

## Introductory Statistics (IS) / Elementary Statistics (ES): Chapter 1 Form A Exam

Name \_\_\_\_\_

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

**Provide an appropriate response.**

- 1) The table below shows the number of new AIDS cases in the U.S. in each of the years 1989–1994. 1) \_\_\_\_\_

Year	New AIDS cases
1989	33,643
1990	41,761
1991	43,771
1992	45,961
1993	103,463
1994	61,301

Classify the study as either descriptive or inferential.

**Answer the question.**

- 2) A magazine publisher always mails out a questionnaire six months before a subscription ends. This questionnaire asks its subscribers if they are going to renew their subscriptions. On average, only 7% of the subscribers respond to the questionnaire. Of the 7% who do respond, an average of 47% say that they will renew their subscription. This 7% who respond to the questionnaire are known as what? 2) \_\_\_\_\_

**Identify the study as an observational study or a designed experiment.**

- 3) 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. 3) \_\_\_\_\_

**Provide an appropriate response.**

- 4) Why do statisticians sometimes use inferential statistics to draw conclusions about a population? In what situations might a statistician draw conclusions about a population using descriptive statistics only? 4) \_\_\_\_\_

**Identify the study as an observational study or a designed experiment.**

- 5) A clinic gives a drug to a group of ten patients and a placebo to another group of ten patients to find out if the drug has an effect on the patients' illness. 5) \_\_\_\_\_

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

- 6) The six members of a board of directors are Sam (S), Laurie (L), Peggy (P), Jorge (J), Max (M), and Claude (C). Consider these board members to be a population of interest. List the 15 possible samples (without replacement) of size four from this population of six board members. 6) \_\_\_\_\_

**Provide an appropriate response.**

- 7) The finalists in an essay competition are Lisa (L), Melina (M), Ben (B), Danny (D), Eric (E), and Joan (J). Consider these finalists to be a population of interest. The possible samples (without replacement) of size three that can be obtained from this population of six finalists are as follows. 7) \_\_\_\_\_

L,M,B L,M,D L,M,E L,M,J L,B,D L,B,E  
 L,B,J L,D,E L,D,J L,E,J M,B,D M,B,E  
 M,B,J M,D,E M,D,J M,E,J B,D,E B,D,J

If a simple random sampling method is used to obtain a sample of three of the finalists, what are the chances of selecting Ben, Danny, and Joan?

**Use the random number table in Appendix A to obtain the required list of random numbers.**

- 8) A company employs 5382 people and wishes to interview a random sample of 14 of them with regard to the company's health insurance policy. Construct a list of 14 random numbers between 1 and 5382 that can be used in obtaining the required simple random sample. Use the random number table and use as your starting point the digits 0691 in row 3, columns 30–33. 8) \_\_\_\_\_

**Provide an appropriate response.**

- 9) A political researcher wishes to gauge political sentiment regarding a proposed tax cut. He obtains a list of 1000 email addresses from an internet provider, uses a random number table to select a random sample of 100 of these addresses, emails the people in the sample and requests that they respond to his questions by email. Do you think that the group of people who respond is likely to be representative of all registered voters? Explain your answer. 9) \_\_\_\_\_
- 10) True or false? In simple random sampling, each possible sample is equally likely to be the one obtained. 10) \_\_\_\_\_
- 11) From a group of 496 students, every 49th student starting with the 3rd student is selected. Identify the type of sampling used in this example. 11) \_\_\_\_\_
- 12) Describe the steps involved when using stratified random sampling with proportional allocation. What are the advantages of this sampling method? 12) \_\_\_\_\_

**A designed experiment is described. Identify the specified element of the experiment.**

- 13) 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 the response variable. 13) \_\_\_\_\_
- 14) An education researcher was interested in examining the effect of the teaching method and the effect of the particular teacher on students' scores on a reading test. In a study, there are four different teachers (Juliana, Felix, Sonia, and Helen) and three different teaching methods (method A, method B, and method C). The number of students participating in the study is 258. Students are randomly assigned to a teaching method and teacher. Identify the experimental units (subjects). 14) \_\_\_\_\_

**Provide an appropriate response.**

- 15) In a designed experiment, explain the difference between the treatments and the factors. 15) \_\_\_\_\_

## Answer Key

## Testname: ISES CHAPTER 1 FORM A

- 1) Descriptive
- 2) The sample
- 3) Observational study
- 4) If a population is large, it may be too expensive and time-consuming to interview every member of the population. In such cases, a sample is drawn from the population, and based on the information in the sample, conclusions are drawn about the population; in other words, inferential statistics are used. If the population is relatively small, it may be realistic to interview every member of the population, in which case only descriptive statistics are needed.
- 5) Designed experiment
- 6) S,L,P,J S,L,P,M S,L,P,C S,L,J,M S,L,J,C S,L,M,C S,P,J,M S,P,J,C  
S,P,M,C S,J,M,C L,P,J,M L,P,J,C L,P,M,C L,J,M,C P,J,M,C
- 7)  $\frac{1}{20}$
- 8) 691, 3863, 3034, 978, 4584, 99, 362, 245, 1788, 4947, 471, 1562, 684, 2598
- 9) No; explanations will vary. Possible answer: the sample was obtained from among people who own a computer. That group is likely to include relatively wealthy people who are more likely to favor a tax cut. Furthermore, the group includes those who chose voluntarily to respond. People who respond voluntarily are likely to have stronger opinions than the average voter.
- 10) True
- 11) Systematic random sampling
- 12) Answers will vary. Possible answer: The population is first divided into subpopulations (strata). From each stratum, a simple random sample is obtained whose size is proportional to the size of the stratum. The advantage of this method is that it ensures that no stratum is missed.
- 13) Change in diastolic blood pressure
- 14) The 258 students participating in the study
- 15) Answers will vary. Possible answer: the factors are the variables whose effect on the response variable is of interest. The treatments are the various experimental conditions. In a single-factor experiment, the treatments are the levels of the factor. In a multi-factor experiment, each treatment is a combination of levels of the factors.

## Introductory Statistics (IS) / Elementary Statistics (ES): Chapter 1 Form B Exam

Name \_\_\_\_\_

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

**Provide an appropriate response.**

- 1) The table below shows the average income by age group for the residents of one town in the year 1998. The average incomes for each age group are estimates based on a sample of size 100 from each group. 1) \_\_\_\_\_

Age group	Average income
18–24	\$17,180
25–39	\$26,661
40–54	\$32,471
55–70	\$25,960
Over 70	\$18,241

Classify the study as either descriptive or inferential.

**Answer the question.**

- 2) The spell-checker in a desktop publishing application may not catch all misspellings (e.g. their, there) or correctly interpret the spellings of proper names. Jackie is an expert editor and can proofread extremely quickly. Jackie is hired by a book publisher to check the spelling of every word in the latest proof of a history book. With regard to Jackie's assignment, what is the population? 2) \_\_\_\_\_

**Identify the study as an observational study or a designed experiment.**

- 3) At one hospital in 1992, 674 women were diagnosed with breast cancer. Five years later, 88% of the Caucasian women and 83% of the African American women were still alive. 3) \_\_\_\_\_

**Provide an appropriate response.**

- 4) Fill in the following blanks: The two major types of statistics are \_\_\_\_\_ statistics and \_\_\_\_\_ statistics. 4) \_\_\_\_\_

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

- 5) Given a group of students: Allen (A), Brenda (B), Chad (C), Dorothy (D), and Eric (E), list all of the possible samples (without replacement) of size four that can be obtained from the group. 5) \_\_\_\_\_

**Provide an appropriate response.**

- 6) The finalists in an essay competition are Lisa (L), Melina (M), Ben (B), Danny (D), Eric (E), and Joan (J). Consider these finalists to be a population of interest. The possible samples (without replacement) of size two that can be obtained from this population of six finalists are as follows.

6) \_\_\_\_\_

L,M L,B L,D L,E L,J M,B M,D  
M,E M,J B,D B,E B,J D,E D,J E,J

If a simple random sampling method is used to obtain a sample of two of the finalists, what are the chances of selecting Lisa and Danny?

**Use the random number table in Appendix A to obtain the required list of random numbers.**

- 7) A market researcher is conducting a telephone poll. She has a list of 581 registered voters and wishes to interview a random sample of 12 of them. Construct a list of 12 random numbers between 1 and 581 that can be used in obtaining the required simple random sample. Use the random number table and use as your starting point the digits 432 in row 13, columns 10–12.

7) \_\_\_\_\_

**Provide an appropriate response.**

- 8) A political researcher wishes to gauge political sentiment regarding a proposed tax cut. He obtains a list of 1000 email addresses from an internet provider, uses a random number table to select a random sample of 100 of these addresses, emails the people in the sample and requests that they respond to his questions by email. Do you think that the group of people who respond is likely to be representative of all registered voters? Explain your answer.

8) \_\_\_\_\_

- 9) A mega-discount chain store just opened a new clothing store in town emphasizing mainly women's clothing. Before opening, management had to decide whether to only carry either men's, women's, boys', girls', or infants' clothing. After performing representative sampling of potential customers from each of these groups, it was decided to carry only women's clothing. Identify the type of sampling used in this example.

9) \_\_\_\_\_

- 10) The residents of one town are classified by a social scientist as follows.

10) \_\_\_\_\_

Lower income: 1274  
Middle income: 6279  
Upper income: 1547

The scientist wishes to pick a sample of 200 of the residents for a study. Describe a method for selecting the sample which involves stratified sampling with proportional allocation.

**A designed experiment is described. Identify the specified element of the experiment.**

- 11) 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 the experimental units (subjects). 11) \_\_\_\_\_
- 12) 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 the factor. 12) \_\_\_\_\_
- 13) A herpetologist performed a study on the effects of the body type and mating call of the male bullfrog as signals of quality to mates. Four life-sized dummies of male bullfrogs and two sound recordings provided a tool for testing female response to the unfamiliar frogs whose bodies varied by size (large or small) and color (dark or light) and whose mating calls varied by pitch (high, normal, or low). The female bullfrogs were observed to see whether they approached each of the four life-sized dummies. Identify the experimental units. 13) \_\_\_\_\_
- 14) An education researcher was interested in examining the effect of the teaching method and the effect of the particular teacher on students' scores on a reading test. In a study, there are four different teachers (Juliana, Felix, Sonia, and Helen) and three different teaching methods (method A, method B, and method C). The number of students participating in the study is 258. Students are randomly assigned to a teaching method and teacher. Identify the experimental units (subjects). 14) \_\_\_\_\_

**Provide an appropriate response.**

- 15) Describe a double-blind experiment and explain why blinding is used. Define the term "placebo effect" as part of the answer. 15) \_\_\_\_\_

## Answer Key

### Testname: ISES CHAPTER 1 FORM B

- 1) Inferential
- 2) Every word in the latest proof of the history book
- 3) Observational study
- 4) descriptive and inferential
- 5) A,B,C,D A,B,C,E A,C,D,E A,D,E,B B,C,D,E
- 6)  $\frac{1}{15}$
- 7) 432, 452, 534, 16, 343, 242, 428, 378, 163, 182, 293, 422
- 8) No; explanations will vary. Possible answer: the sample was obtained from among people who own a computer. That group is likely to include relatively wealthy people who are more likely to favor a tax cut. Furthermore, the group includes those who chose voluntarily to respond. People who respond voluntarily are likely to have stronger opinions than the average voter.
- 9) Stratified sampling
- 10) Answers will vary. Possible answer: Proportional allocation dictates that the number of lower income, middle income, and upper income residents selected by the scientist be 28, 138, and 34, respectively. Thus the scientist can obtain a stratified sample of 200 residents as follows: Number the lower income residents from 1 through 1274 and use table of random numbers to randomly select 28 of the 1274 lower income residents; number the middle income residents from 1 to 6279 and use a table of random numbers to randomly select 138 of the 6279 middle income residents; number the upper income residents from 1 to 1547 and use a table of random numbers to randomly select 34 of the 1547 upper income residents.
- 11) The participants in the experiment
- 12) The experimental drug
- 13) The female bullfrogs
- 14) The 258 students participating in the study
- 15) A double-blind experiment is one in which neither the subjects nor the researchers know who is getting the treatment. Blinding is when the subject does not know whether he or she is receiving a treatment or a placebo. Blinding is used to counteract the placebo effect in which an untreated subject believes he or she is receiving a treatment and reports an improvement in symptoms due to this belief.



## Introductory Statistics (IS) / Elementary Statistics (ES): Chapter 1 Form C Exam

Name \_\_\_\_\_

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

**Provide an appropriate response.**

- 1) A researcher randomly selects a sample of 100 students from the students enrolled at a particular college. She asks each student his age and calculates the mean age of the 100 students. It is 21.3 years. Based on this sample, she then estimates the mean age of all students enrolled at the college to be 21.3 years. In what way are descriptive statistics involved in this example? In what way are inferential statistics involved? 1) \_\_\_\_\_

**Answer the question.**

- 2) A computer network manager wants to test the reliability of some new and expensive fiber-optic Ethernet cables that computer department just received. The computer department received 7 boxes containing 50 cables each. The manager does not have the time to test every cable in each box. The manager will choose one box at random and test 10 cables chosen randomly within that box. What is the sample? 2) \_\_\_\_\_

**Identify the study as an observational study or a designed experiment.**

- 3) In a group of 500 men and women, those who smoked did worse on tests of reaction time than those who did not smoke. 3) \_\_\_\_\_

**Provide an appropriate response.**

- 4) Define the terms population and sample. 4) \_\_\_\_\_

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

- 5) The members of a board of directors have the following roles: president (P), vice president (V), secretary (S), treasury (T), and fundraiser (F). Consider these board members to be a population of interest. List the 10 possible samples (without replacement) of size two from this population of five board members. 5) \_\_\_\_\_

**Provide an appropriate response.**

- 6) The finalists in an essay competition are Lisa (L), Melina (M), Ben (B), Danny (D), Eric (E), and Joan (J). Consider these finalists to be a population of interest. The possible samples (without replacement) of size two that can be obtained from this population of six finalists are as follows. 6) \_\_\_\_\_

L,M L,B L,D L,E L,J M,B M,D  
M,E M,J B,D B,E B,J D,E D,J E,J

If a simple random sampling method is used to obtain a sample of two of the finalists, what are the chances of selecting Lisa and Danny?

**Use the random number table in Appendix A to obtain the required list of random numbers.**

- 7) A medical researcher is conducting clinical trials. Of the 60 people participating in the trial, 20 will receive a placebo, 20 will receive the experimental drug, and 20 will constitute the control group. The 20 people who will receive the drug will be selected at random. Construct a list of 20 random numbers between 1 and 60 which can be used in obtaining the required simple random sample. Use the random number table and use as your starting point the digits 54 in row 15, columns 20–21. 7) \_\_\_\_\_

**Provide an appropriate response.**

- 8) Define probability sampling. Identify some advantages of probability sampling. 8) \_\_\_\_\_
- 9) At a college there are 120 freshmen, 90 sophomores, 110 juniors, and 80 seniors. A school administrator selects a simple random sample of 12 of the freshmen, a simple random sample of 9 of the sophomores, a simple random sample of 11 of the juniors, and a simple random sample of 8 of the seniors. She then interviews all the students selected. Identify the type of sampling used in this example. 9) \_\_\_\_\_
- 10) Geologists have an interest in the structure and the history of the earth. A geologist can go back in time by drilling deep into the ground, retrieving a core sample, estimating the ages of the various layers, and examining the composition. A timeline can be built of the entire area from where the core sample was drilled. A geologist may retrieve several core samples to confirm the history of the earth's structure in that sampled area. Mountains, lakes, and unstable ground can easily impede a simple random sampling of a desired geographical area, therefore what is the most realistic sampling method that represents the actual drillings, comparisons, and scientific examinations of several core samples within the same geographical area? 10) \_\_\_\_\_
- 11) Describe the advantages and disadvantages of cluster sampling as compared with simple random sampling. 11) \_\_\_\_\_

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

**A designed experiment is described. Identify the specified element of the experiment.**

- 12) 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 the response variable. 12) \_\_\_\_\_
- A) The participants in the experiment
  - B) Change in diastolic blood pressure
  - C) The dosage of the drug
  - D) The treatment received (placebo, low dosage, high dosage)

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

- 13) A herpetologist performed a study on the effects of the body type and mating call of the male bullfrog as signals of quality to mates. Four life-sized dummies of male bullfrogs and two sound recordings provided a tool for testing female response to the unfamiliar frogs whose bodies varied by size (large or small) and color (dark or light) and whose mating calls varied by pitch (high, normal, or low). The female bullfrogs were observed to see whether they approached each of the four life-sized dummies. Identify the response variable. 13) \_\_\_\_\_

**Provide an appropriate response.**

- 14) In a designed experiment, explain the difference between the treatments and the factors. 14) \_\_\_\_\_
- 15) A study was conducted to evaluate the effectiveness of a new diet pill for men. A group of 3000 men were involved in the study. Of these 3000 men, 2311 took the diet pill and 889 were given a placebo. Identify the treatments, the treatment group, and the control group. 15) \_\_\_\_\_