

10-4

Two-Way Tables

What You'll Learn

To construct and interpret two-way frequency tables and two-way relative frequency tables

New Vocabulary two-way table, frequency, relative frequency

CONTENT STANDARDS

8.SP.4

Why Learn This?

You can use a two-way frequency table, such as the one at the right, to display the number of science club members who are in favor of planting a garden on school property.

	For	Against	Total
Boys	7	8	15
Girls	9	6	15
Total	16	14	30

A **two-way table** of frequencies is useful for organizing and displaying data that pertains to different categories. The **frequency** of an item is the number of times the item occurs.

EXAMPLE Making a Frequency Table

1 Fifty moviegoers were surveyed about their favorite movie types.

- 13 men and 6 women chose "Action" as their favorite type.
- 8 men and 8 women chose "Drama" as their favorite type.
- 5 men and 4 women chose "Comedy" as their favorite type.
- 4 men and 2 women chose "Animated" as their favorite type.

Make a two-way table of frequencies for the data. Use the frequency table to determine the most popular type of movie in the survey.

Step 1 Choose the categories. Use Men and Women as one set of categories. Use Action, Drama, Comedy, and Animated as the other set of categories.

Step 2 Draw the two-way table. Fill in the table using the data above.

	Action	Drama	Comedy	Animated	Total
Men	13	8	5	4	30
Women	6	8	4	2	20
Total	19	16	9	6	50

Action movies have 19 votes. They are the most popular type of movie.

Examples

1 **Making a Frequency Table** Fifty students were surveyed about their favorite flavors of ice cream.

- 4 boys and 8 girls chose chocolate as their favorite flavor.
- 2 boys and 9 girls chose rocky road as their favorite flavor.
- 8 boys and 4 girls chose vanilla as their favorite flavor.
- 12 boys and 3 girls chose strawberry as their favorite flavor.

Make a two-way table of frequencies for the data. According to the survey, what is the most popular flavor of ice cream?

Step 1 Choose the categories.

Use Girls and Boys as one set of categories. Use , , and as the other set of categories.

Step 2 Draw the two-way table. Fill in the table using the data above.

has votes. is the most popular flavor.



A two-way table can also be used to display relative frequency. **Relative frequency** is the ratio of a frequency to the value of the corresponding row total, corresponding column total, or total population.

EXAMPLE Making a Relative Frequency Table

2 The frequency table shows the hair and eye colors of 25 students. Is there evidence that blue eyes are more common for students with blond hair than for those with black hair? Explain.

		Hair Color			Total
		Blond	Black	Brown	
Eye Color	Blue	3	1	2	6
	Brown	2	7	6	15
	Green	1	1	2	4
	Total	6	9	10	25

Step 1 Make a two-way table of relative frequencies. Find the relative frequencies for each *column*. Divide each frequency by its corresponding column total.

		Hair Color		
		Blond	Black	Brown
Eye Color	Blue	$\frac{3}{6} = 0.50$	$\frac{1}{9} = 0.1\bar{1}$	$\frac{2}{10} = 0.20$
	Brown	$\frac{2}{6} = 0.3\bar{3}$	$\frac{7}{9} = 0.7\bar{7}$	$\frac{6}{10} = 0.60$
	Green	$\frac{1}{6} = 0.1\bar{6}$	$\frac{1}{9} = 0.1\bar{1}$	$\frac{2}{10} = 0.20$
	Total	$\frac{6}{6} = 1.00$	$\frac{9}{9} = 1.00$	$\frac{10}{10} = 1.00$

Step 2 Analyze the results. According to the table, **0.50**, or **50 %**, of the students with blond hair have blue eyes. Only **0.1**, or **11.1 %**, of the students with black hair have blue eyes.

Step 3 Draw a conclusion. For the students surveyed, there is evidence that blue eyes are more common for students with blond hair than for those with black hair.

For the two-way table of frequencies in Example 2, you can also find the relative frequencies for each *row*. Divide each frequency by its corresponding row total.

		Hair Color			Total
		Blond	Black	Brown	
Eye Color	Blue	$\frac{3}{6} = 0.50$	$\frac{1}{6} = 0.1\bar{6}$	$\frac{2}{6} = 0.\bar{3}$	$\frac{6}{6} = 1.00$
	Brown	$\frac{2}{15} = 0.1\bar{3}$	$\frac{7}{15} = 0.4\bar{6}$	$\frac{6}{15} = 0.40$	$\frac{15}{15} = 1.00$
	Green	$\frac{1}{4} = 0.25$	$\frac{1}{4} = 0.25$	$\frac{2}{4} = 0.50$	$\frac{4}{4} = 1.00$

2 Making a Relative Frequency Table To design a school decal, the principal surveyed students about their favorite colors and shapes. The frequency table shows the results. Is there evidence that students who like blue are more likely to like a round decal than a triangular one? Explain.

		Favorite Color			Total
		Blue	Red	Green	
Favorite Shape	Circle	4	3	2	9
	Square	3	5	1	9
	Triangle	2	2	3	7
	Total	9	10	6	25

Step 1 Make a two-way table of relative frequencies. Find the relative frequencies of each column. Divide each frequency by its corresponding column total.

		Favorite Color		
		Blue	Red	Green
Favorite Shape	Circle	$\frac{4}{9} = 0.\bar{4}$		
	Square			$\frac{1}{6} = 0.1\bar{6}$
	Triangle			
	Total		$\frac{10}{10} = 1.00$	

Step 2 Analyze the results. According to the table, $0.\bar{4}$, or %, of the students who favor blue also like circles. or %, of the students who favor blue also like triangles.

Step 3 Draw a conclusion. For the students surveyed, there is evidence that students who liked blue preferred a decal than a one.

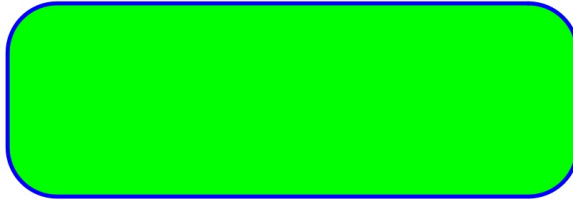


Quick Check

1. Thirty students were surveyed about their favorite type of lunch. Six girls and 8 boys chose turkey sandwiches. Seven girls and 3 boys chose grilled chicken. Four girls and 2 boys chose veggie pizza. Make a two-way table of frequencies for the data. According to the survey, what is the least popular lunch choice?

	Turkey Sandwich	Grilled Chicken	Veggie Pizza	Total
Girls				
Boys				
Total				

2. Use the data from Example 2. Is there evidence that students who favor red are more likely to prefer a triangular decal than a square one? Explain your reasoning.



Name _____ Class _____ Date _____

Practice 10-4 Two-Way Tables

1. Forty people were surveyed at a sporting goods store about their favorite outdoor activities. Below are the results.
- 10 men and 3 women chose water skiing.
 - 5 men and 7 women chose wakeboarding.
 - 1 man and 2 women chose hiking.
 - 8 men and 4 women chose fishing.
- a. Construct a two-way frequency table for the data.

All rights reserved.

Favorite Outdoor Activity

	Water Skiing	Wakeboarding	Hiking	Fishing	Total
Men					
Women					
Total					

- b. According to the survey, what is the least popular activity? _____

2. The frequency table shows the uniform preferences of 45 band members.

© Pearson Education, Inc., publishing as Pearson Prentice Hall.

Favorite Color

	Black	White	Gray	Total
Ribbons	3	6	1	10
Ruffles	2	8	6	16
Sequins	11	6	2	19
Total	16	20	9	45

- a. Make a two-way table of relative frequencies. Find the relative frequencies for each column.

	Black	White	Gray
Ribbons			
Ruffles			
Sequins			
Total			

- b. Is there evidence that those who prefer black also prefer sequins to ruffles? Explain. _____
- _____
- _____