Unit 8, Lesson 4

Tables of Relative Frequencies

Let's use tables to organize probabilities.

4.1 Notice and Wonder: Dog City

This two-way table summarizes data from a survey of 200 people who reported their home environment (urban or rural) and pet preference (dog or cat).

	urban	rural	total
cat	54	42	96
dog	80	24	104
total	134	66	200

What do you notice? What do you wonder?

4.2 Rolling into Tables

Decide who will be Partner A and who will be Partner B.

The result of Partner A's roll is represented by the values on the left side of the table. The result of Partner B's roll is represented by the values on the top of the table.

Roll your number cube. Record the result of the roll. For example, if Partner A rolls a 3 and Partner B rolls a 5, then make a mark in the third row down and fifth column over. Repeat this process as many times as you can until your teacher tells you to stop.

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

1. Do the values in the table match your expectation? Explain your reasoning.

2. According to the data in the table, how many times did Partner A roll a 5?

3. How many times did you both roll the same number?

4. What percentage of the rolls resulted in the same number from both partners?

5. What percentage of the rolls resulted in Partner A rolling a 3 and Partner B rolling a 6?

6. Use the table to estimate the probability that Partner A will roll a 2 and Partner B will roll a 4. Explain your reasoning.

4.3 Traveling Methods

1. A company has an office in Austin, Texas, and an office in Copenhagen, Denmark. The company wants to know how employees get to work, so they take a survey of all the employees and summarize the results in a table.

	walk	car	public transit	bike	total
Austin	63	376	125	63	627
Copenhagen	48	67	95	267	477
total	111	443	220	330	1,104

   a. If an employee is selected at random, what is the probability that the employee works in Austin and drive a car to work?

   b. If an employee is selected at random, what is the probability that the employee works in Copenhagen and rides a bike to work?

   c. If an employee is selected at random, what is the probability that the employee takes public transit to work?

   d. If an employee from Copenhagen is selected at random, what is the probability that the employee rides a bike to work?

   e. If an employee who takes public transit to work is selected at random, what is the probability the employee works in Austin?

   f. Of the five questions above, how are the last two questions different from the first three?

2. A school district is interested in how students get to school, so they survey their high school students to see how they get to school, and they separate the numbers by grade level. The results of the survey are summarized in the table.

	car	bus	other method	total
grade 9	1,141	3,196	228	4,565
grade 10	1,126	1,770	322	3,218
grade 11	1,732	799	133	2,664
grade 12	1,676	447	111	2,234
total	5,675	6,212	794	12,681

a. If a high school student is selected at random, what is the probability that the student is in grade 9 and rides the bus to school?

b. If a high school student is selected at random, what is the probability that the student is in grade 12?

c. If a high school student is selected at random, what is the probability that the student takes a car to school?

d. If a grade 10 student is selected at random, what is the probability that the student rides a bus to school?

e. If a grade 12 student is selected at random, what is the probability that the student rides a bus to school?

f. If a student who rides the bus to school is selected at random, what is the probability that the student is in grade 9?

Are you ready for more?

Clare surveyed 40 students at her school as part of a psychology project. Here are the two questions she asked:

- Do you like to swim? (Yes or No)
- What is your favorite season? (Winter, Spring, Summer, or Fall)

Here are the results of her survey.

	likes to swim	does not like to swim
winter	5	4
spring	8	3
summer	11	1
fall	4	4

1. Create a relative frequency table for Clare's data.

2. If a student who took Clare's survey is selected at random, what is the probability that the student likes to swim and their favorite season is summer?

3. Create two of your own survey questions or use Clare's questions to survey 20 or more people. Record your survey questions and display the results in a table.

4. Create a relative frequency table for your own data. What is the most common response to your survey? What is the least common response to your survey?

Lesson 4 Summary

Tables provide a useful structure for organizing data. When several responses have been collected about some categorical variables, the data can be organized into a frequency table. The table can be used to calculate relative frequencies, which can be interpreted as probabilities.

For example, 243 participants in a survey responded to questions about their favorite season and whether they prefer wearing pants or shorts.

The results are summarized in the table.

	pants	shorts
winter	21	16
spring	43	20
summer	18	56
autumn	40	29

This table can be turned into a relative frequency table by dividing each of the values in the cells by the total number of participants.

	pants	shorts
winter	0.09	0.07
spring	0.18	0.08
summer	0.07	0.23
autumn	0.16	0.12

If a person is randomly selected from among these 243 participants, we can see that the probability that the chosen person's favorite season is spring and likes shorts better than pants is 0.08. We can also use the fact that there were 63 people who listed spring as their favorite season ($43 + 20$), so the probability that a randomly selected person from this group likes spring best is around 0.26 ($\frac{63}{243} \approx 0.26$).

Sometimes it is helpful to consider probabilities within subgroups. For example, we might want to focus on only people who prefer winter and find the probability that a person in the survey who enjoys winter best prefers wearing shorts. For this situation, we are looking at only the 37 people ($21 + 16$) who prefer winter, so that becomes the sample space, and the probability that a randomly selected person from that group likes wearing shorts is $\frac{16}{37} \approx 0.43$. We could compare that to the probability of a person who prefers shorts from among those who like summer best, $\frac{56}{18+56} \approx 0.76$.