

Two categorical variables can be represented with a **two-way frequency table**.

Consider the following survey.

149 elementary students were asked to choose whether they prefer math or English class. The data were broken down by gender.

- 42 males prefer math class.
- 47 males prefer English class.
- 35 females prefer math class.
- 25 females prefer English class.

A two-way frequency table is a visual representation of the frequency counts for each categorical variable. The table can also be called a **contingency table**.

Elementary Students' Subject Preferences

	Math	English	Total
Males	42	47	89
Females	35	25	60
Total	77	72	149

The total frequency for any row or column is called a **marginal frequency**.

- Why do you think these total frequencies are called marginal frequencies?

*In the margins*

**Joint frequencies** are the counts in the body of the table that join one variable from a row and one variable from a column.

- Why do you think these frequencies are called joint frequencies?

*Joining categories*

1. A survey of high school students asked if they play video games. The following frequency table was created based on their responses.

Student Video Game Activity

	Play Video Games	Do Not Play Video Games	Total
Males	69	60	129
Females	65	85	150
Total	134	145	279

- a. Compute the joint and marginal relative frequencies in the table.
- b. How many female students do not play video games?
- c. What percentage of students interviewed were females who do not play video games?

*85*

*$\frac{85}{279} \approx 31\%$*

Frequency tables can be easily changed to show **relative frequencies**.

- To calculate relative frequency, divide each count in the frequency table by the overall total.

Complete the following relative frequency table.

Elementary Students' Subject Preferences

	Math	English	Total
Males	$\frac{42}{149} = .28$	$\frac{47}{149} = .32$	$\frac{89}{149} = .60$
Females	$\frac{35}{149} = .24$	$\frac{25}{149} = .17$	$\frac{60}{149} = .40$
Total	$\frac{77}{149} = .52$	$\frac{72}{149} = .48$	$\frac{149}{149} = 1$

Why do you think these ratios are called relative frequencies?

*Relative to the total*

Interpret the marginal relative frequency for male students.

*60% surveyed were male  $(\frac{89}{149})$*

Interpret the joint relative frequency for females who prefer math.

*$\frac{35}{149}$  females enjoyed math  
24%*

Consider the frequency table "Student Video Game Activity."

a. How many male students were interviewed?

129

b. One of the interviewed students is selected at random. What is the probability that a student interviewed is male?

$$\frac{129}{279} \approx 46\%$$

c. Which numbers represent joint frequencies?

69, 65, 60, 85

d. Which numbers represent joint relative frequencies?

0.25, 0.23, 0.22, 0.31

e. What percentage of the subjects interviewed play video games?

$$\frac{134}{279} \approx 48\%$$

1. A survey conducted at Ambidextrous High School asked all 1,700 students to indicate their grade level and if they are left-handed or right-handed. Only 59 of the 491 freshmen are left-handed. Out of the 382 students in the sophomore class, 289 of them are right-handed. There are 433 students in the junior class and 120 of them are left-handed. There are 307 right-handed seniors.

Part A: Complete the frequency table to display the results of the survey.

Dominant Hand Survey

	9 <sup>th</sup>	10 <sup>th</sup>	11 <sup>th</sup>	12 <sup>th</sup>	Total
Right-handed	432	289	313	357	1391
Left-handed	59	93	120	87	359
Total	491	382	433	394	1700

Part B: What is the joint relative frequency for right-handed freshmen?

$$\frac{432}{1700} = 25\%$$

Part C: What does the relative frequency  $\frac{491}{1,700}$  represent?

Total 9<sup>th</sup> graders