The following exercises are meant to supplement those found in MyLab Statistics.

1.1 Assess Your Understanding

1. Match each word or phrase with its definition.

Word/Phrase	**Definition**
(a) Statistics	I. A numerical summary of a sample.
(b) Population	II. Organizing and summarizing data through tables, graphs, and numerical summaries.
(c) Sample	III. The science of collecting, organizing, summarizing, and analyzing information to draw conclusions or answer questions. It is also about providing a measure of confidence in any conclusions.
(d) Parameter	IV. A subset of the group of individuals that is being studied.
(e) Statistic	V. Uses methods that take results from a sample and extends them to the population, and measures the reliability of the result.
(f) Individual	VI. A person or object that is a member of the group being studied.
(g) Descriptive Statistics	VII. A numerical summary of a population.
(h) Inferential Statistics	VIII. The entire group of individuals to be studied.

2. Match each word or phrase with its definition.

(a) Discrete Variable	I. Provide numerical measures of individuals. The measures can be added or subtracted, and provide meaningful results.
(b) Data	II. Allow for classification of individuals based on some attribute or characteristic.
(c) Continuous Variable	III. The characteristics of the individuals within the population.
(d) Qualitative Variable	IV. Information that describes characteristics of an individual.
(e) Quantitative Variable	V. Has either a finite number of possible values or countable number of possible values. The values these variables typically result from counting.
(f) Variable	VI. Has an infinite number of possible values that are not countable. The values of these variables typically result from measurement.

In Problems 3 and 4, determine whether the underlined value is a parameter or a statistic.

3. **Calculus Exam** The average score for a class of 28 students taking a calculus midterm exam was 72%.

4. **Public Knowledge** Interviews of 100 adults 18 years of age or older, conducted nationwide, found that 44% could state the minimum age required for the office of U.S. president. *Source*: *Newsweek Magazine*

In Problems 5–8, classify the variable as qualitative or quantitative.

5. Number of siblings
6. Number on a soccer player's jersey
7. Current value of a four-year-old Chevy Camaro
8. Student ID number

In Problems 9 and 10, determine whether the quantitative variable is discrete or continuous.

9. Length (in minutes) of a country song
10. Points scored in an NFL football game

In Problems 11–14, determine the level of measurement of each variable.

11. Movie ratings of one star through five stars
12. Year of birth of college students
13. Eye color
14. Trade-in value of a car

In Problems 15–17, a research objective is presented. For each, identify the population and sample in the study.

15. Every year the U.S. Census Bureau releases the *Current Population Report* based on a survey of 50,000 households. The goal of this report is to learn the demographic characteristics of all households within the United States, such as income.

16. **Folate and Hypertension** Researcher John P. Forman and co-workers want to determine whether or not higher folate intake is associated with a lower risk of hypertension (high blood pressure) in younger women (27 to 44 years of age). To make this determination, they look at 7373 cases of hypertension in younger women and find that younger women who consume at least 1000 micrograms per day (mg/d) of total folate (dietary plus supplemental) had a decreased risk of hypertension compared with those who consume less than 200 mg/d. *Source*: John P. Forman, MD; Eric B. Rimm, ScD; Meir J. Stampfer, MD; Gary C. Curhan, MD, ScD, "Folate Intake and the Risk of Incident Hypertension among US Women," *Journal of the American Medical Association* 293:320–329, 2005

17. A large community college notices that an increasing number of full-time students are working while attending the school. The administration randomly selects 128 students and asks, "How many hours per week do you work?"

18. For the following data set, identify the individuals, variables, and data corresponding to the variables. Determine whether each variable is qualitative, continuous, or discrete.

State	Minimum Age for Driver's License (unrestricted)	Mandatory Belt Use Seating Positions	Maximum Allowable Speed Limit (cars on rural interstate)
Alabama	17	Front	70
Colorado	17	Front	75
Indiana	18	All	70
North Carolina	16	All	70
Wisconsin	18	All	65

Source: Governors Highway Safety Association

19. A Cure for the Common Wart A study conducted by researchers was designed "to determine if application of duct tape is as effective as cryotherapy (liquid nitrogen applied to the wart for 10 seconds every 2 to 3 weeks) in the treatment of common warts." The researchers randomly divided 51 patients into two groups. The 26 patients in Group 1 had their warts treated by applying duct tape to the wart for 6.5 days and then removing the tape for 12 hours, at which point the cycle was repeated for a maximum of 2 months. The 25 patients in Group 2 had their warts treated by cryotherapy for a maximum of six treatments. Once the treatments were complete, it was determined that 85% of the patients in Group 1 and 60% of the patients in Group 2 had complete resolution of their warts. The researchers concluded that duct tape is significantly more effective in treating warts than cryotherapy. *Source*: Dean R. Focht III, Carole Spicer, Mary P. Fairchok. "The Efficacy of Duct Tape vs. Cryotherapy in the Treatment of Verruca Vulgaris (The Common Wart)," *Archives of Pediatrics and Adolescent Medicine*, 156(10), 2002

(a) What is the research objective?
(b) What is the population being studied? What is the sample?
(c) What are the descriptive statistics?
(d) What are the conclusions of the study?

20. Investment Decision The Gallup Organization conducted a survey of 1018 adults, aged 18 and older, living in all 50 U.S. states and the District of Columbia and asked, "If you had a thousand dollars to spend, do you think investing it in the stock market would be a good or bad idea?" Of the 1018 adults, 46% said it would be a bad idea. The Gallup Organization reported that 46% of all adults, aged 18 and older, living in all 50 U.S. states and the District of Columbia thought it was a bad idea to invest $1000 in the stock market with a 4% margin of error with 95% confidence.

(a) What is the research objective?
(b) What is the population?
(c) What is the sample?
(d) List the descriptive statistics.
(e) What can be inferred from this survey?

21. Interpreting the Variable Suppose a fundraiser holds a raffle for which each person who enters the room receives a ticket. The tickets are numbered 1 to *N*, where *N* is the number of people at the fundraiser. The first person to arrive receives ticket number 1, the second person receives

ticket number 2, and so on. Determine the level of measurement for each of the following interpretations of the variable *ticket number*.

(a) The winning ticket number

(b) The winning ticket number was announced as 329. An attendee noted his ticket number was 294 and stated, "I guess I arrived too early."

(c) The winning ticket number was announced as 329. An attendee looked around the room and commented, "It doesn't look like there are 329 people in attendance."

22. Analyze the Article Read the following newspaper article and answer the following questions:

(a) What is the research question the study addresses?

(b) What is the sample?

(c) What type of variable is season in which you were born?

(d) What can be said (in general) about individuals born in summer? Winter?

(e) What conclusion was drawn from the study?

Season of Birth Affects Your Mood Later In Life
by Nicola Fifield

Babies born in the summer are much more likely to suffer from mood swings when they grow up while those born in the winter are less likely to become irritable adults, scientists claim.

Researchers studied 400 people and matched their personality type to when in the year they were born. They claim that people born at certain times of the year have a far greater chance of developing certain types of temperaments, which can lead to mood disorders. The scientists, from Budapest, said this was because the seasons had an influence on certain monoamine neurotransmitters, such as dopamine and serotonin, which control mood, however more research was needed to find out why.

They discovered that the number of people with a "cyclothymic" temperament, characterized by rapid, frequent swings between sad and cheerful moods, was significantly higher in those born in the summer. Those with a hyperthymic temperament, a tendency to be excessively positive, was significantly higher among those born in the spring and summer. The study also found that those born in the autumn were less likely to be depressive, while those born in winter were less likely to be irritable.

Lead researcher, assistant professor Xenia Gonda, said: "Biochemical studies have shown that the season in which you are born has an influence on certain monoamine neurotransmitters, such as dopamine and serotonin, which is detectable even in adult life. This led us to believe that birth season may have a longer-lasting effect.

"Our work looked at 400 subjects and matched their birth season to personality types in later life. Basically, it seems that when you are born may increase or decrease your chance of developing certain mood disorders.

Professor Gonda added: "We can't yet say anything about the mechanisms involved. What we are now looking at is to see if there are genetic markers which are related to season of birth and mood disorder".

The study may well provide a clue as to why some of the nation's best-known personalities are good natured, while others are slightly grumpier. The Duchess of Cambridge was born in winter, on January 9, which according to the study, means she is less likely to be irritable while Roy Keane, the famously hot-headed former Manchester United footballer, was born in August, when the scientists say people are more likely to have mood swings. Mary Berry, the ever-cheerful presenter of the Great British Bake Off, was born in the Spring, when, according to the study, people are more likely to be excessively positive.

The study is being presented at the annual conference of the European College of Neuropsychopharmacology (ECNP) in Berlin, Germany, on Sunday. Professor Eduard Vieta,

from the ECNP, said: “Although both genetic and environmental factors are involved in one’s temperament, now we know that the season at birth plays a role too.
“And the finding of “high mood” tendency (hyperthymic temperament) for those born in summer is quite intriguing.” *The Telegraph, October 19, 2014*

23. Contrast the differences between qualitative and quantitative variables.

24. Discuss the differences between discrete and continuous variables.

25. In your own words, define the four levels of measurement of a variable. Give an example of each.

26. Explain what is meant when we say “data vary.” How does this variability affect the results of statistical analysis?

27. Explain the process of statistics.

28. The age of a person is commonly considered to be a continuous random variable. Could it be considered a discrete random variable instead? Explain.