CHAPTER

1 The Nature of Statistics and Organizing Data

CHAPTER OUTLINE

1-1 Statistics Basics

Statistics is used in almost all fields of human endeavor. **In sports**, for example, a statistician may keep records of the number of yards a running back gains during a football game, or the number of hits a baseball player gets in a season. In other areas, such as public **health**, an administrator might be concerned with the number of residents who contract a new strain of flu virus during a certain year. **In education**, a researcher might want to know if new methods of teaching are better than old ones. These are only a few examples of how statistics can be used in various occupations.

DEFINITION 1.1

Statistics: is the science of conducting studies to collect, organize, summarize, analyze, and draw conclusions from data.
Data: observations (such as measurements, genders, or survey responses) that have been collected.

There are two major types of statistics: **descriptive statistics** and **inferential statistics.**

DEFINITION 1.2

Descriptive statistics: consists of the collection, organization, summarization, and presentation of data.
Inferential statistics: the method used to determine something about a population on the basis of a sample.
Or consists of generalizing from samples to populations, performing estimations, hypothesis tests, determining relationships among variables, and making predictions.

DEFINITION 1.3

Population: is the complete collection of data that we would like to make inferences about.
Sample: That part of the population from which information is obtained.

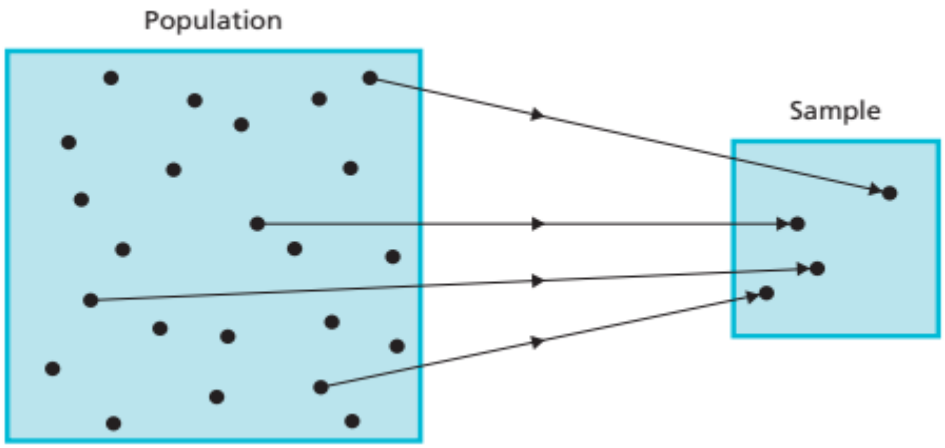

FIGURE 1.1: Relationship between population and sample

1-2 Variables and Types of Data

Statisticians gain information about a particular situation by collecting data. This section will explore in greater detail the nature of variables and types of data.

DEFINITION 1.4 **A variable** is a characteristic that can assume different values.

Variables can be classified as qualitative or quantitative.

DEFINITION 1.5 **Qualitative variable:** A non-numerically valued variable. consist of names or labels (not numbers that represent counts or measurements).
Quantitative (or numerical) variable: are variables that can be counted or measured.

Variable is the characteristic that varies from one person or thing to another. **Examples of qualitative variables** are the genders (male/ female), marital status, eye color, type of cars owned. **Examples of quantitative variables** are the income of college graduates, children in a family, height of a student, and body temperatures.

Quantitative variables can be classified as either **discrete** or **continuous**.

DEFINITION 1.6 **Discrete variables:** assume values that can be counted, and there are usually gaps between the values.
Continuous variables: can assume an infinite number of values between any two specific values. They are obtained by measuring. They often include fractions and decimals.

Examples of discrete variables: The number of Lumps that a factory can produce, the number of bedrooms in a house, the number of calls received by a call center each day fora month, and the number of students in a classroom.

Examples of Continuous variables: The air pressure in a tire, the length of time a car battery lasts, the weight of a shipment of tomatoes, and height of students.

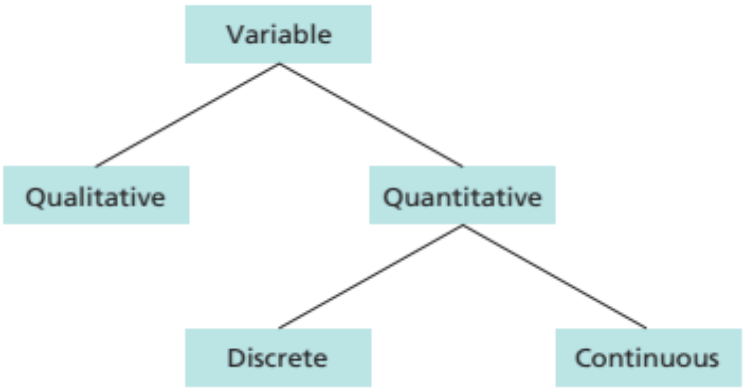

FIGURE 1.2:
Types of variables

EXAMPLE 1.1 **Classify each variable as a discrete or continuous variable.**

a. The number of hours during a week that children ages 12 to 15 reported that they watched television.
b. The amount of money a person earns per week working at a fast-food restaurant.
c. The weights of the football players on the teams that play in the Palestine this year.

Solution

a. Continuous, since the variable time is measured.
b. Discrete, since the smallest value that money can assume is in cents.
c. Continuous, since the variable weight is measured.

EXAMPLE 1.2 **Variables and Data**

Human Blood Types Human beings have one of four blood types: A, B, AB, or O.
What kind of data do you receive when you are told your blood type?

Solution

Blood type is a qualitative variable because its possible values are nonnumerical. Therefore, your blood type is qualitative data.

EXAMPLE 1.3 **Variables and Data**

Household Size The Palestine Census Bureau collects data on household size and publishes the information in Current Population Reports.
What kind of data is the number of people in your household?

Solution Household size is a quantitative variable, which is also a discrete variable because its possible values are 1, 2, ... Therefore, the number of people in your household is discrete, quantitative data.

EXAMPLE 1.4 **Variables and Data**

The World's Highest Waterfalls The list shows that Angel Falls in Venezuela is 3281 feet high, or more than twice as high as Ribbon Falls in California, which is 1612 feet high. What kind of data are these heights?

Solution Height is a quantitative variable, which is also a continuous variable because height can conceptually be any positive number. Therefore, the waterfall heights are continuous, quantitative data.

1-3 Organizing Qualitative Data

Some situations generate an overwhelming amount of data. We can often make a large or complicated set of data more compact and easier to understand by organizing it in a table, chart, or graph. In this section, we examine some of the most important ways to organize qualitative data. In the next section, we do that for quantitative data.

One way of organizing qualitative data is to construct a table that gives the number of times each distinct value occurs. The number of times a particular distinct value occurs is called its frequency

DEFINITION 1.7 **A frequency distribution:** is the organization of raw data in table form, using classes and frequencies

Reasons for Constructing Frequency

1- Large data sets can be summarized.
2- Determine the nature or shape of the distribution.
3- We have a basis for constructing important graphs such as Histogram.

Procedure 1.1 provides a step-by-step method for obtaining a frequency distribution of qualitative data.

PROCEDURE 1.1 **To Construct a Frequency Distribution of Qualitative Data**

Step 1 **List the distinct values of the observations in the data set in the first column of a table.**

Step 2 **For each observation, place a tally mark in the second column of the table in the row of the appropriate distinct value.**

Step 3 **Count the tallies for each distinct value and record the totals in the third column of the table.**

EXAMPLE 1.5 **Frequency Distribution of Qualitative Data**

Political Party Affiliations Professor Weiss asked his introductory statistics students to state their political party affiliations as Democratic (D), Republican (R), or Other (O). The responses of the 40 students in the class are given in Table.

D	R	O	R	R	R	R	R
D	O	R	D	O	O	R	D
D	R	O	D	R	R	O	R
D	O	D	D	D	R	O	D
O	R	D	R	R	R	R	D

Determine a frequency distribution of these data.

Solution

Class	Tally	Frequency
Democratic	𝍸 𝍸 ///	13
Republican	𝍸 𝍸 𝍸 ///	18
Other	𝍸 ////	9
Total		**40**

In addition to the frequency that a particular distinct value occurs, we are often interested in the relative frequency, which is the ratio of the frequency to the total number of observations

DEFINITION 1.8 **A relative-frequency distribution:** of qualitative data is a listing of the distinct values and their relative frequencies.

To obtain a relative-frequency distribution, we first find a frequency distribution and then divide each frequency by the total number of observations. Thus, we have Procedure 1.2

PROCEDURE 1.2 **To Construct a Frequency Distribution of Qualitative Data**

Step 1 **Obtain a frequency distribution of the data.**

Step 2 **For each observation, place a tally mark in the second column of the table in the row of the appropriate distinct value.**

Step 3 **Count the tallies for each distinct value and record the totals in the third column of the table.**

$$Relative\ frequency = \frac{Frequency}{Number\ of\ observations}$$

EXAMPLE 1.6 **Frequency Distribution of Qualitative Data**

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D	R	O	R	R	R	R	R
D	O	R	D	O	O	R	D
D	R	O	D	R	R	O	R
D	O	D	D	D	R	O	D
O	R	D	R	R	R	R	D

Construct a relative frequency distribution of the political party affiliations of the students.

Solution

$$\text{Relative frequency of D} = \frac{\text{Frequency}}{\text{Number of observations}} = \frac{13}{40} = 0.325$$

$$\text{Relative frequency of R} = \frac{\text{Frequency}}{\text{Number of observations}} = \frac{18}{40} = 0.450$$

$$\text{Relative frequency of O} = \frac{Frequency}{Number\ of\ observations} = \frac{9}{40} = 0.225$$

Class	Tally	Frequency	Relative frequency	percent
Democratic	𝍸 𝍸 ///	13	0.325	32.5%
Republican	𝍸 𝍸 𝍸 ///	18	0.450	45%
Other	𝍸 ////	9	0.225	22.5%
Total		**40**	**1**	**100%**

Interpretation From Table, we see that 32.5% of the students in Professor Weiss's introductory statistics class are Democrats, 45.0% are Republicans, and 22.5% are Other.

Note: Relative-frequency distributions are better than frequency distributions for comparing two data sets. Because relative frequencies always fall between 0 and 1, they provide a standard for comparison.

Two common methods for graphically displaying qualitative data are **pie charts** and **bar charts**. We begin with pie charts.

DEFINITION 1.9 A **pie chart** is a disk divided into wedge-shaped pieces proportional to the relative frequencies of the qualitative data.

PROCEDURE 1.3 **To Construct a Frequency Distribution of Qualitative Data**

Step 1 **Obtain a relative-frequency distribution of the data by applying Procedure 1.2.**

Step 2 **Divide a disk into wedge-shaped pieces proportional to the relative frequencies**

Step 3 **Label the slices with the distinct values and their relative frequencies.**

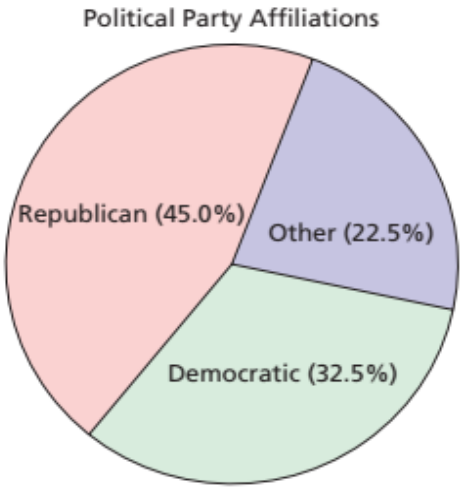
EXAMPLE 1.7 **Pie Charts**

Political Party Affiliations Construct a pie chart of the political party affiliations of the students in Professor Weiss's introductory statistics class presented in Table on page 6.

Solution

Class	Tally	Frequency	Relative frequency	percent
Democratic	𝍸 𝍸 ///	13	0.325	32.5%
Republican	𝍸 𝍸 𝍸 ///	18	0.450	45%
Other	𝍸 ////	9	0.225	22.5%
Total		**40**	**1**	**100%**

The first piece of the disk$= 0.325 * 360 = 117$
The sconed piece of the disk$= 0.45 * 360 = 162$
The first piece of the disk$= 0.225 * 360 = 81$



DEFINITION 1.10 A **bar chart** displays the distinct values of the qualitative data on a horizontal axis and the relative frequencies of those values on a vertical axis. The relative frequency of each distinct value is represented by a vertical bar whose height is equal to the relative frequency of that value. The bars should be positioned so that they do not touch each other.

PROCEDURE 1.4 **To Construct a Frequency Distribution of Qualitative Data**

Step 1 **Obtain a relative-frequency distribution of the data by applying Procedure 2.2.**

Step 2 **Draw a horizontal axis on which to place the bars and a vertical axis on which to display the relative frequencies.**

Step 3 For each distinct value, construct a vertical bar whose height equals the relative frequency of that value.

Step 4 Label the bars with the distinct values, the horizontal axis with the name of the variable, and the vertical axis with "Relative frequency."

EXAMPLE 1.8 **Bar Charts**

Political Party Affiliations Construct a bar chart of the political party affiliations of the students in Professor Weiss's introductory statistics class presented in Table on page 6.

Solution

Class	Tally	Frequency	Relative frequency	percent
Democratic	𝍸 𝍸 ///	13	0.325	32.5%
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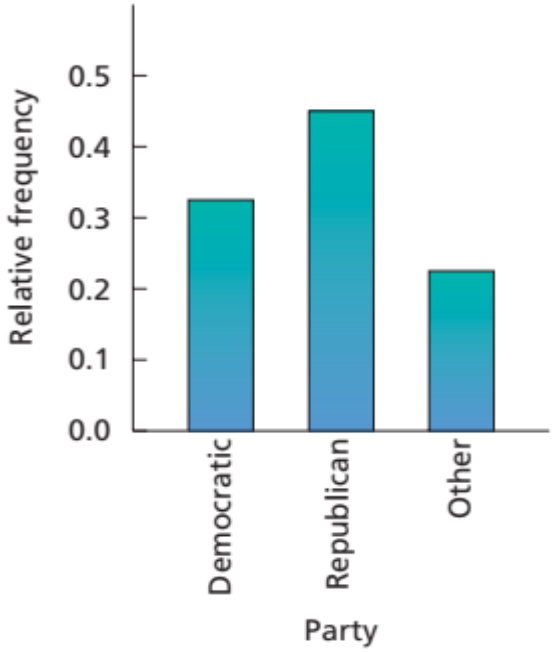
Total		**40**	**1**	**100%**



1-4 Organizing Quantitative Data

In the preceding section, we discussed methods for organizing qualitative data. Now we discuss methods for organizing quantitative data. To organize quantitative data, we first group the observations into **classes**.

Consequently, once we group the quantitative data into classes, we can construct frequency and relative-frequency distributions of the data in exactly the same way as we did for qualitative data.

DEFINITION 1.11

Lower class limit: The smallest value that could go in a class.
Upper class limit: The largest value that could go in a class.
Class width: The difference between the lower limit of a class and the lower limit of the next-higher class.
class boundaries: are the numbers used to separate classes, but without the gaps created by class limits

PROCEDURE 1.5 Constructing a Grouped Frequency Distribution

Step 1 **Determine the classes.**
- **Find the highest and lowest values.**
- **Find the range.**
- **Select the number of classes desired.**
- **Find the width by dividing the range by the number of classes and rounding up.**
- **Select a starting point (usually the lowest value or any convenient number less than the lowest value); add the width to get the lower limits.**
- **Find the upper-class limits.**
- **Find the boundaries.**

Step 2 **Tally the data.**

Step 3 **Find the numerical frequencies from the tallies, and find the cumulative frequencies.**

Ungrouped frequency distribution

When the range of the data values is relatively small, a frequency distribution can be constructed using single data values for each class. This type of distribution is called an **ungrouped frequency distribution**.

EXAMPLE 1.9 **ungrouped frequency distribution**

The data shown represent the number of hours 30 college students said they sleep per night. Construct a frequency distribution and a cumulative frequency distribution for the data.

8	6	6	8	5	7
7	8	7	6	6	7
9	7	7	6	8	10
6	7	6	7	8	7
7	8	7	8	9	8

Solution

Step 1 : Determine the classes.

Find the highest value and lowest value: H = 10 and L = 5.

Find the range: R = highest value - lowest value = H - L, so

R = 10 - 5= 5

Since the range is small, classes consisting of a single data value can be used.

Class limits	Class boundaries	Tally	Frequency
5	4.5-5.5	/	1
6	5.5-6.5	𝍸 //	7
7	6.5-7.5	𝍸 𝍸 /	11
8	7.5-8.5	𝍸 ///	8
9	8.5-9.5	//	2
10	9.5-10.5	/	1
Total			30

In this case, 11 students sleep 7 hours a night. Most of the students sleep between 5.5 and 8.5 hours.

DEFINITION 1.12 **A cumulative frequency distribution** is a distribution that shows the number of data values less than or equal to a specific value.

The cumulative frequency distribution for the data in the previous example is as follows:

Class limits	Cumulative frequency
Less than 4.5	0
Less than 5.5	1
Less than 6.5	8
Less than 7.5	19
Less than 8.5	27
Less than 9.5	29
Less than 10.5	30

Grouped Frequency Distributions

When the range of the data is large, the data must be grouped into classes that are more than one unit in width, in what is called a grouped frequency distribution.

EXAMPLE 1.10 Grouped Frequency Distributions

Record High Temperatures These data represent the record high temperatures in degrees Fahrenheit (°F) for each of the 50 states. **Construct a grouped frequency distribution** for the data, using 7 classes.

112	100	127	120	134	118	105	110	109	112
110	118	117	116	118	122	114	114	105	109
107	112	114	115	118	117	118	122	106	110
116	108	110	121	113	120	119	111	104	111
120	113	120	117	105	110	118	112	114	114

Solution

Step 1 : Determine the classes.

Find the highest value and lowest value: H = 134 and L = 100.

Find the range: R = highest value - lowest value = H - L, so

R = 134 - 100 = 34

Find the class width

$$\text{Width} = \frac{\text{R}}{\text{number of classes}} = \frac{34}{7} = 4.9 \approx 5$$

Class limits	Class boundaries	Tally	Frequency	*Relative frequency*
100-104	99.5-104.5	//	2	0.02
105-109	104.5-109.5	𝍸 ///	8	0.32
110-114	109.5-114.5	𝍸 𝍸 𝍸 ///	18	0.28
115-119	114.5-119.5	𝍸 𝍸 ///	13	0.24
120-124	119.5-124.5	𝍸 //	7	0.06
125-129	124.5-129.5	/	1	0.04
130-134	129.5-134.5	/	1	0.04
Total			50	1

The cumulative frequency distribution for the data

Class limits	Cumulative frequency
Less than 99.5	0
Less than 104.5	**2**
Less than 109.5	10
Less than 114.5	18
Less than 119.5	41
Less than 124.5	48
Less than 129.5	49
Less than 124.5	50

1-5 Histograms, Frequency Polygons, and Ogives

After you have organized the data into a frequency distribution, you can present them in graphical form.

The three most commonly used graphs in research are

1. The histogram. - [المدرج التكراري]
2. The frequency polygon. - [المضلع التكراري]
3. The cumulative frequency graph, or ogive

The steps for constructing the histogram, frequency polygon, and the ogive are summarized in the procedure table.

PROCEDURE 1.6 **Constructing a Histogram, Frequency Polygon, and Ogive**

Step 1 **Draw and label the *x* and *y* axes.**

Step 2 **On the *x* axis, label the class boundaries of the frequency distribution for the histogram and ogive. Label the midpoints for the frequency polygon.**

Step 3 **Plot the frequencies for each class, and draw the vertical bars for the histogram and the lines for the frequency polygon and ogive.**

(Note: Remember that the lines for the frequency polygon begin and end on the x axis while the lines for the ogive begin on the x axis.)

The Histogram

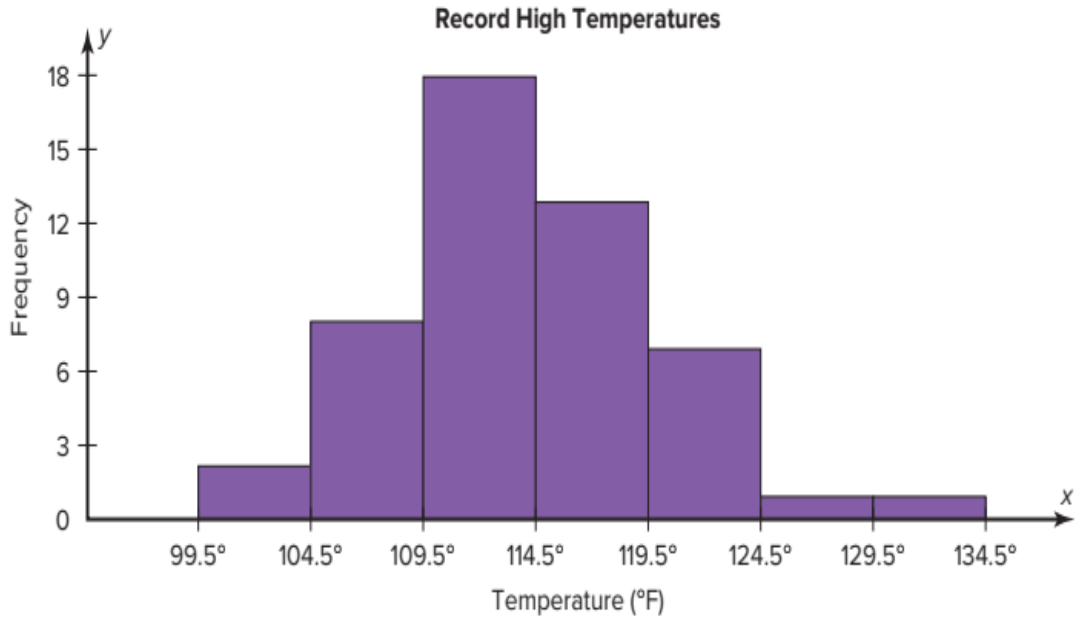
DEFINITION 1.13 **The histogram** is a graph that displays the data by using contiguous vertical bars of various heights to represent the frequencies of the classes.

EXAMPLE 1.11 The histogram

Record High Temperatures Construct a histogram to represent the data shown for the record high temperatures for each of the 50 states (see Example 1.10).

Solution

Class boundaries	Frequency
99.5-104.5	2
104.5-109.5	8
109.5-114.5	18
114.5-119.5	13
119.5-124.5	7
124.5-129.5	1
129.5-134.5	1
	50



As the histogram shows, the class with the greatest number of data values (18) ism109.5–114.5, followed by 13 for 114.5–119.5. The graph also has one peak with then data clustering around it.

The Frequency Polygon

DEFINITION 1.14 **The frequency polygon** is a graph that displays the data by using lines that connect points plotted for the frequencies at the midpoints of the classes. The frequencies are represented by the heights of the points.

EXAMPLE 1.12 Using the frequency distribution given in Example 1.10, construct a frequency polygon.

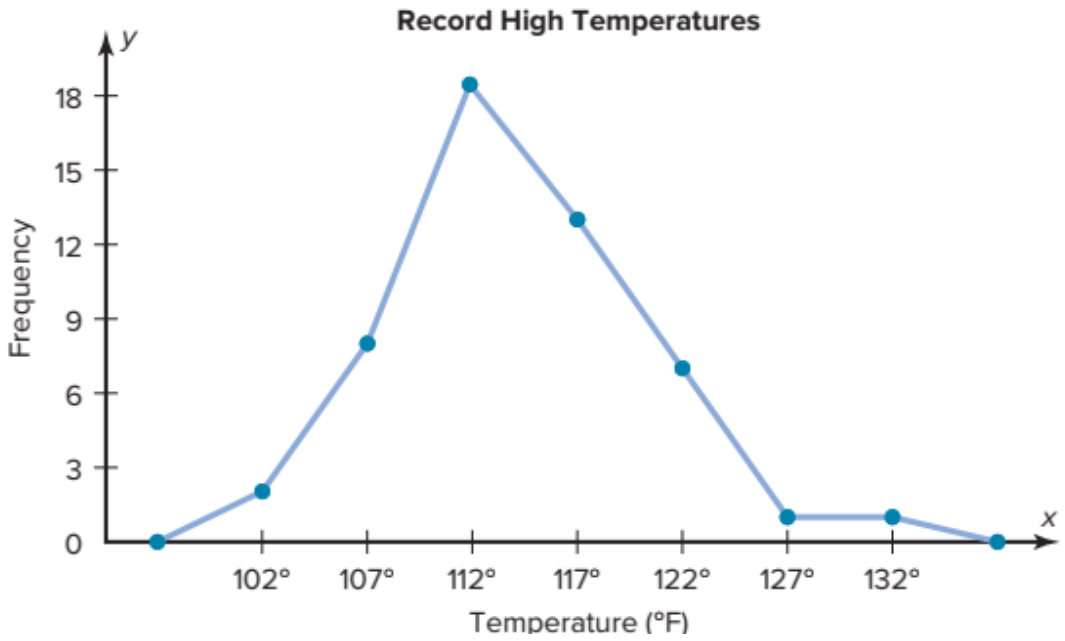
Solution

Step 1 Find the midpoints of each class. Recall that midpoints are found by adding the upper and lower boundaries and dividing by 2:

$$\frac{99.5 + 104.5}{2} = 102$$

$$\frac{104.5 + 109.5}{2} = 107$$

Class boundaries	Midpoints	Frequency
99.5-104.5	102	2
104.5-109.5	107	8
109.5-114.5	112	18
114.5-119.5	117	13
119.5-124.5	122	7
124.5-129.5	127	1
129.5-134.5	132	1
		50



The Ogive

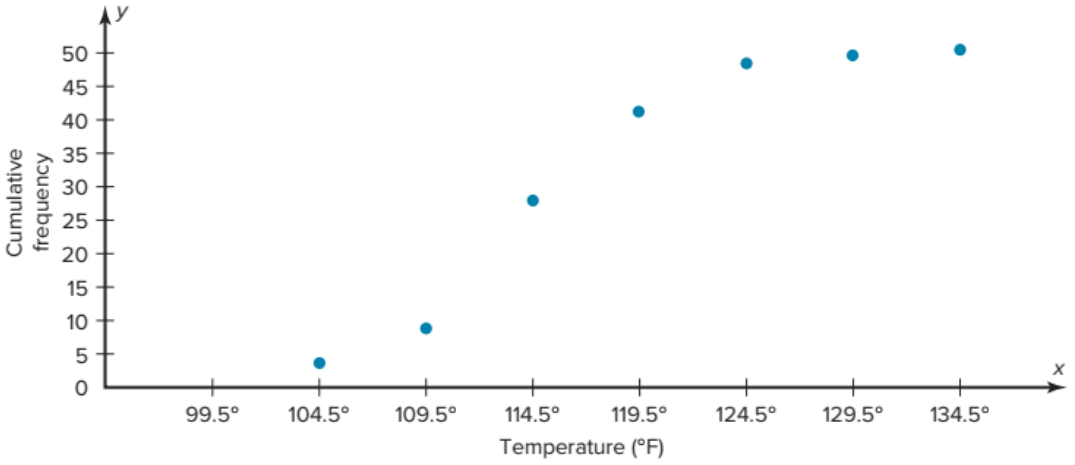
DEFINITION 1.14 **The ogive** is a graph that represents the cumulative frequencies for the classes in a frequency distribution.

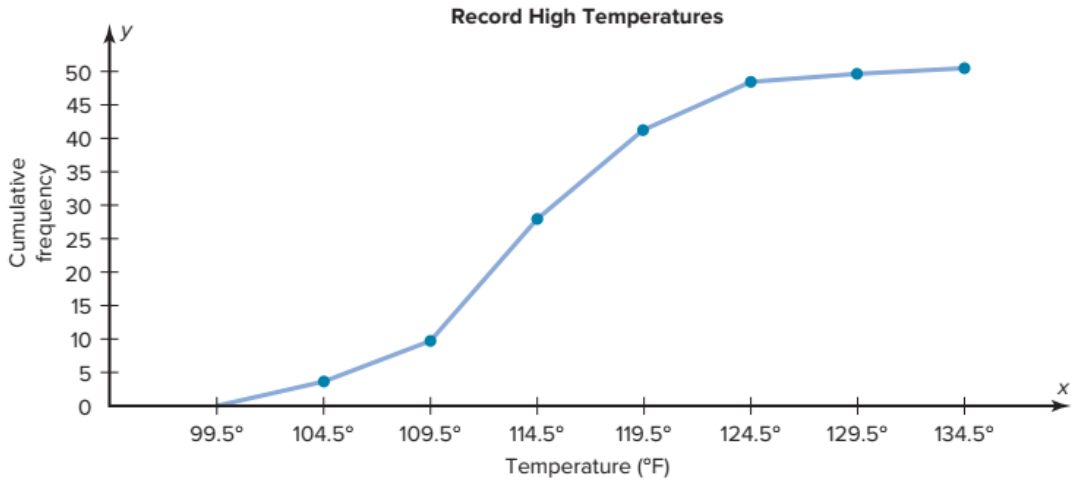
EXAMPLE 1.13 Construct an ogive for the frequency distribution described in Example 1.10.

Solution

Find the cumulative frequency for each class

Class limits	Cumulative frequency
Less than 99.5	0
Less than 104.5	2
Less than 109.5	10
Less than 114.5	18
Less than 119.5	41
Less than 124.5	48
Less than 129.5	49
Less than 124.5	50





Exercises

1.1 Define the following terms:
a. Population
b. Sample

1.2 What are the two major types of statistics? Describe them in detail.

1.3 Explain the difference between qualitative variables and quantitative variables.

1.4 Explain the difference between discrete and continuous variables.

1.5 Give an example, of a
a. qualitative variable.
b. discrete, quantitative variable.
c. continuous, quantitative variable.

1.6 Explain the difference between frequency and relative frequency.

For each part of Exercises **1.7**–**1.10**, classify the data as either qualitative or quantitative; if quantitative, further classify it as discrete or continuous. Also, identify the variable under consideration in each case.

1.7 The highest temperatures on record for selected cities are collected by the U.S. and published in Comparative Climatic Data. The following table displays data for years through 2007.

City	Rank	Highest temperature (°F)
Yuma, AZ	1	124
Phoenix, AZ	2	122
Redding, CA	3	118
Tucson, AZ	4	117
Las Vegas, NV	5	117
Wichita Falls, TX	6	117
Midland-Odessa, TX	7	116
Bakersfield, CA	8	115
Sacramento, CA	9	115
Stockton, CA	10	115

a. What type of data is presented in the second column of the table?
b. What type of data is provided in the third column of the table?
c. What type of data is provided by the information that Phoenix is in Arizon?

1.8 **Top Wi-Fi Countries.** According to JiWire, Inc., the top 10 countries by number of Wi-Fi locations, as of October 27, 2008, are as shown in the following table.

Rank	Country	Locations
1	United States	66,242
2	United Kingdom	27,365
3	France	22,919
4	Germany	14,273
5	South Korea	12,817
6	Japan	10,840
7	Russian Federation	10,619
8	Switzerland	5,332
9	Spain	4,667
10	Taiwan	4,382

Identify the type of data provided by the information in each of the following columns of the table:

a. First
b. second
c. third

1.9 **Top Broadcast Shows.** The following table gives the top five television shows, as determined by the Nielsen Ratings for the week ending October 19, 2008. Identify the type of data provided by the information in each column of the table.

Rank	Show title	Network	Viewers (millions)
1	*CSI*	CBS	19.3
2	*NCIS*	CBS	18.0
3	*Dancing with the Stars*	ABC	17.8
4	*Desperate Housewives*	ABC	15.5
5	*The Mentalist*	CBS	14.9

1.10 **Smartphones**. Several companies conduct reviews and perform rankings of products of special interest to consumers. One such company is TopTenReviews, Inc. As of October 2008, the top 10 smartphones, according to TopTenReviews, Inc., are as shown in the second column of the following table.

Rank	Smartphone	Battery (minutes)	Internet browser	Weight (oz)
1	Apple iPhone 3G 16GB	300	No	4.7
2	BlackBerry Pearl 8100	210	Yes	3.1
3	Sony Ericsson W810i	480	Yes	3.5
4	HP iPaq 510	390	Yes	3.6
5	Nokia E61i	300	Yes	5.3
6	Samsung Instinct	330	No	4.8
7	BlackBerry Curve 8320	240	No	3.9
8	Motorola Q	240	Yes	4.1
9	Nokia N95 (8GB)	300	No	4.5
10	Apple iPhone 4 GB	480	Yes	4.8

Identify the type of data provided by the information in each column of the table.

1.11 Determine whether the data are qualitative or quantitative.

a- Sizes of soft drinks sold by a fast-food restaurant (small, medium, and large)

b- Pizza sizes (small, medium, and large)

c- Cholesterol counts for individuals

d- Microwave wattage

1.12 Determine whether the data are discrete or continuous.

a. Number of phone calls received by a 911 call center each day

b. Systolic blood pressure readings

c. Weights of the suitcases of airline passengers on a specific flight

d. Number of students in the mathematics classes during the fall semester at your school for a particular school year

e. Temperatures at a seashore resort

For each data set in Exercises 1.13–1.15,

a. determine a frequency distribution.

b. obtain a relative-frequency distribution.

c. draw a pie chart.

d. construct a bar chart.

1.13 NCAA Wrestling Champs. From the official Web site for NCAA sports- we obtained the National Collegiate Athletic Association wrestling champions for the years 1984–2008. They are displayed in the following table.

Year	Champion	Year	Champion
1984	Iowa	1997	Iowa
1985	Iowa	1998	Iowa
1986	Iowa	1999	Iowa
1987	Iowa St.	2000	Iowa
1988	Arizona St.	2001	Minnesota
1989	Oklahoma St.	2002	Minnesota
1990	Oklahoma St.	2003	Oklahoma St.
1991	Iowa	2004	Oklahoma St.
1992	Iowa	2005	Oklahoma St.
1993	Iowa	2006	Oklahoma St.
1994	Oklahoma St.	2007	Minnesota
1995	Iowa	2008	Iowa
1996	Iowa		

1.14 Colleges of Students. The following table provides data on college for the students in one section of the course Introduction to Computer Science during one semester at Palestine University. In the table, we use the abbreviations BUS for Business, ENG for Engineering and Applied Sciences, and LIB for Libraries administration.

ENG	ENG	BUS	BUS	ENG
LIB	LIB	ENG	ENG	ENG
BUS	BUS	ENG	BUS	ENG
LIB	BUS	BUS	BUS	ENG
ENG	ENG	LIB	ENG	BUS

1.15 U.S. Regions. The U.S. Census Bureau divides the states in the United States into four regions: Northeast (NE), Midwest (MW), South (SO), and West (WE). The following table gives the region of each of the 50 states.

SO	WE	WE	MW	NE	WE	WE	SO	MW	SO
WE	NE	WE	SO	MW	MW	NE	WE	SO	WE
WE	SO	MW	SO	MW	WE	SO	NE	SO	SO
SO	SO	MW	NE	SO	NE	MW	NE	WE	MW
WE	SO	MW	SO	MW	NE	MW	SO	NE	WE

In each of Exercises 1.16–1.18, we have presented a frequency distribution of qualitative data. For each exercise,
a. obtain a relative-frequency distribution.
b. draw a pie chart.
c. construct a bar chart

1.16 Fricker bought three bags of M&Ms from local stores and counted the

number of each color. The average number of each color in the three bags was distributed as shown in the following table.

Color	Frequency
Brown	152
Yellow	114
Red	106
Orange	51
Green	43
Blue	43

1.17 An Edge in Roulette? An American roulette wheel contains 18 red numbers, 18 black numbers, and 2 green numbers.
The following table shows the frequency with which the ball landed on each color in 200 trials.

Number	Red	Black	Green
Frequency	88	102	10

1.18 Medical School Faculty. The Women Physicians Congress compiles data on medical school faculty. The following table presents a frequency distribution of rank for medical school faculty during one year.

Rank	Frequency
Professor	24,418
Associate professor	21,732
Assistant professor	40,379
Instructor	10,960
Other	1,504

1.19 Twenty-five army inductees were given a blood test to determine their blood type. The data set is

A	B	B	AB	O
O	O	B	AB	B
B	B	O	A	O
A	O	O	O	AB
AB	A	O	B	A

Construct a Relative frequency for the data.

1.20 In the following table displays the number of days to maturity for 40 short-term investments. Organize these data into frequency and relative-frequency

distributions, using 7 classes.

70	64	99	55	64	89	87	65
62	38	67	70	60	69	78	39
75	56	71	51	99	68	95	86
57	53	47	50	55	81	80	98
51	36	63	66	85	79	83	70

1.21 in the following Table gives the number of TV sets per household for 50 randomly selected households. Construct a frequency and relative-frequency distributions for the data.

1	1	1	2	6	3	3	4	2	4
3	2	1	5	2	1	3	6	2	2
3	1	1	4	3	2	2	2	2	3
0	3	1	2	1	2	3	1	1	3
3	2	1	2	1	1	3	1	5	1

1.22 Favorite Coffee Flavor A survey was taken asking the favorite flavor of a coffee drink a person prefers. The responses were V = Vanilla, C = Caramel, M = Mocha, H = Hazelnut, and P = Plain. Construct a frequency distribution and percentage for the data.

V	C	P	P	M	M	P	P	M	C
M	M	V	M	M	M	V	M	M	M
P	V	C	M	V	M	C	P	M	P
M	M	M	P	M	M	C	V	M	C
C	P	M	P	M	H	H	P	H	P

Which class has the most data values and which class has the fewest data values?

1.23 A survey was taken of 50 individuals. They were asked how many days per week they ate at a fast-food restaurant. Construct a frequency distribution using 8 classes.

1	3	4	0	4
5	2	2	3	1
2	2	2	2	2
2	2	2	2	3
2	2	5	2	4
2	4	5	2	1
4	1	3	2	2
2	0	7	2	3
2	2	2	5	2
3	3	4	1	3

1.25 Ages of Declaration of Independence Signers The ages of the signers of the Declaration of Independence are shown. Construct a grouped

frequency distribution and a cumulative frequency distribution for the data, using 7 classes.

41	54	47	40	39	35	50	37	49	42	70	32
44	52	39	50	40	30	34	69	39	45	33	42
44	63	60	27	42	34	50	42	52	38	36	45
35	43	48	46	31	27	55	63	46	33	60	62
35	46	45	34	53	50	50					

1.26 Average Wind Speeds A sample of 40 large cities was selected, and the average of the wind speeds was computed for each city over one year. Construct a frequency distribution, using 7 classes.

12.2	9.1	11.2	9.0
10.5	8.2	8.9	12.2
9.5	10.2	7.1	11.0
6.2	7.9	8.7	8.4
8.9	8.8	7.1	10.1
8.7	10.5	10.2	10.7
7.9	8.3	8.7	8.7
10.4	7.7	12.3	10.7
7.7	7.8	11.8	10.5
9.6	9.6	8.6	10.3

1.27 For 108 randomly selected college applicants, the following frequency distribution for entrance exam scores was obtained.

Class limits	Frequency
90–98	6
99–107	22
108–116	43
117–125	28
126–134	9
	Total 108

- Construct a histogram, frequency polygon, and ogive for the data.
- Applicants who score above 107 need not enroll in a summer developmental program. In this group, how many students do not have to enroll in the developmental program?

1.28 Pupils Per Teacher The average number of pupilsper teacher in each state is shown. Construct a grouped frequency distribution with 6 classes. Draw a histogram, frequency polygon, and ogive. Analyze the distribution

16	16	15	12	14
13	16	14	15	14
18	18	18	12	15
15	16	16	15	15
25	19	15	12	22
18	14	13	17	9
13	14	13	16	12
14	16	10	22	20
12	14	18	15	14
16	12	12	13	15

1.29 The amount of protein (in grams) for a variety of fast-food sandwiches is reported here. Construct a frequency distribution using 5 classes. Draw a histogram, a frequency polygon, and an ogive for the date, using relative frequencies.

40	43	40
53	47	46
44	57	43
43	52	44
54	47	51
39	48	36
37	56	42
54	56	49
54	52	40
48	50	40