

## It's A Two-Way Street

ID: 11583

Time Required  
20 minutes

## Activity Overview

*In this activity, students will be introduced to two-way tables. They will calculate marginal and conditional distributions using formulas in a spreadsheet. This activity is intended to be followed up with teacher discussion and student interpretation of the calculations. An additional data set is provided for students to use for homework.*

## Topic: Categorical Data

- *Two-way tables*
- *Marginal distributions*
- *Conditional distributions*

## Teacher Preparation and Notes

- *This activity should be used in conjunction with the student worksheet. A homework problem is included. Teacher questions are included to aid in class discussion.*
- *A solution TI-Nspire document is available in addition to the solutions in this document.*
- ***To download the student and solution TI-Nspire documents (.tns files) and student worksheet, go to [education.ti.com/exchange](http://education.ti.com/exchange) and enter "11583" in the quick search box.***

## Associated Materials

- *StatWeek11\_TwoWay\_worksheet.doc*
- *StatWeek11\_TwoWay.tns*
- *StatWeek11\_TwoWay\_Soln.tns*

## Suggested Related Activities

*To download any activity listed, go to [education.ti.com/exchange](http://education.ti.com/exchange) and enter the number in the quick search box.*

- *Two-Way Tables (TI-Navigator) — 1942*
- *Describing Categorical Data – Advanced Placement (TI-89 Titanium) — 4352*

**Part 1 –Marginal Distributions**

Students are given a two-way table and asked to calculate marginal distributions based on each category. They may need further explanation that marginal and conditional distributions are percentages determined by the variable in question..

The sums and percentages are to be determined using formulas in the spreadsheet on page 1.3. Students should be encouraged to discuss which numbers need to be divided to get the desired result. When using a formula, students need to be sure to use an equal sign before entering the formula.

To enter “total” in cell a5, students need to type the quotation marks before and after the word.

Discussion Questions:

- Why are two-way tables helpful as a means to display data?
- What do the different percentages tell us? For example, what does the marginal distribution based on party affiliation tell us?

A bar graph is often used to display the data from marginal distributions. On the handheld, the bar graph can be displayed as a dot plot, where the dot represents the top of the line of a bar graph. To create the dot plot, the categories are in one list and the percentages are in a second list.

**Solutions:**

Republican: 39%      Democrat: 58%  
 Independent: 3%

Obama: 57%      McCain: 39%  
 Other: 1%      Not Sure: 3%

The marginal distribution for candidate choice says that 57% of the respondents are voting for Obama, 38% are voting for McCain, 1% are voting for candidates besides Obama and McCain, and 3% of the respondents are not sure who they are voting for.

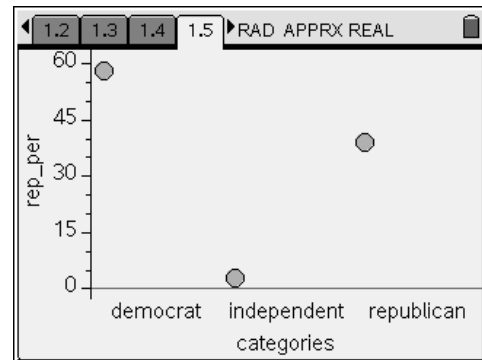
	A candid...	B republi...	C democ...	D indepe...
1	Obama	58.	691.	20.
2	McCain	444.	63.	16.
3	Other	5.	8.	1.
4	Not Sure...	21.	23.	3.
5				

	A candi...	B rep...	C dem...	D ind...	E totals
1	Obama	58.	691.	20.	769.
2	McCain...	444.	63.	16.	523.
3	Other	5.	8.	1.	14.
4	Not Sur...	21.	23.	3.	47.
5	total	528.	785.	40.	1353.

E5 =b5+c5+d5

	A rep_per	B catego...	C	D
1	39.0244	republi...		
2	58.0192	democra...		
3	2.95639	independ...		
4				
5				

A7 39.024390243902



**Part 2 – Conditional Distributions**

Students will calculate conditional distributions. They restrict their attention to each party affiliation. Students can use any cells in the spreadsheet they want to perform the calculations. Or, they can look at their worksheet for the numbers and use a *Calculator* page instead.

58	0.109848
528	
444	0.840909
528	
21	0.039773
528	

Students are to pick one box from each table and explain what the percentage represents. For example, in the first table, the McCain Democrat box means that 8% of Democratic respondents are voting for McCain. For the second table, that same box means 12% of respondents voting for McCain are Democrats.

Discussion Questions:

- Restricting our attention to Republicans, what does the percentage for Obama tell us?
- Pick any of the boxes and ask for interpretations.
- How can the percents add to more than 100% in the first row of the chart?
- Now let’s restrict our attention to Obama supporters. What does the percentage of Republicans tell us?
- Why are the conditional distributions not the same? For example, why is the percentage of Obama supporters who are Republican not the same as the percentage of Republicans who support Obama?

Given party affiliation:

	Rep.	Dem.	Ind.
Obama	11%	58%	50%
McCain	84%	8%	40%
Other	9%	1%	2.5%
Not Sure	4%	3%	7.5%

Given voter choice:

	Rep.	Dem.	Ind.
Obama	8%	90%	3%
McCain	85%	12%	3%
Other	36%	57%	7%
Not Sure	45%	49%	6%

**Homework**

Students will use what they’ve learned in the activity to calculate the marginal and conditional distributions for the data given on page 2.3.

	A	B	C	D	E
1	Strongly ...	48.	62.	55.	57.
2	Somewh...	60.	94.	61.	47.
3	Somewh...	64.	57.	33.	24.
4	Strongly ...	51.	59.	35.	16.
5	Not sure	81.	63.	35.	19.

Marginal distributions:

<b>Age</b>		<b>Opinion</b>	
Echo Boomers	30%	Strongly favor	22%
Gen X	33%	Somewhat favor	27%
Baby Boomers	21%	Somewhat oppose	17%
Matures	16%	Strongly oppose	16%
		Not sure	19%

Conditional distributions:

Given opinion:

	Echo Boomers	Gen X	Baby Boomers	Matures
Strongly favor	22%	28%	25%	26%
Somewhat favor	23%	36%	23%	18%
Somewhat oppose	36%	32%	19%	13%
Strongly oppose	32%	37%	22%	10%
Not sure	41%	32%	18%	10%

Given age:

	Echo Boomers	Gen X	Baby Boomers	Matures
Strongly favor	16%	19%	25%	35%
Somewhat favor	20%	28%	28%	29%
Somewhat oppose	21%	17%	15%	15%
Strongly oppose	17%	18%	16%	10%
Not sure	27%	19%	16%	12%