2.2 Section Exercises

Bar Graphs

Construct a bar graph for the given data. If it is appropriate, make the bar graph a Pareto chart.

1.

Math Grades on Test 1

Grade	Number of Students
A	30
B	56
C	47
D or F	12

2.

First United States Presidential Election, 1789

	Number of Electoral Votes
George Washington	69
John Adams	34
Another Candidate	26
Not Voted	44

Source: Encyclopedia Britannica. "United States Presidential Election Results." https://www.britannica.com/topic/United-States-Presidential-Election-Results-1788863 (30 Jan. 2019).

3.

Value-Added Tax

Country	Tax Percentage
Spain	16%
Canada	7%
Norway	25%
Japan	5%
United Kingdom	17.5%

Source: Wikipedia contributors. "Value added tax." *Wikipedia, The Free Encyclopedia.* 24 Jan. 2012. http://en.wikipedia.org/wiki/Value_added_tax (24 Jan. 2012).

4.

Cost of Attendance

	College Pricing
Public 2-year	$17,930
Public 4-year in state	$25,890
Public 4-year Out of state	$41,950
Private 4-year Nonprofit On-campus	$52,500

Source: Trends in Higher Education. College Board. "Average Estimated Undergraduate Budgets, 2018-19." https://trends.collegeboard.org/college-pricing/figures-tables/average-estimated undergraduate-budgets-2018-19 (18 July 2019).

Construct a side-by-side bar graph and a stacked bar graph for the given data. Then answer the questions.

5.

Math Enrollment

Math Class	Freshmen	Sophomores
Statistics	147	45
Algebra	160	73
Calculus	23	92
Quantitative Reasoning	12	120

a. Which course has the most students enrolled? Which graph did you use to answer this question?

b. Which course has the most sophomores enrolled? Which graph did you use to answer this question?

c. Which course has the most freshmen enrolled? Which graph did you use to answer this question?

d. Which course has the least students enrolled? Which graph did you use to answer this question?

6.

Pets Seen by the Vet in One Month

Type of Animal	Number Seen by Dr. Warren	Number Seen by Dr. Campbell
Cats	47	59
Dogs	56	37
Reptiles	13	6
Birds	28	30

a. Which veterinarian saw more dogs this month? Which graph did you use to answer this question?

b. Which type of animal was seen the least this month? Which graph did you use to answer this question?

c. Which veterinarian saw more cats this month? Which graph did you use to answer this question?

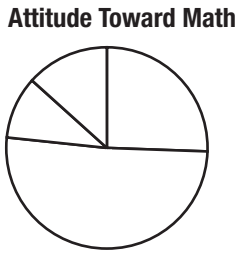
d. Which animal did Dr. Warren see the least this month? Which graph did you use to answer this question?

Pie Charts

Based on the data provided, label the pie charts with which section of the pie corresponds to which category. Provide the category label and the percentage of the pie associated with that category.

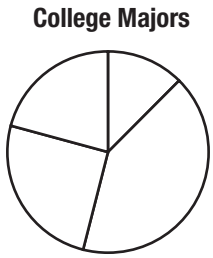
7.

Attitude Toward Math	
Attitude	**Number of Students**
Love	23
Like	46
Indifferent	9
Hate	12



8.

College Majors	
Major	**Number of Students**
English	171
Business	569
Education	346
Science	285



Histograms

Do the following for each frequency distribution.

a. Construct a histogram.
b. Calculate the relative frequency for each class.
c. Construct a relative frequency histogram.

9.

Ages of Taste-Test Participants (in Years)	
Class	**Frequency**
15–19	7
20–24	8
25–29	10
30–34	2
35–39	3

10.

Braking Times for Vehicles at 60 mph (in Minutes)	
Class	**Frequency**
0.05–0.07	12
0.08–0.10	15
0.11–0.13	14
0.14–0.16	15
0.17–0.19	14

11.

Age at Time of First Marriage (in Years)	
Class	**Frequency**
15–18	2
19–22	5
23–26	4
27–30	5
31–34	4

12.

Hourly Wage at First Job (in Dollars)	
Class	**Frequency**
7.50–8.49	12
8.50–9.49	50
9.50–10.49	48
10.50–11.49	45
11.50–12.49	34

Stem-and-Leaf Plots

Create a stem-and-leaf plot for the given data.

13. The following data represent the numbers of sit-ups completed in 60 seconds for a group of sixteen children What is the range of values from the stem-and-leaf plot that has the largest number of children completing sit-ups in 60 seconds?

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

14. The following data represent the caloric intakes in one day for a group of fifteen men between the ages of 20 and 39. Estimated Energy Requirements (EER) from the Institute of Medicine recommend a caloric intake for men between 2000 and 3000 calories per day. The following data represent the caloric intakes in one day for a group of fifteen men between the ages of 20 and 39. Based on the stem and leaf plot you created, are the majority of men in this group following the Institute of Medicine recommendation?

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

Create an ordered stem-and-leaf plot for the given data.

15. The following data represent times in minutes for completing a one mile run from a group of twenty-four teenagers.

12.4	12.3	11.1	11.9	12.1	9.5	11.6	10.8
10.2	9.3	10.1	11.2	8.2	9.3	9.5	12.5
9.4	9.7	10.7	10.9	9.3	10.4	12.9	10.6

16. The following data represent the precipitation totals in inches for the month of September in 21 different towns in Alaska.

2.73	2.81	2.54	2.59	2.70	2.88	2.64
2.55	2.86	2.68	2.77	2.61	2.56	2.62
2.78	2.64	2.50	2.67	2.89	2.74	2.81

17. The following data represent the saline concentrations (in terms of specific gravity) in a saltwater aquarium on various days.

1.022	1.021	1.022	1.023	1.019	1.021	1.022	1.017	1.024
1.021	1.022	1.022	1.023	1.020	1.019	1.023	1.025	1.018

18. The following data represent the numbers of grams of fat per serving for a representative sample of various foods found in someone's kitchen pantry. Do you believe that this person is on a low-fat diet? Explain your reasoning using the data as your evidence.

0	2	0	6	8	1	10	2
3	14	4	21	13	7	9	17

Dot Plots

Create a dot plot for the given data.

19. The following data represent the numbers of visitors, in thousands, which various online clothing retailers had on their websites during the month of February.

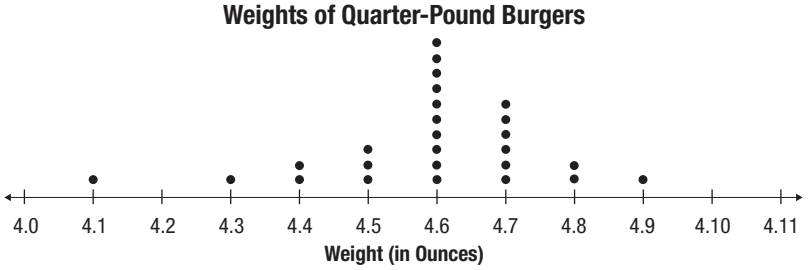
13	11	19	15	11	11	17
3	10	14	14	9	12	15
12	16	12	13	15	12	10

20. The following data represent the numbers of plastic shopping bags that customers used in a single shopping trip at a local grocery store one afternoon.

3	2	5	5	7	7	3	10	2	3	9	2	6	3	4
2	1	3	5	1	5	0	4	2	8	2	6	2	1	6
2	8	10	4	5	3	8	0	3	2	2	7	11	1	3
4	4	3	10	4	2	6	14	5	3	4	4	10	3	1
3	19	1	15	2	4	1	1	4	4	7	3	2	1	1
4	8	8	6	8	3	1	0	30	1	4	1	11	5	6
19	1	9	0	5	1	5	7	5	1	9	2	10	5	8
3	3	4	4	5	2	2	4	9	1	2	2	0	2	7
7	13	3	1	7										

Use the given dot plot to answer the questions.

21. A local fast food restaurant collected the following data while checking the weights of their quarter-pound burgers, which should be approximately 4 ounces.



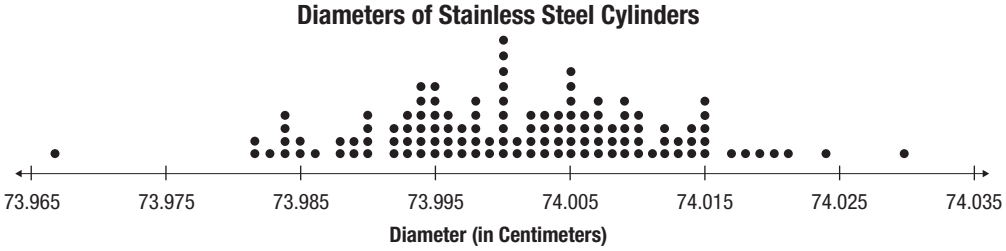
a. How many burgers were checked for weight?

b. What was the most common weight?

c. If you were describing the average weight for this sample rounded to the nearest whole ounce, would you say 4 ounces or 5 ounces? Explain your reasoning.

d. If you were a customer at this restaurant, would you feel satisfied that you were always getting your money's worth for a quarter-pound burger? Why or why not?

22. A quality control manager for a manufacturer of household products collected the following data while measuring the diameters of stainless steel cylinders that the company uses to make large trash cans.



a. Which diameter is the most common?

b. What is the largest diameter in the data?

c. Discuss the pros and cons of displaying this data set in this type of dot plot, keeping in mind any difficulties you had in answering part b.

Interpreting Graphs

Use the given graphs to answer the questions.

23. The following heat map shows the percentage of students enrolled in the Fall of each year who received a grade of D, F, W (withdraw), or I (incomplete). Use this map to answer the following questions:

DFWI Rates	2012	2013	2014	2015	2016	2017	2018
American History I	25%	23%	22%	23%	20%	19%	19%
College Algebra	44%	42%	40%	35%	37%	36%	34%
English Composition I	35%	35%	36%	38%	37%	39%	38%
Psychology I	28%	30%	35%	36%	30%	27%	24%
Principles of Biology	31%	29%	30%	29%	32%	33%	31%
Music Appreciation	10%	12%	14%	13%	17%	20%	22%

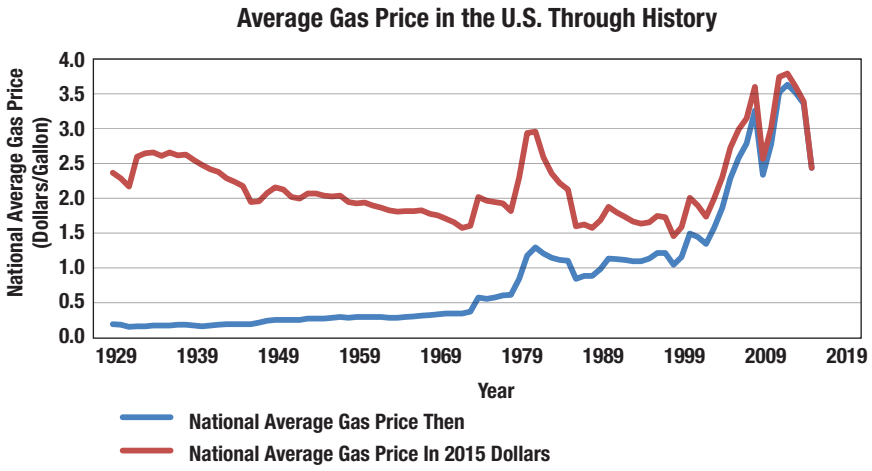
a. Which course had the worst DFWI rates?

b. Which course had the best DFWI rates?

c. Which course showed the most inconsistency in its DFWI rate?

d. Which year(s) had the most classes with poor (dark red or orange) DFWI rates?

24. Below is a line graph depicting the average national gas prices in the United States in that year's dollars ("then") and in 2015 dollars.



Source: Gringer, Bonnie. "Gas Prices Through History." https://www.titlemax.com/discovery-center/planes-trains-and-automobiles/average-gas-prices-through-history/ (30 Jan. 2019).

a. Approximately, what was the highest average price for gasoline? When did it occur? (Use the "then" values.)

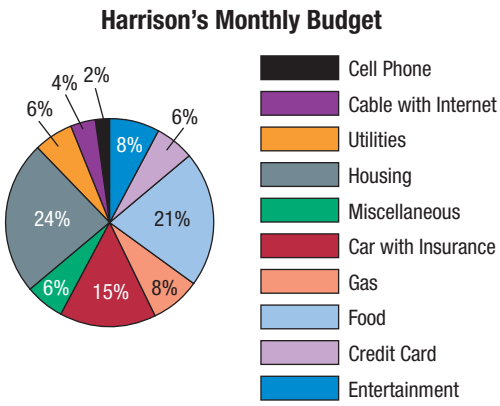
b. Approximately, what was the lowest average price for gasoline? When did it occur? (Use the "then" values.)

c. Approximately, what was the highest average price for gasoline? When did it occur? (Use the 2015 dollar values.)

d. Approximately, what was the lowest average price for gasoline? When did it occur? (Use the 2015 dollar values.)

e. How does the trend in the price of gas in that year's dollars compare to the trend in the price of gas adjusted to 2015 dollar values?

25. The following pie chart depicts Harrison's monthly budget.



a. What does Harrison spend the most money on each month?

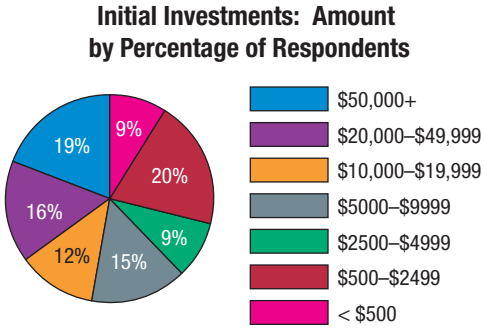
b. What does Harrison spend the least on each month?

c. What percentage of Harrison's budget is spent on household bills? (Housing, Utilities, Cable with Internet, and Cell Phone)

d. What percentage of his monthly budget does Harrison spend on his car? (Car with Insurance and Gas)

e. Disposable income is the money remaining after all essentials have been paid. What percentage of Harrison's budget is disposable income? (Entertainment, Cable with Internet, Miscellaneous, Cell Phone)

26. Consider the pie chart below.



a. What percentage of respondents initially invested $50,000 or more?

b. What percentage of respondents initially invested less than $10,000?

c. What percentage of respondents initially invested between $5000 and $19,999?

d. What percentage of respondents initially invested $10,000 or more?

27. Below is a stem-and-leaf plot of ACT math scores for a group of college music students.

ACT Math Scores of Students in a College Music Class

Stem	Leaves
1	2 3 3 4
1	5 7 8 8 8 8 9 9
2	0 0 0 1 1 2 2 2 3
2	5 5 5 6 7
3	2 3 4
3	

Key: 1 | 2 = 12

a. What was the lowest math score a student in this class received on the ACT?

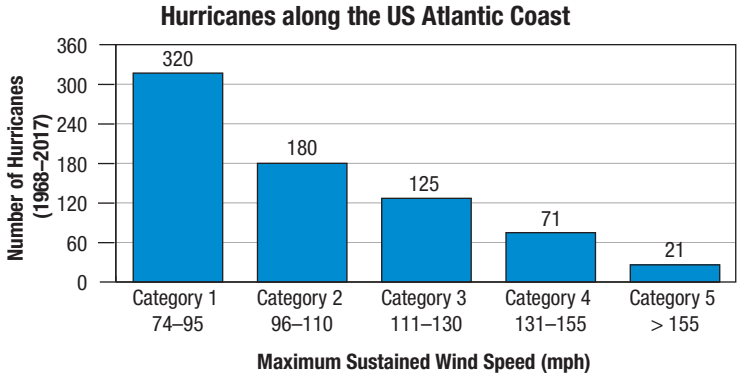
b. What was the highest math score a student in this class received on the ACT?

c. Which math score occurred most often?

d. How many students are represented by this information?

28. Meteorologists categorize hurricanes according to their maximum sustained wind speed using the Saffir-Simpson scale. This scale divides hurricanes into five categories, with Category 1 hurricanes having maximum sustained winds between 74 and 95 miles per hour (mph). The bar graph below depicts the number of hurricanes along the Atlantic coast of the United States from 1968 to 2017. Each bar in the graph represents one of the categories used to classify hurricanes.

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).



a. How many Category 3 hurricanes, with wind speeds of 111 to 130 mph, have hit the US Atlantic coast between 1968 and 2017?

b. A major hurricane is considered a hurricane in categories 3, 4, or 5 (that is, wind speeds greater than 111 mph). How many major hurricanes have hit the US Atlantic coast between 1968 and 2017?

c. What is the total number of hurricanes to hit the US Atlantic coast between 1968 and 2017?

29. Consider the following stem-and-leaf plot from a study published in an academic journal, which displays the measurements of the anterior radius of the left otolith for female stone flounder obtained from commercial capture in Tokyo Bay. The numbers to the left of the stems in this graph represent the cumulative frequencies of the data to the closest end. The middle stem is denoted by parentheses around the frequency of data in that category.

Source: Salgado Ugarte, Isaías H. "Exploratory Analysis of Some Measures of the Asymmetric Otoliths of Stone Flounder *Kareius bicoloratus* (Pisces: Pleuronectidae) in Tokyo Bay." *Anales del Instituto de Ciencias del Mar y Limnología*, Vol. 18, 1991 No. 2.

Anterior Radius of the Left Otolith for Female Stone Flounder

1	18	2
	19	
5	20	0 5 6 8
	21	
8	22	1 3 8
11	23	2 6 7
15	24	2 3 4 6
21	25	0 4 4 5 6 7
27	26	0 2 2 7 8 8
32	27	1 2 4 8 8
36	28	3 6 8 9
(7)	29	0 4 7 7 9 9 9
42	30	0 1 2 2 3 4 5 6 6 8 8 8 9
29	31	0 0 2 4 5 5 7 8 9
20	32	0 0 2 4 5 5 7
13	33	3 3 5 6 6 9
7	34	0 3
5	35	3 6
3	36	1 9
1	37	6

Unit = 0.01, N = 85 10 | 2 represents 1.02 mm

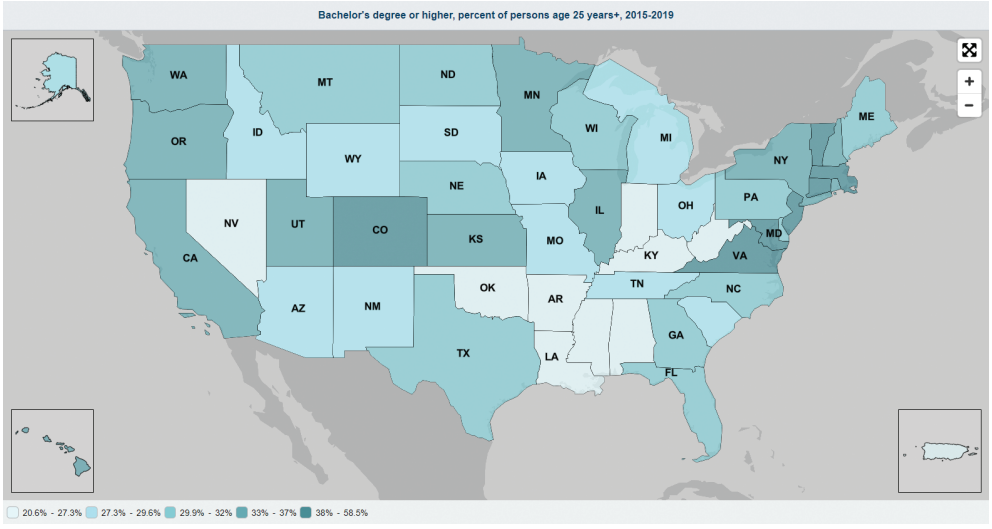
a. How many fish were in the study?

b. What were the smallest and largest measurements recorded?

c. Which length(s) appeared most often?

d. Did more fish have an otolith radius shorter or longer than the middle length category?

30. The following map depicts the percentage of each state population with a bachelor's degree or higher.



Source: US Census Bureau. "QuickFacts United States." 01 July 2018. https://www.census.gov/quickfacts/fact/map/US/EDU685217 (27 November 2019).

a. What area of the country has the largest percentage of bachelor's degrees or higher?

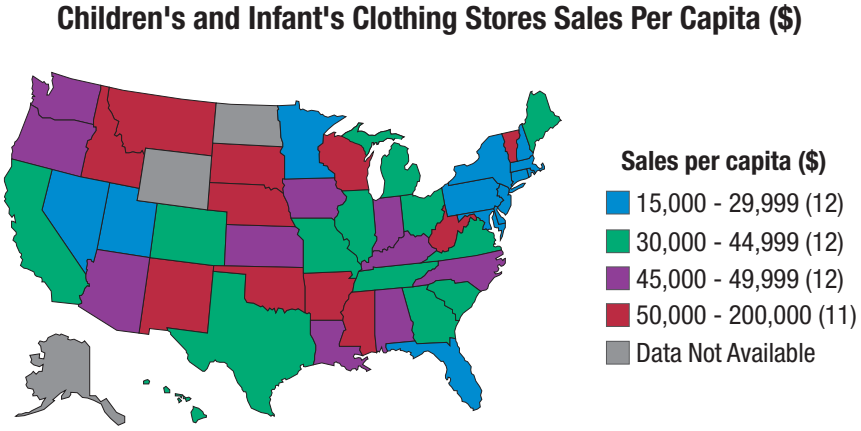
b. Look at the state you live in, what can you say about the percentage of bachelor's degrees or higher in your state compared to the rest of the United States?

31. For a school project, you need to graphically display data that you have collected. Determine the best way to display the following data. Explain your choice.

Number of Social Network Friends for Adults Over the Age of 40

213	583	114	317	80	497	524	352	126	627	250	710
528	438	347	944	721	753	302	349	101	812	74	849
314	841	411	160	174	439	435	569	323	444	529	556

32. The following map depicts the sales per capita for the children's clothing industry.



a. Of the states Texas, Oklahoma, and Louisiana, which state has the largest number of sales per capita in the children's clothing industry?

b. What is the range of sales per capita for California?

c. If you want to open a new children's clothing store either in the state you live or a state that shares a border with your state, where would you open? Explain your choice.

d. Notice that some of the wealthiest states (New York, Texas, California) have lower sales per capita. Conversely, some of the less wealthy states (Mississippi, West Virginia, Idaho) are among the highest sales per capita. Is this surprising to you? To what could you attribute these results?

Determine which type of graph would most clearly depict the data described.

33. The number of tickets sold at one theater over the course of a year

34. The number of tickets sold at one theater for each movie showing during one week

35. The number of tickets sold at one theater for each movie this week, specifically comparing the movie choices of patrons aged 18–35 to the choices of patrons aged 36 and older

36. Ticket prices for all theaters across the country