She Blinded Me with Science!

10.3

Relative Frequency Conditional Distribution

LEARNING GOALS

In this lesson, you will:

- Construct and interpret relative frequency conditional distributions displayed in two-way tables for categorical data.

KEY TERM

- relative frequency conditional distribution

Chances are pretty good you have taken some sort of science class every year since you started school. However, unlike elementary school science which was very general, you are probably now taking a more specific science class. The word science comes from the Latin word *scientia* which means knowledge and the study of science in the broadest sense has existed since humans began communicating knowledge to each other. In the Age of Enlightenment, which took place in the 17th and 18th centuries, there was rapid scientific advancement where scientists such as Descartes and Newton confirmed scientific thinking with experiments and mathematics. Today there are two major groups of sciences: natural sciences and social sciences. The natural sciences include topics such as astronomy, biology, chemistry, physics, and earth science. The social sciences include topics dealing with society and human behavior such as economics, geography, linguistics, and psychology.

Often scientists are belittled or questioned for their beliefs or ideas, such as when Galileo suggested the Earth traveled around the sun. However, without the work scientists have achieved we would have very little understanding about the world around us.

PROBLEM 1 Passing the Class

Mr. Lewis teaches three science classes at Matthews High School. He wants to compare the grades of the three classes of his students. He creates the following two-way frequency table shown.

Grades of Mr. Lewis's Science Students

Science Classes	A	B	C	D	F	Total
Biology	6	6	5	1	2	
Chemistry	4	8	12	4	2	
Physics	2	5	6	1	1	
Total						

10

1. Complete the frequency marginal distributions on Mr. Lewis's frequency table.

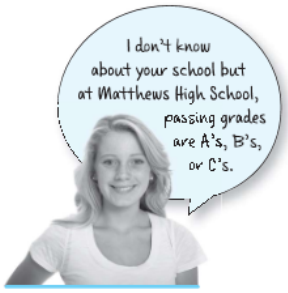
2. Complete the relative frequency and relative frequency marginal distributions for the data.

Grades of Mr. Lewis's Science Students

Science Classes	A	B	C	D	F	Total
Biology						
Chemistry						
Physics						
Total						

3. Write a paragraph interpreting the relative frequency distributions and relative frequency marginal distributions for the data.

4. Create a stacked bar grade to represent the percent of students passing in each class.



10

5. Campbell claims that the Chemistry class is the smartest because they have the greatest percent of students passing. Is Campbell's statement correct? Explain your reasoning.

PROBLEM 2 Which Is the Best?

Because each science class has a different number of students, the relative frequencies cannot help determine which class is doing the "best." Instead, you can use a *relative frequency conditional distribution* to determine this information. A **relative frequency conditional distribution** is the percent or ratio of occurrences of a category given the specific value of another category.

Let's construct a relative frequency conditional distribution of grades given the classes.

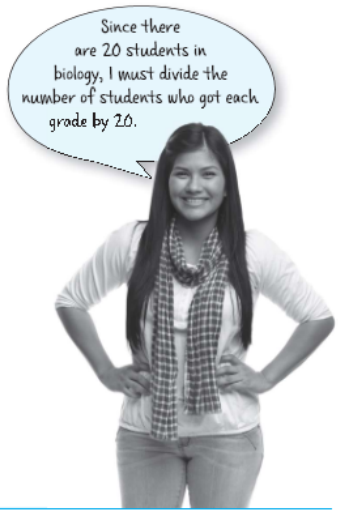
1. Use the information from Problem 1, Question 1 to determine the relative frequency for each grade given that particular class.

10

Grades of Mr. Lewis's Science Students

Science Classes	A	B	C	D	F	Total
Biology	$\frac{6}{20} = 30\%$					
Chemistry			$\frac{12}{30} = 40\%$			
Physics				$\frac{1}{15} \approx 6.7\%$		

2. Interpret the relative frequency conditional distributions of each class.



3. Use the relative frequency conditional distribution to answer each question.

   a. What percent of the biology students are passing?

   b. What percent of the chemistry students are passing?

   c. What percent of the physics students are passing?

   d. Which science class is doing the best according to their grades? Explain your reasoning.

   e. How does this compare to the statement Campbell made in Problem 1, *Passing the Class*, Question 5?

10

4. Which science class has the greatest percent of students failing?

Mr. Lewis also teaches two General Science classes. He wants to teach his students about a topic they are most interested in. He surveys his students and records the data in the table shown.

Science Classes	Matter	Plants and Animals	Astronomy	Anatomy	Genetics	Total
Class 1	5	3	10	3	4	25
Class 2	9	5	3	7	6	30
Total	14	8	13	10	10	55

10

5. Mr. Lewis wants to teach the same topic to both classes. Which topic would you recommend Mr. Lewis teach? Use the data to explain why you made your suggestion to Mr. Lewis.

Be prepared to share your solutions and methods.