitudinal
  - C) experimental
  - D) inferential
33. A professor wishes to record information on some of his students for later use. He arrives to class early and samples the first five students that enter the room. Is this a simple random sample of size 5?
- A) yes
  - B) no
  - C) It depends on the information the professor seeks from the students.
  - D) More information is needed to answer the question.

34. An office manager wishes to survey 5 of her 20 employees for whom she is responsible. She assigns each of the 20 employees a number and writes the number on 20 identical but separate pieces of paper. She places the 20 paper pieces in a hat, mixes them up, and then blindly draws five numbers to determine which five employees are included in the sample. If the slips of paper are identical and the selection of each is blind, is this a simple random sample of size 5?
- A) yes
  - B) no
  - C) It depends on the information the manager seeks from the employees.
  - D) More information is needed to answer the question.
35. A researcher wishes to obtain information about American males in the metro area between the ages of 20 and 25. He has a phone book that contains the land line phone numbers of households in the metro area. He uses a random number generator to select 50 households to call. Bearing in mind he will only be contacting people who have a land line, is this a simple random sample?
- A) yes
  - B) no
  - C) It depends on the information the researcher seeks from those surveyed.
  - D) More information is needed to answer the question.
36. A clinical nurse supervisor (CNS) is designing an experiment that will evaluate the effectiveness of household pets in treating depression. Using computer software, she generates a list of 200 people. In the sampling process, every possible sample in the population of size 200 has the same chance of being selected. Is this a simple random sample?
- A) yes
  - B) no
  - C) It depends on the information the CNS seeks from the people.
  - D) More information is needed to answer the question.
37. In a study that seeks to evaluate the effect caffeine has on narcoleptics, 40 narcoleptic patients are randomly selected to participate. Fifteen of the patients are given high doses of caffeine, 15 are given moderate doses, and 10 are given low doses over a period of 30 days. The total amount of time they slept over the 30 days was recorded. This is BEST described as a(n) \_\_\_\_\_ study.
- A) voluntary
  - B) observational
  - C) dosage
  - D) experimental

38. In a study that seeks to evaluate the effect caffeine has on narcoleptics, 40 narcoleptic patients are randomly selected to participate in the study. Fifteen of the patients are given high doses of caffeine, 15 are given moderate doses, and 10 are given low doses over a period of 30 days. The **variable** in this study is the:
- A) 40 narcoleptic patients.
  - B) period of 30 days.
  - C) dosage of caffeine administered.
  - D) sample size used.
39. To evaluate the objectivity of a certain professor's grading, 20 classes that she previously taught are randomly selected for auditing. The proportion of male students that pass in each class is compared to the proportion of female students for each selected class. The **sample** in this study is:
- A) the comparison of male and female passing rates for the classes.
  - B) the proportion of all males that passed and the proportion of all females that passed.
  - C) the 20 selected classes.
  - D) a single selected class.
40. An artist mass-produces sculptures that are claimed to be 99% identical. To test this claim, 50 of the artist's sculptures are selected from a local retail store. The sculptures are analyzed for any eccentricities. The **population** in this study is:
- A) the artist's statement that the sculptures are 99% identical.
  - B) the 50 sculptures selected.
  - C) the analysis conducted for similarity.
  - D) all sculptures that this artist produces.
41. Which of the following is a good estimate of the probability of lung cancer for a typical American adult?
- A) the incidence of lung cancer among U.S. adults
  - B) the average number of U.S. adults who died from lung cancer in 2013
  - C) the relative frequency of lung cancer among U.S. adults
  - D) All of the above

42. During July 2007, the National Association of College and Employers reported an increase in the average starting salaries of trades related to engineering. Offers to students awarded a bachelor's degree in chemical engineering rose 5.4% to an average of \$59,361, and starting salaries for students awarded a bachelor's degree in computer engineering rose 4.8% to an average of \$56,201. The numbers in this case are an example of:
- A) relative frequency and probability.
  - B) summary statistics.
  - C) probability and odds.
  - D) statistical likelihood and inference.
43. Ten apples are taken off the top of a truckload of apples, and the amount of bruising on those apples is measured in order to estimate how much bruising there is, on average, in the whole truckload. Is this a simple random sample?
- A) yes
  - B) no
  - C) It depends on whether the apples were in a clump or from across the top of the truck.
  - D) More information is needed to answer the question.
44. The registrar at a small liberal arts college computes description summaries for all members of the entering class on a regular basis. For example, the average high school GPA for the entering students in the most recent year was 3.16. The Chemistry department is interested in helping all students who wish to take a chemistry class identify the appropriate course, so they offer a placement exam. They randomly select a subset of 175 students who took this exam during the past decade, and found they had an average score on the exam of 71.05. The **population** of interest to the Chemistry department in this study is:
- A) the 175 selected students who took this exam during the past decade.
  - B) all entering students during the most recent year.
  - C) all entering students during the past decade.
  - D) all students who took the chemistry placement exam during the past decade.

45. The registrar at a small liberal arts college computes description summaries for all members of the entering class on a regular basis. For example, the average high school GPA for the entering students in the most recent year was 3.16. The Chemistry department is interested in helping all students who wish to take a chemistry class identify the appropriate course, so they offer a placement exam. They randomly select a subset of 175 students who took this exam during the past decade, and found they had an average score on the exam of 71.05. The **variable** of interest to the Chemistry department in this study is the:
- A) 175 selected students who took this exam during the past decade.
  - B) students' scores on the placement exam
  - C) average score on the placement exam.
  - D) GPA of the 175 students who took the placement exam.
46. Consider the population of the approximately 25,000 protein-coding genes in human DNA. Suppose each gene is assigned a number from 1 to 25,000 and computer software then used to randomly select 100 of these numbers, yielding a sample of 100 genes. Would this be a simple random sample?
- A) yes
  - B) no
  - C) The sample size is too small to tell.
  - D) More information is needed to answer the question.
47. A volleyball coach records information about each serve in one game in order to determine in general, if a player using a jump serve rather than a standard overhand serve is more likely to lead to winning a point. This is an example of using:
- A) inferential statistics.
  - B) descriptive statistics.
  - C) simple random sampling analysis.
  - D) inferential random sampling analysis.
48. The 2009 National Survey on Drug Use and Health selected a random sample of U.S. college students and asked them about illicit drug use. Roughly 23% of the students surveyed reported using illicit drugs in the past year. The **population** in this study is:
- A) U.S. college students.
  - B) the 23% of the students who reported using illicit drugs.
  - C) the college students who responded to the National Survey on Drug Use and Health.
  - D) all U.S. adults.

49. The 2009 National Survey on Drug Use and Health selected a random sample of U.S. college students and asked them about illicit drug use. Roughly 23% of the students surveyed reported using illicit drugs in the past year. The **sample** in this study is:
- A) U.S. college students.
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  - C) the college students who responded to the National Survey on Drug Use and Health.
  - D) all U.S. adults.
50. The 2009 National Survey on Drug Use and Health selected a random sample of U.S. college students and asked them about illicit drug use. Roughly 23% of the students surveyed reported using illicit drugs in the past year. The **variable** in this study is:
- A) the percentage of students who reported using illicit drugs.
  - B) whether or not a student used illicit drugs.
  - C) whether or not a college student responded to the survey.
  - D) the number of college students who use illicit drugs.
51. In the mid-1990s a study was conducted to determine if arthroscopic surgery was an effective treatment for arthritis of the knee. Ten men were scheduled for surgery and each patient was anesthetized. But then the surgeon consulted a randomly generated code to determine whether to do the actual surgery, or to perform a “sham” surgery (make three small incisions in the knee, stitch the patient up, and leave a small scar). This is BEST described as a(n) \_\_\_\_\_ study.
- A) voluntary
  - B) observational
  - C) medical
  - D) experimental
52. A 2008 study examined the impact of the color red on how attractive men perceive a woman to be. The men were randomly divided into two groups and were asked to rate the attractiveness of women on a scale of 1 to 9. One group of men were shown pictures of women on a white background and the other group were shown the same pictures on a red background. This is BEST described as a(n) \_\_\_\_\_ study.
- A) experimental
  - B) observational
  - C) social
  - D) inferential

53. If all visitors to the CNN Web site are invited to take part in the daily poll online, is the resulting sample likely to be biased?
- A) No, this will result in a simple random sample.
  - B) No, although this sample would not be random, it would definitely be representative of the population.
  - C) Yes, the sample is likely to suffer from non-response and self-selection bias.
  - D) More information is needed to answer the question.

## Answer Key

1. D
2. C
3. A
4. B
5. A
6. D
7. B
8. C
9. D
10. A
11. B
12. B
13. A
14. D
15. A
16. D
17. D
18. C
19. A
20. C
21. D
22. C
23. A
24. C
25. C
26. B
27. B
28. D
29. A
30. C
31. A
32. A
33. B
34. A
35. B
36. A
37. D
38. C
39. C
40. D
41. C
42. B
43. B
44. D

- 45. B
- 46. A
- 47. A
- 48. A
- 49. C
- 50. B
- 51. D
- 52. A
- 53. C