Example 4.6.2

Determining a Batting Average

Suppose you have been playing softball and have kept records on each plate appearance. According to your records you have batted 216 times. Of those 216 plate appearances, you have walked 24 times, gotten out on a sacrifice hit 7 times, and reached base on a hit 64 times. Let's compute your batting average, which is a proportion. The batting average is the proportion of times you reached base on a hit, excluding walks and sacrifice hits. In this case the number in the group of at bats we will consider is

$$\begin{aligned} N &= \text{Plate appearances} - \text{Walks} - \text{Sacrifice Hits} \\ &= 216 - 24 - 7 \\ &= 185 \text{ at bats.} \end{aligned}$$

The proportion of times you got a hit (excluding walks and sacrifice hits) is

$$p = \frac{64}{185} \approx 0.346.$$

Hence your batting average is 0.346.

Sabermetrics

In baseball and softball, statistics are plentiful. Using these metrics to improve performance, plan a game strategy, or evaluate a player is part of the field of sabermetrics. Some other proportions which are related to Batting Average include OBP and SLG. They give more information about the offensive output of a player.

On Base Percentage, OBP, uses the number of times a batter reaches base, including when walked (BB) per plate appearance.

Slugging Percentage, SLG, measures the offensive productivity of a batter by calculating a weighted average for the number of bases achieved per hit, i.e., a double counts twice as much as a single, etc. A player who generates many extra-base hits would have a higher SLG value.

The most commonly used metric to gauge a player's offensive ability is the statistic OPS, On-base Plus Slugging, which is the sum of OBP and SLG.

Source: www.mlb.com/glossary/standard-stats

For the softball example, you would not convert 0.346 to a percentage because batting averages are always reported as a proportion. In Major League Baseball (MLB) statistics, the zero in front of the decimal point is usually omitted in batting averages. So, if you were in MLB your batting average would be reported as .346.

This chapter has been devoted to summarizing data. Yet with the exception of the mode, none of the summary methods discussed should be applied to nominal data. Using proportions is one of the few summary methods available for analyzing qualitative data.

4.6 Exercises

Basic Concepts

1. What is a proportion?
2. What is the difference in notation between a population and a sample proportion?
3. Other than the mode, proportions are one of the few summary methods available to analyze what type of data?

Exercises

4. *Science News*, Vol. 143 reported some "depressing news for low-cholesterol men."[14] A study conducted at the University of California, San Diego found that among men age 70 and older in the low cholesterol group (concentration of less than 160 mg of cholesterol per deciliter of blood), nine of 75 reported symptoms of mild depression. Calculate the sample proportion of men age 70 and older in the low cholesterol group who reported symptoms of mild depression.

5. A study conducted at Virginia Commonwealth University in Richmond indicates that many older individuals can shed insomnia through psychological training.[15] A total of 23 insomnia sufferers averaging age 67 years old completed eight weekly sessions of cognitive-behavior therapy. After the therapy, 13 participants enjoyed a substantially better night's sleep. Compute the sample proportion of insomnia sufferers who enjoyed a better night's sleep after the therapy.

6. A study was conducted to explore the relationship between smoking and depression. Researchers interviewed 995 smokers and asked them if they had ever experienced severe depression. Of those surveyed, 250 said that they had experienced severe depression. Compute the sample proportion of smokers who experienced severe depression.

7. Researchers conducted a study of the relationship between baldness and heart disease.[16] Of 600 men age 21–54 who had just suffered their first heart attack, 50 were found to have vertex scalp baldness (hair loss from the top of the head). Compute the sample proportion of men age 21–54 who had just suffered their first heart attack and also experienced vertex scalp balding.

8. Using the Beers and Breweries data set from the companion website, consider the following questions. Round your answers to three decimal places.

Data

Discovering Statistics and Data, Fourth Edition > Data Sets > Beers and Breweries

a. What proportion of beers are brewed in Colorado?

b. What proportion of beers are brewed in California?

c. What is the overall proportion of beers brewed in Colorado or Texas?

9. According to a study administered by the National Bureau of Economic Research, half of Americans would struggle to come up with $2000 in the event of a financial emergency.[17] The majority of the 1900 Americans surveyed said they would rely on more than one method to come up with emergency funds if required. In the survey, 532 people said that they "certainly" would not be able to cope with an unexpected $2000 bill if they had to come up with the money in 30 days, and 418 people said they "probably" would not be able to cope.

a. What percentage of Americans "certainly" would not be able to produce $2000 in the event of an emergency according to the study?

b. What percentage of Americans would "probably" not be able to pay a $2000 bill in 30 days if required?

c. What does this say about the savings habits of Americans?

10. What college football conference has the right to brag about putting players in the NFL? The following table displays the conference affiliations of the first round draft picks for the NFL from 2012 to 2022. Use the data to answer the following questions. Round answers to three decimal places where appropriate.

First Round NFL Draft Picks by Conference 2012–2022	
Football Conference	**Number of Players**
SEC	117
Big Ten	55
Pac-12	48
ACC	57
Big 12	25
AAC	15
Independent	12
Other	22

a. What proportion of first round draft picks are from the SEC?

b. What proportion of first round draft picks are from the "Other" conferences category?

c. Is it true that a player in the SEC has a better chance of being drafted in the NFL than a player from a different conference? Explain.

11. It is no secret that Wall Street firms compete aggressively to attract clients to their firms. Having more clients translates into fees and revenues that turn into profits. A survey of 125 clients were asked what attracted them to their respective Wall Street firm. The following table shows the results.

Client Response	
Perk Received	**Client Response**
Lucrative Golf Outings	12
Lavish Dinners	33
Free Private Jet Use	8
Prime Seats at Sports Events	20
Other	22
No Perk Received	30

a. Which type of perk appears to be most successful in attracting clients?

b. What proportion of clients were attracted to a Wall Street firm by the perk identified in part **a.**?

c. What proportion of clients did not receive a perk at all?

d. Given that these perks aren't inexpensive, what conclusion can you make about providing perks to clients? Explain.