NAME:_____ Math _____, Period _____

Mr. Rogove Date:_____

LEARNING OBJECTIVE: We will summarize bivariate categorical data in two-way tables. (G8M6L9)

CONCEPT DEVELOPMENT:

We have been looking at relationships between numerical variables.
Now, we will look at relationships between categorical variables

Numerical Variables: Variables that represent data that is measured in numbers.
Example: Size of a house. Miles per hour.

Categorical Variables: Variables that represent data evaluated using specific categories or descriptions.
Example: Favorite ice cream flavor, gender, age range.

Univariate Categorical Data: Data on one variable that is categorical.

One-Way Frequency Table: A way to organize and present univariate categorical data.
Example: 30 students were asked their favorite ice cream flavor.

Ice Cream Flavor	Chocolate	Vanilla	Cookie Dough	Total
Number of Students	15	9	6	30

Relative Frequency: A description of the frequency of the occurrences of each categorical data in relation to the whole. A **proportion** measured by the following fraction: $\frac{frequency}{total}$.
Example:

Ice Cream Flavor	Chocolate	Vanilla	Cookie Dough	Total
Number of Students	.50 $\frac{15}{30}$	.30 $\frac{9}{30}$	.20 $\frac{6}{30}$	1.00 $\frac{30}{30}$

Bivariate Categorical Data: Data on two variables that is categorical. This data is easily organized and summarized in a **two-way frequency table**.
Example: The number of boys and girls who like a specific flavor of ice cream.

		Favorite Ice Cream Flavor			
		Chocolate	Vanilla	Cookie Dough	Total
Gender	**Male**	7	8	2	17
	Female	8	1	4	13
	Total	15	9	6	30

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GUIDED PRACTICE:

Steps for Summarizing Bivariate Data
1. Select the variables you would like to evaluate.
2. Enter in the values for each of the data.
3. Figure out relevant relative frequencies.
4. Answer any questions regarding the data.

Below is a one-way table that reports data collected on how we normally get to school. Answer all questions below.

Mode of Transportation to School	Walk	Skateboard/ Scooter	Bike	In a car	TOTAL
Number of students	$\frac{18}{87}$ .207	$\frac{1}{87}$ .011	$\frac{21}{87}$ .241	$\frac{47}{87}$ .540	87 1.000

1. What is the relative frequency for each of the different ways to get to school?

PROPORTION!

Below is a two-way table that reports data collected on gender and cell phone ownership. Answer all questions below.

COLUMN ↓

		Gender: Male	Gender: Female	TOTAL
Cell Phone Owner?	Yes	$\frac{36}{87}$ .414	$\frac{35}{87}$ .402	$\frac{71}{87}$ .816
	No	$\frac{11}{87}$ .126	$\frac{5}{87}$ .057	$\frac{16}{87}$ .184
	TOTAL	$\frac{47}{87}$ .540	$\frac{40}{87}$ .460	87 1.000

ROW →

1. What is the relative frequency for each of the cells above?

FREQ. / TOTAL

2. Of the girls, what percent have cell phones? Column relative frequency

$35/40 = .875 = 87.5\%$

3. Of cell phone owners, what percent are girls? Row relative frequency

$35/71 = 49.3\%$ .493

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Below is a two-way table that reports data collected. Answer all questions below

		Mode of Transportation to School				
		Walk	**Skateboard/ Scooter**	**Bike**	**In a car**	**Total**
Gender	**Male**	11 .126	0 0	10 .115	26 .299	**47** .540
	Female	7 .080	1 .011	11 .126	21 .241	**40** .460
	Total	**18** .207	**1** .011	**21** .241	**47** .540	**87** 1.000

1. What is the relative frequency for each cell in the table above?

2. What percent of the girls ride a skateboard or a scooter to school?

40 ?

$\frac{1}{40} = 2.5\%$ .025

3. Of those who reported they walked to school, what percent were boys?

$\frac{11}{18} = 61.1\% = .611$

4. If a student is selected at random, how would you predict they would get to school?

In a car!

5. If the randomly selected student was one who walked, do you think they are a boy or a girl?

61.1% v. 38.9%

Boy v. girl.

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Below is a two-way table that reports data collected on gender and the snacks that students like to eat. Answer all questions below.

		Favorite Snack					
		Candy Bar	**Baked Goods**	**Salty**	**Spicy**	**Healthy**	**Total**
Gender	**Male**	9 .103	10 .115	15 .172	5 .057	8 .092	**47** .540
	Female	2 .023	13 .149	14 .161	1 .011	10 .115	**40** .460
	Total	**11** .126	**23** .264	**29** .333	**6** .069	**18** .207	**87** 1.000

1. List the relative frequencies for each cell in the table.

2. What is the difference in how you'd determine the proportion of male students who prefer baked goods and the proportion of students who are male AND prefer baked goods? Explain this in words.

10/47 Row relative frequency

10/87 Table relative frequency

3. What proportion of the female students prefer healthy foods?

10/40 Row relative

4. What proportion of the students who prefer spicy snacks are male?

5/6 Column relative

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Below is a two-way table that reports data collected on how people get to school and the snacks they like to eat. Answer all questions below.

		Favorite Snack					
		Candy Bar	**Baked Goods**	**Salty**	**Spicy**	**Healthy**	**Total**
Mode of Transportation	**Walk**	2	3	7	0	6	**18**
	Skateboard/ Scooter	0	0	1	0	0	**1**
	Bike	1	11	5	0	4	**21**
	In a car	8 .73	9 .39	16 .55	6 1.00	8 .44	**47** .54
	Total	**11**	**23**	**29**	**6**	**18**	**87**

1.Write down three interesting observations that you would be willing to share with the class.

- 16 people who rode in a car liked salty snacks
- All spicy snackers are drivers
- Most popular snack was salty

2. What is the proportion of students that bike to school ~~and~~ who like salty snacks?

5/87 .057

3. A student is selected at random. They biked to school this morning. Would they rather have a brownie or a Snickers bar? Explain your thoughts.

Baked goods 11/21 > 1/21

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Below is a two-way table that reports data collected on sports we like to watch and sports we like to play. Answer the questions below.

		Favorite Sport to WATCH					
		Baseball	**Basketball**	**Football**	**Hockey**	**Soccer**	**Total**
Favorite Sport to PLAY	**Baseball**	13	0	2	2	1	**18**
	Basketball	4	10	3	0	4	**21**
	Football	0	1 .2	4 .8	0	0	**5**
	Hockey	0	1 .25	1 .25	2 .5	0	**4**
	Soccer	5	5	6	3	20	**39**
	Total	**22**	**17**	**16**	**7**	**25**	**87**

1. Which sport is the most popular to play?

Soccer 39/87 .449

2. Which sport is the most popular to watch?

25/87 .253

3a. Of those who said soccer was their favorite sport to PLAY, what percent also said it was their favorite sport to WATCH?

20/39 .513 51.3% Row relative freq.

3b. Of those who said soccer was their favorite sport to WATCH, what percent also said is was their favorite sport to PLAY?

20/25 80%

3c. What conclusions can you draw from this?

4. Create row relative frequencies for the favorite sport to PLAY.

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Independent Practice:

If time, independent practice will be to create their own two-way table with the data collected.

Activating Prior Knowledge:

We understand percentages and proportions.

A bag of M&Ms has 300 candies in it. 70 are red, 30 are blue, 60 are green, 50 are brown and the rest are yellow. What is the percentage of yellow M&Ms in the bag?	If you randomly selected 20 M&Ms from the bag, how many would you expect to be blue?

Closure:

Why can't you graph these relationships on a coordinate plane?

Notes:

This maps to lesson 13 from Grade 8, Module 6.