

Frequency Tables

A **relative frequency** is the frequency that an event occurs divided by the total number of events.

part ÷ whole

Example: If your team has won 9 games from a total of 12 games played:
The **frequency** of winning is 9 The **relative frequency** of winning is $9/12 = 75\%$.

A **two way table** is a useful way to organize data that can be categorized by **two variables (bi-variate)**. The following table shows the results of a poll of randomly selected high school students and their preference for either math or English. **Joint frequencies** are the number of times a response was given for a certain characteristic. **Marginal frequencies** is the total number of times a response is given for a certain characteristic. Marginal frequencies are found in the *margins* of the table.

	9 th Grade	10 th Grade	11 th Grade	12 th Grade	Total
Math	10	12	11	8	41
English	12	11	8	8	39
Total	22	23	19	16	80

1. How many students are in 11th grade?

19

2. How many students are in 9th grade and prefer math?

10

3. How many students prefer English and are in 12th grade?

8

4. How many students are there total?

80

Example 1: Fill in the missing values into the table below and then answer the following questions:

9th Grader's School Transportation Survey

	Male	Female	Total
Walk	34	46	80
Car	28	17	45
Bus	15	12	27
Bike	52	17	69
Total	129	92	221

a. How many students are there total?

221

b. How many 9th boys walk to school?

34

c. How many 9th girls ride their bike to school?

17

d. How many males took the survey?

129

Example 2: The table below represents the favorite meals of 9th and 10th graders. Use the table to answer the following questions.

Favorite Meals of Students

		Burgers	Chicken Nuggets	Pizza	Salad Bar	Total
Grade Level	9 th grade	4	1	3	5	13
	10 th grade	3	7	3	4	17
	Total	7	8	6	9	30

- a. How many 9th graders participated in the survey?
13
- b. How many students prefer chicken nuggets?
8
- c. How many students prefer burgers?
7
- d. Which meal is the least favorite of all students?
Pizza
- e. Which meal is the least favorite of 9th graders?
Chicken Nuggets
- f. Which meal is most favorite of 10th graders?
Chicken Nuggets

Joint and Marginal Relative Frequencies

The **joint relative frequencies** are the values in each category divided by the total number of values and written as percents (or decimals). They provide the **ratio of occurrences** in each category to the **total number of occurrences**.

part ÷ whole

The **marginal relative frequencies** are found by adding the joint relative frequencies in each row and column (totals) and are written as percents (or decimals). They provide the **ratio of total occurrences for each category** to the **total number of occurrences**. Marginal frequencies are written in the **MARGINS** of the table. The marginal frequency totals in each row and column should always total 1 or 100%.

Calculate the joint and marginal relative frequencies for the table:

	9 th Grade	10 th Grade	11 th Grade	12 th Grade	Total
Math	$\frac{10}{80} = .125$ <u>12.5%</u>	$\frac{12}{80} = .15$ <u>15%</u>	$\frac{11}{80} = .1375$ <u>13.75%</u>	$\frac{8}{80} = .10$ <u>10%</u>	<u>51.25%</u>
English	<u>15%</u>	<u>13.75%</u>	<u>10%</u>	<u>10%</u>	<u>48.75%</u>
Total	<u>27.5%</u>	<u>28.75%</u>	<u>23.75%</u>	<u>20%</u>	$\frac{80}{80} = 1$ <u>100%</u>

- a. What percent of students are 10th graders & like English?
13.75%
 - b. What percent of students like Math and are 12th graders?
10%
 - c. What percent of students like Math?
51.25%
 - d. What percent of those surveys were seniors?
20%
- ↑ decimal
↑ percent

Practice with Joint and Marginal Relative Frequencies

Example 3: One hundred people who frequently get migraine headaches were chosen to participate in a study of new anti-headache medicine. Some of the participants were given the medicine; others were not. After one week, the participants were asked if they got a headache during the week. The two way frequency table summarizes the results. Fill in the missing value and then create a joint and marginal relative frequency table.

	Took Medicine	Did NOT Take Medicine	TOTAL
Headache	12	15	27
No Headache	48	25	73
TOTAL	60	40	100

Joint and Marginal Frequencies

	Took Medicine	Did NOT Take Medicine	TOTAL
Headache	12/100 12%	15%	27%
No Headache	48%	25%	73%
TOTAL	60%	40%	100%

Example 4: Create a joint and marginal relative frequency table to represent the favorite movies of students.

Favorite Movies of Students

	Comedy	Drama	Horror	Total
Class A	20	8	3	31
Class B	18	6	9	33
Total	38	14	12	64

a. What percent of people prefer to watch comedies?

59.38%

b. What percent of people prefer to watch horror movies?

18.75%

c. What percent of people are from class A and prefer to watch drama movies?

12.5%

d. Which class prefers watching horror movies?

B

Favorite Books of Students

	Comedy	Drama	Horror	Total
Class A	31.25%	12.5%	4.69%	48.44%
Class B	28.13%	9.38%	14.06%	51.57%
Total	59.38%	21.88%	18.75%	100.51%

100.01

↑ Human Rounding Error

Conditional Frequencies

A **conditional frequency** is restricted to a particular group (or subgroup). Conditional frequencies are typically identified by the words "given that" or "if" or "what percent of (insert condition)". They do NOT come from the total data, but from a row or column total. To calculate a conditional frequency, divide the joint relative frequency by the marginal relative frequency (does not matter if they are the frequencies or percents/decimals). Conditional frequencies are used to find conditional probabilities.

In the Group...
out of...
Looking @ ...

	Took Medicine	Did NOT Take Medicine	TOTAL
Headache	12	15	27
No Headache	48	25	73
TOTAL	60	40	100

part ÷ specific whole

1. What is the probability that a participant did not get a headache if they took the medicine?

$$\frac{48}{60} \leftarrow \begin{matrix} \text{part} \\ \text{specific whole} \end{matrix} = .80 \text{ or } 80\%$$

2. What is the probability that a participant took medicine given they did not have a headache?

$$\frac{48}{73} = .657534247 \approx 65.75\% \approx 66\%$$

3. What is the probability that a participant took medicine given they did have a headache?

$$\frac{12}{27} = .444444 \approx 44.44\% \approx 44\%$$

4. Calculate the joint and marginal frequencies from the table above.

	Took Medicine	Did NOT Take Medicine	TOTAL
Headache			
No Headache			
TOTAL			

5. What is the probability that a participant who did not get a headache took the medicine?

6. What is the probability that a participant took medicine given they did not have a headache?

7. What is the probability that a participant took medicine given they did have a headache?

8. What do you notice about the answers from problems 1 – 3 and problems 5 – 7?

Example 5: Students were surveyed about whether or not they have a pet and if they are allergic or not to animals. The results are below:

	Has a Pet	Does Not Have a Pet	Total
Allergic to Animals	32	192	224
Not Allergic to Animals	213	63	276
Total	245	255	500

a. What percent of those surveyed who are allergic to animals have a pet?

$$\frac{32}{224} = 13.11 \approx 13\%$$

b. What percent of those surveyed who are not allergic to animals have a pet?

$$\frac{213}{276} = 77.17 \approx 77\%$$

c. What percent of those who have a pet are allergic to animals?

$$\frac{32}{245} = 13.06\% \approx 13\%$$

d. What percent of those who have a pet are not allergic to animals?

$$\frac{213}{245} = 86.94 \approx 87\%$$

Example 6: The following contains the scores of the latest math project. Use the table to answer the following questions:

PROJECT SCORES

	Male	Female	Total
A	9	12	21
B	18	14	32
C	8	11	19
D	2	3	5
F	1	2	3
Total	38	42	80

a. What percentage of males earned a score of an "A"?

$$\frac{9}{38} = 23.68 \approx 24\%$$

b. What percentage of those who earned an "A" were male?

$$\frac{9}{21} = 42.86 \approx 43\%$$

c. What percentages of females earned a score of a "B"?

$$\frac{14}{42} = 33.33 \approx 33\%$$

d. What percentage of those who earned an "F" were female?

$$\frac{2}{3} = 67\%$$