Applications

1. N
2. C
3. N
4. N
5. C
6. N
7. C
8. N
9. N
10. N
11. Answers will vary: vans, trucks, sedans, SUVs, and so on
12. Answers will vary: Bus, walking, car, subway, and so on
13. Answers will vary: Violin, viola, cello, piccolo, flute, oboe, clarinet, trumpet, trombone, tuba, and so on
14. Answers will vary: Soccer, softball, volleyball, basketball, base ball, and so on
15. Graphs and statistics that can be used: (See Figure 1.)
16. a. While it is true that more men were saved than women, the fraction of men saved (20%) was less than the fraction of women saved (74%)

    b. False (about $\frac{1}{4}$ of total women lost; about 50% of children lost)

    c. It is true that about six times as many men were saved ($56 \times 6 = 336$ and 338 men were saved). However, the survival rate for men (20%) was much less than the survival rate for children (51%).

Figure 1

Categorical Data	Numerical Data
Graphs: bar graphs, circle graphs (pie charts); two-way tables	**Graphs:** bar graphs, circle graphs (pie charts), dot plots/line plots, histograms, box plots, line graphs, scatter plots, frequency tables, and two-way tables
Measures of center: mode	**Measures of center:** mean, median, and mode (mode is seldom used with numerical data as it is the least stable of these three measures)
Measures of spread: none	**Measures of spread:** range, interquartile range, MAD, and SD

17. a. (See Figure 2.)

   b. Women and children had greater numbers of survivors than expected if the same survivor rate occurred for all passenger categories.

18. a. (See Figure 3.)

   **b. i.** 22.5%

   ii. 18.6%

   iii. 13.9%

   c. (See Figure 4.)

Figure 2

Passenger Category	Expected Saved	Expected Lost
Men	540	1,150
Women	136	289
Children	35	74

Figure 3

|	Adult Children Smoke	Adult Children Do Not Smoke	Total	Percent of Adult Children Who Smoke
Both Parents Smoke	400	1,380	1,780	22.5%
One Parent Smokes	416	1,823	2,239	18.6%
Neither Parent Smokes	188	1,168	1,356	13.9%
Total	1,004	4,371	5,375	18.7%
Percent of Adults With at Least One Parent Who Smokes	81.3%	73.3%	74.8%	

Figure 4
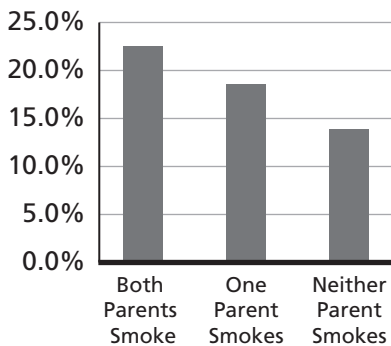
d. There is evidence that if parents smoke, adult children are more likely to become smokers. 22.5% of adult children with both parents who smoke also smoke as compared to the 13.9% for adult children when neither parent smokes.

e. There is evidence that if only one parent smokes, adult children are more likely to become smokers. 18.6% of adult children with one parent who smokes also smoke as compared to the 13.9% for adult children when neither parent smokes.

f. Yes; there is evidence that some adult children of nonsmoking parents become smokers; 13.9% of these adult children smoke.

19. There is evidence that the active treatment worked. The data show that 67.4% of the patients receiving the treatment showed at least some improvement, while only 31.7% of the patients receiving the placebo showed at least some improvement.

Connections

20. a. (See Figure 5.)

b. The sample is not unbiased; it is biased. People surveyed all lived on one street in the city. We would need a representative sample of the city's population.

c. Mode—Brand C is the most frequently owned. For categorical data, the mode is the only measure of the three that makes sense. Calculating the mean requires that you sum all the data values. You cannot sum words. The median requires that you order your data values by increasing value. Words do not have a numerical value to use for ordering. If you take the mean or median of the frequencies, this is not a mean or median of the brands.

21. $360° \div 68° = 5.29$; $5.29 \cdot 277 = 1,465$.

22. $\frac{23}{180}$ of 360 = 46 degrees.

Figure 5

**Number of TV Owners by Brand**
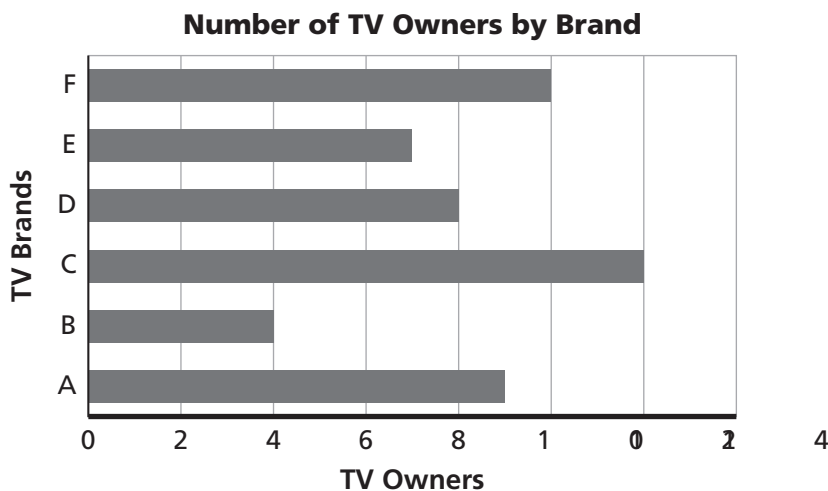
23. $\frac{128}{720}$ of 360 = 64 degrees.

24. $\frac{238}{1250}$ of 360 = 69 degrees (approx.)

25. a. Doubles the mean of the scores. The new mean is $\frac{2}{3}$ of the mean of the scores. The new mean is 0.2 times the mean of the scores.

b. If you multiply each of the individual scores by a factor, then by the distributive property, you can factor out the constant from each term and multiply the sum of the scores by the factor.

26. B; mode (The storeowner wants to know what he/she sells most, i.e., the most frequently bought shoe size or the mode. If the shoe sizes are treated as numerical data and not categorical data, the mean will be a decimal number and influenced by very large or very small shoe sizes. The median might also be a reasonable choice, because half the shoes will be larger and half will be smaller.)

27. H; median (This is because the middle of the data ignores the dramatic effect of the three absent students with temporary scores of 0.)

28. C; If $\frac{1}{4}$ of chips are red, then $\frac{3}{4}$ of chips are black. $\frac{1}{4} + \frac{3}{4} = 1$

29. Yes. Dividing each score by two and adding is the same as adding both scores and dividing by two.

30. G; Mr. Jones wants to see if his students' shoe sizes are directly related to their heights.

31. a.

Hours at Mall—Dollars Spent
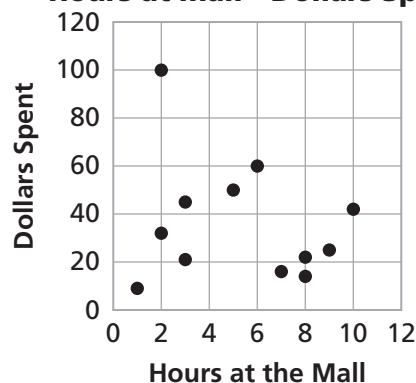
b. No correlation is apparent.

Extensions

32. a. Battery lifetime is the numerical variable; battery price is the categorical variable.

b. The parallel box plots do support that battery lifetime depends on price. Batteries that are high priced have the longest lifetime and also the least variability. There isn't much difference in battery life between low and medium quality batteries. Medium quality batteries show smaller variability.

33. a. Fifth grade; the middle 50% of backpack weights is most widely spread for the fifth grade compared to the other grades. (**Note:** Seventh grade has an interquartile range of 9 which is close to the fifth grade interquartile range of 10.)

b. The median is 10; that 50% of the data is less than 10 and 50% of the data is greater than 10.

c. Yes. Grade one, three, five, and seven all show backpack weights that are more than 15% of a students' weight. The box plots for those grades have data points larger than 15%. Grade one has two outliers greater than 15%. Grade three shows the upper 25%, grade five shows the upper 50%, and grade seven shows the upper 75% of the data points are greater than 15%.

d. Yes they do. The median and upper quartile backpack weights increase from grade 1 to 3 to 5 to 7, with the median in grade $n + 2$ consistently higher than the upper quartile in grade n.

34. a.

Survey of Favorite Colors
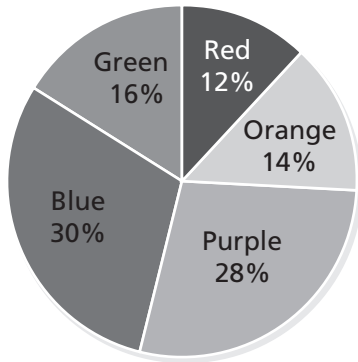
Survey of Favorite Colors
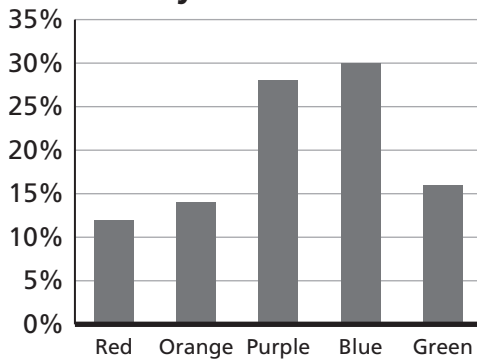
b. Percentages are used to calculate the angles in the sectors; each angle is the percent of 360 degrees. Percentages are used to reflect the frequencies/bar heights in bar graphs.

c. 50 people since the percents are exact. 50 is the smallest number of people with whole number results.