Solution

a. Although the graph was on the United States Census website with relative source information noted, the graphic could be improved. The bold subtitle stating that the government receives a total of $24.9 billion dollars in revenue can be misleading for the data bars that are shown. The bars don't actually represent the entirety of that money. They only show the top 13 states, which represent a total of 76.4% of the revenue. A horizontal axis with markings might also help readers.

b. We are told that the graphs are included in the text, along with the data they represent. However, since the graphs are displayed side-by-side, having consistency with the horizontal labels as well as the type of graph would be an improvement. Notice that dates are given in the first two graphs while presidents' names are given in the third graph. It's also worth noting that 21.0% in the first graph is visually higher than 21.1% in the last graph.

Skill Check Answers

1. Mailboxes, fencing, and buildings were all tied for the smallest number of crashes at 5 each. **2.** Lower class limit of the 4th class: 280; Upper class limit of the 4th class: 329 **3.** Corequisite

11.2 Exercises

✔ CONCEPT CHECK

1. A _____ is a table that displays how often each value in the data set occurs.

2. A _____ is a circular graph that illustrates the size of each category in relation to the whole data set.

3. In a _____, the height of each bar represents the frequency of each class.

4. True or False: The class width is equal to the lower class limit minus the upper class limit.

5. True or False: The width of the bars in a bar graph should be equal in size.

PRACTICE

6. The grades on the first statistics test for Ms. Seago's class are listed in the following table. Construct a frequency distribution for the grades.

Grades on Statistics Test 1

A	C	F	C	C	D	F
B	D	F	B	A	A	F
B	C	C	A	B	F	D

7. Sisscon is a phone answering service. The following data are the numbers of calls per day reported by the company for the last month.

10	72	64	32	78	62	11
37	45	32	52	38	70	66
13	21	14	13	39	73	62
41	63	44	23	27	22	21
55	24	53	43	20	16	22

a. Create a grouped frequency distribution for the data using 8 classes and then use it to answer the following questions. Let the first lower class limit be 0 and the class width equal 10.

b. Calculate the relative frequencies for each class. Give your answer as a percentage rounded to the nearest tenth.

c. For what percentage of the days is the number of calls between 40 and 49?

d. For what percentage of the days is the number of calls in the single digits?

e. What is the most common range for the number of calls per day?

Create a frequency distribution with the indicated number of classes for each set of data. Include the frequency and relative frequency of each class.

8. The following data represent the numbers of curl-ups completed in 60 seconds for a group of 16 eight-year-old children. Use six classes that have a class width of 5. Begin with a lower class limit of 15.

31	34	41	36	27	29	18	33
31	28	34	22	26	28	36	42

9. The following data represent the caloric intakes in one day for a group of 15 people between the ages of 20 and 39. Use five classes that have a class width of 400. Begin with a lower class limit of 1800.

2700	2200	2500	2800	2600
3000	2600	2200	3100	2800
1800	3500	2500	3000	2900

APPLICATIONS

10. A local book shop analyzed their sales to determine the most popular genres. The following table shows data collected on the number of books of each genre sold in the latest quarter. Answer the following questions based on the table.

Grades on Statistics Test 1 Book Genre	Number of Items Sold (% of total)
Romance	327 (25.85)
Detective and Mystery	189 (14.94)
Fantasy	153 (12.09)
Action and Adventure	128 (10.12)
Science Fiction	96 (7.59)
Suspense and Thrillers	91 (7.19)
Classics	77 (6.09)
Comic Book or Graphic Novel	75 (5.93)
Short Stories	62 (4.90)
Poetry	24 (1.90)
Other	43 (3.40)

a. What do the numbers in the parentheses represent?

b. Which genre was sold the most?

c. How many books were sold by the shop in the last quarter?

11. Sofie keeps track of her expenses to make budget planning more transparent and understandable. The following table shows her expenses in each category for the last month.

Category	Amount Spent (% of total)
Housing and Utilities	$752.08 (25.53)
Tax and Insurance	$544.76 (18.49)
Food	$406.33 (13.79)
Household Expenses	$327.12 (11.10)
Wellness and Beauty	$217.64 (7.39)
Transport	$184.09 (6.25)
Entertainment	$174.85 (5.93)
Clothes and Accessories	$108.25 (3.67)
Other	$231.18 (7.85)

a. What do the numbers in the parentheses represent?

b. Which category required the most spending?

c. What are Sophie's total expenses for the last month?

12. The following table gives the grouped frequency distribution of weights of 194 babies in kilograms. Answer the questions that follow based on the distribution.

Weights of Babies

Birth Weight (kg)	0.00–0.99	1.00–1.99	2.00–2.99	3.00–3.99	4.00–4.99	5.00–5.99
Frequency	2	17	39	89	46	1

a. How many classes are in the grouped frequency distribution?

b. What is the class width?

c. What is the value of the lower class limit of the 3rd class?

d. What is the value of the upper class limit of the 5th class?

e. What is the relative frequency of the 4th class? Give your answer as a percentage rounded to the nearest tenth.

13. The following table represents a grouped frequency distribution of the number of hours spent on the computer per week for 55 students.

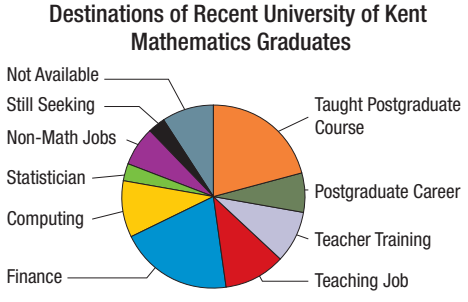
Hours	Number of Students
0.0–4.4	9
4.5–8.9	14
9.0–13.4	21
13.5–17.9	11

a. Calculate the relative frequencies (as percentages rounded to the nearest tenth) for each class.

b. What percentage of the students used the computer between 9 and 13.4 hours per week?

c. What percentage of the students used the computer less than 9 hours per week?

14. The following pie chart shows destinations of recent University of Kent mathematics graduates, including business, financial math, and statistics.[11]



a. Does it appear that any destination category accounts for more than 25% of the graduates?

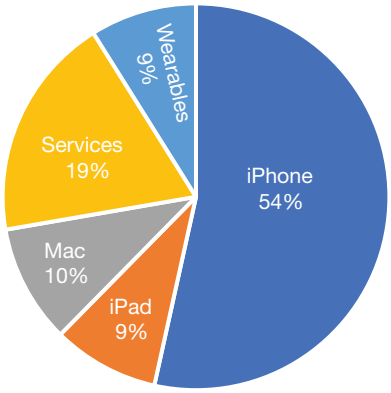
b. Which pairs of destinations appear to have similar percentages of graduates?

c. How many mathematics graduates from the University of Kent were surveyed?

d. Is the graph misleading in any way?

11 University of Kent, http://www.kent.ac.uk

15. The following pie chart shows Apple's quarterly revenue[12] by category for the fiscal second quarter of 2021. Use the chart to answer the following questions.



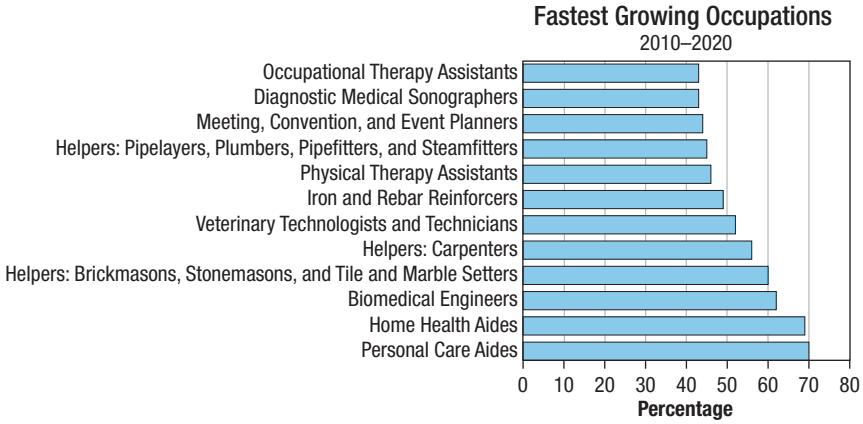
a. What product generated the most revenue?

b. What percentage of the sales were services?

c. What percentage of sales came from Mac, iPad, and Wearables?

d. Is the statement "Most revenue was generated from Mac, iPad, and Wearables" true? Explain.

16. Consider the bar graph of the predicted fastest growing occupations between 2010 and 2020.[13]



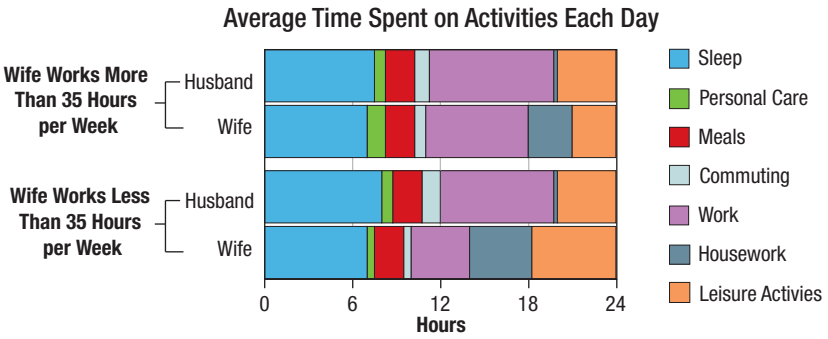
a. At a quick glance, which occupation is predicted to grow the most between 2010 and 2020? What is the predicted amount of growth?

b. How many new jobs will be available in the fastest-growing occupation in 2020?

12 "Investor Updates," News and Results, Apple, accessed January 4, 2022, https://investor.apple.com/investor-relations/default.aspx.

13 BLS Occupational Outlook Handbook, http://www.bls.gov/ooh

17. The stacked bar graph shows the average number of hours that married people in Japan spend each day doing various activities.[14]



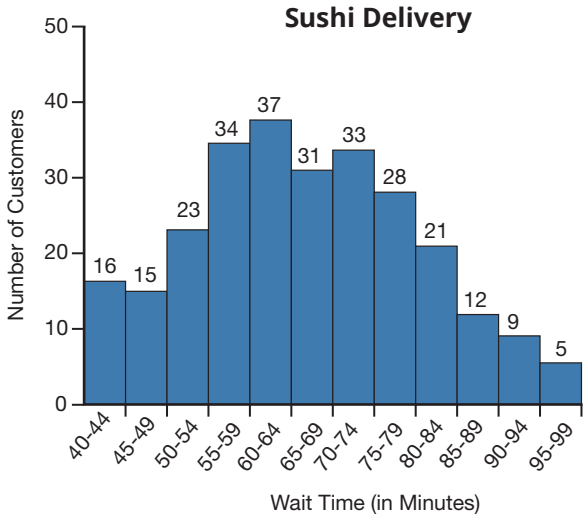
a. For wives who spend less than 35 hours per week working, how many hours on average are spent each day for leisure activities?

b. For husbands whose wives work more than 35 hours per week, approximately how many hours on average are spent on sleep?

c. Compare the number of hours spent sleeping for wives in each category.

d. What type of graph could be used to represent these data in a clearer fashion?

18. The following histogram displays data of wait times for delivery from a local sushi restaurant.



a. Determine how many wait times were recorded in the survey.

b. How many customers had to wait between 60 minutes and 74 minutes?

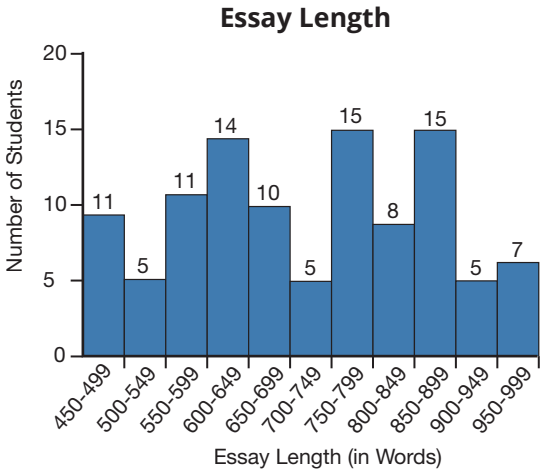
c. Approximately what percentage of customers had to wait at least one hour?

d. What was the most common wait time for customers?

e. The middle bars represent 65–69 minutes and 70–74 minutes. Is it accurate to say that about half of the wait times were more than 70 minutes? Why or why not?

14 Statistics Bureau (Japan), http://www.stat.go.jp

19. The following histogram displays data on the number of words in essays written by students at a high school.



a. Determine how many essays were surveyed.

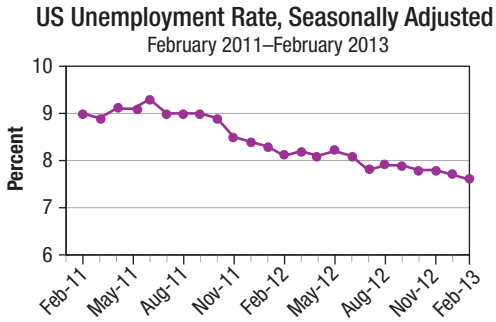
b. How many essays had the number of words between 700 and 899?

c. Approximately what percentage of essays had at least 800 words?

d. What was the most common numbers of words in essays?

e. The middle bar represents 700–749 words. Is it accurate to say that about half of the essays had 700 or more words? Why or why not?

20. The following graph shows the US unemployment rate from February 2011 to February 2013.[15]



a. Describe the trend of the unemployment percentage from February 2011 to February 2013.

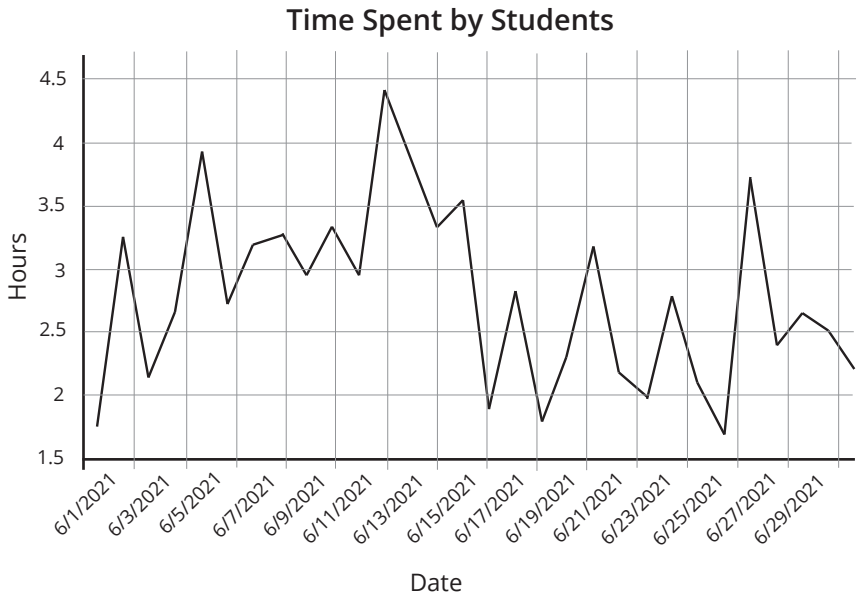
b. Approximate the month and rate of the highest unemployment during this time period.

c. Approximate the month and rate of the lowest unemployment during this time period.

d. Is the graph misleading in any way?

15 Bureau of Labor Statistics, http://www.bls.gov

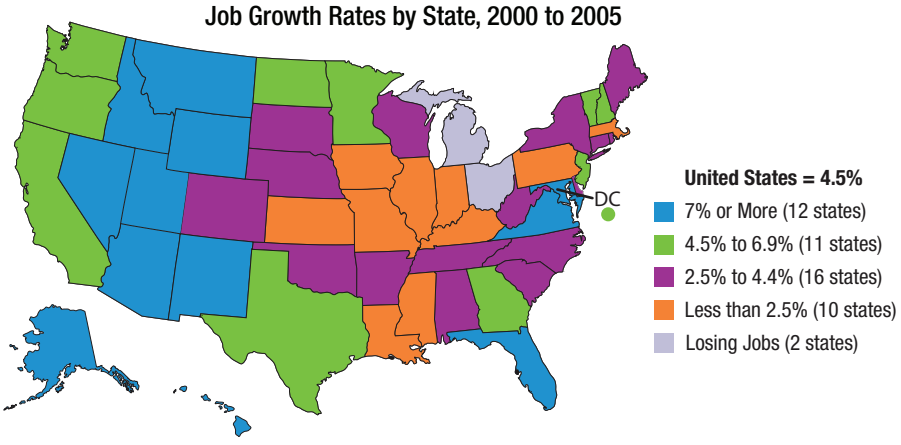
21. An online learning platform presented their analytics on average daily usage by their users. The data for June 2021 is shown in the following graph. Use the graph to answer the following questions.



a. Approximately when did the amount of time spent by students on the learning platform peak during this period?

b. Suppose you are writing an article about the usage of this platform and referencing this graph. Would the headline "Learning Engagement is Falling" be a fair representation of the information contained in this graph?

22. Answer the following questions about the Job Growth graph.[16]

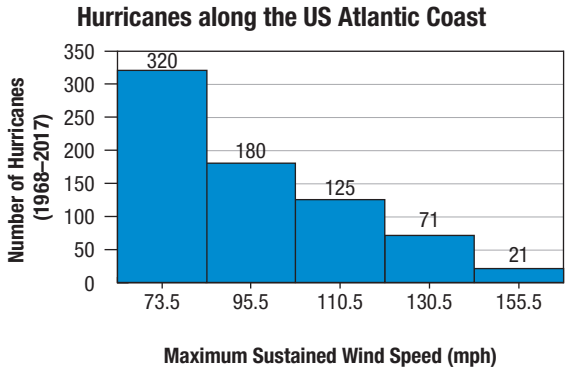


a. How many states lost jobs between 2000 and 2005?

b. In what part of the country are jobs growing the most in this time period?

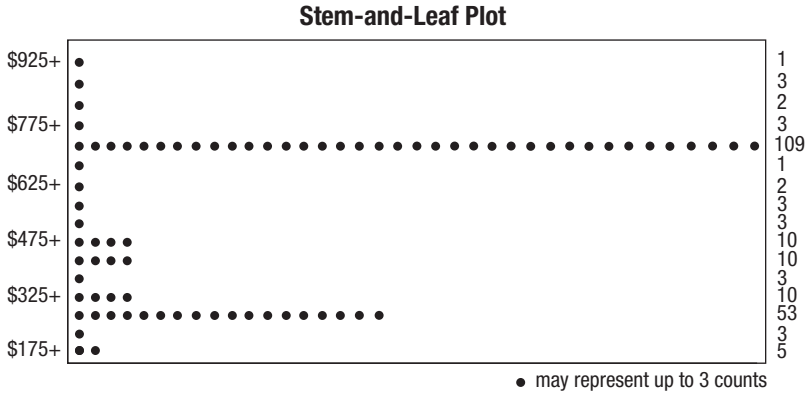
16 InContext, http://www.incontext.indiana.edu

23. What errors occur in the following histogram?



Source: Wikipedia. Atlantic hurricane season. https://en.wikipedia.org/wiki/Atlantic_hurricane_season#Number_of_storms_of_each_strength_since_the_satellite_era (18 July 2019).

24. Consider the following excerpt from an online publication. Is the graph correctly labeled? If not, identify the corrections needed.



Source: NHHealthCost.org. "Health Costs for Consumers - Methodology." 16 Feb. 2007. http://www.nhhealthcost.org/method.aspx (24 Jan. 2012).

WRITING & THINKING

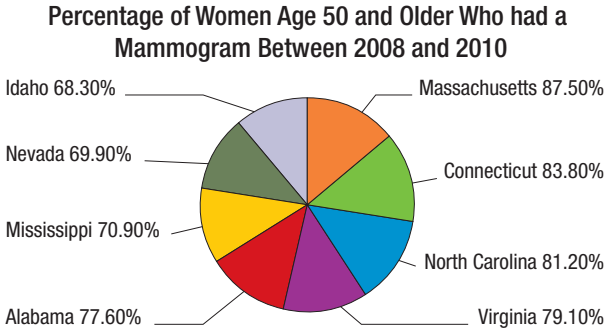
25. The following is a portion of a table about state health facts. It lists 8 of the 50 states along with the percentage of women age 50 and older who report having had a mammogram between 2008 and 2010.

Percentage of Women Age 50 and Older Who Had a Mammogram Between 2008 and 2010

Massachusetts	87.50%
Connecticut	83.80%
North Carolina	81.20%
Virginia	79.10%
Alabama	77.60%
Mississippi	70.90%
Nevada	69.90%
Idaho	68.30%

Source: Centers for Disease Control and Prevention (CDC). Behavioral Risk Factor Surveillance System Survey Data. Atlanta, Georgia: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 2010, available at http://apps.nccd.cdc.gov/brfss/list.asp?cat=WH&yr=2010&qkey=4427&state=All

Is the following pie chart a good way to display this data? Explain why or why not.



11.2 PROJECT

FOLLOWING THE BOOMERS

The US population is comprised of seven living *generations*: the Greatest Generation (born 1901–1927), the Silent Generation (1928–1945), Baby Boomers (1946–1964), Generation X (1965–1980), Millennials (1981–1995), Generation Z (1996–2010), and Generation Alpha (2011–2025). In this project, you will construct a series of stacked, side-by-side bar charts that demographers call an *age pyramid* and focus on how one of these generations affects the pyramid. This pyramid distribution for human population has been observed throughout the history of mankind but, since the 1950s, an interesting trend has developed. Our goal is to identify that trend and offer a reasonable explanation for its occurrence. In the table[17] below, we have the distribution of the percentage of the US population

17 Paul Taylor, "The Next America." Pew Research Center, Washington, D.C. (April 10, 2014) https://www.pewresearch.org/next-america/#Two-Dramas-in-Slow-Motion. Pew Research Center bears no responsibility for the analyses or interpretations of the data presented here. The opinions expressed herein, including any implications for policy, are those of the author and not of Pew Research Center.