
It's A Two-Way Street

ID: 11582

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*
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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.*
- *This activity uses the Cell Sheet application. It should be loaded on students' calculators before beginning the activity.*
- ***To download the student worksheet and cell sheet data files, go to education.ti.com/exchange and enter "11582" in the quick search box.***

Associated Materials

- *StatWeek23_TwoWay_worksheet_TI84.doc*
- *TWOWAY (cell sheet data file)*
- *NUCLEAR (cell sheet data file)*

Suggested Related Activities

To download any activity listed, go to 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 for 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, **TWOWAY**. 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. The equal sign is obtained by pressing the **[STO▶]** key.

Discussion Questions:

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

TWOW	A	B	C
2	OBAMA	58	691
3	MCCAIN	444	63
4	OTHER	5	8
5	NOT SU	21	23
6			
7	SUM	528	
B7: =sum(B2:B5)			[Menu]

TWOW	A	B	C
2	OBAMA	58	691
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5	NOT SU	21	23
6			
7	SUM	528	
Cut Copy			[Menu]

TWOW	A	B	C
3	MCCAIN	444	63
4	OTHER	5	8
5	NOT SU	21	23
6			
7	SUM	528	785
8	PCT	.39024	.58019
C8: =C7/E7			[Menu]

	Party Affiliation			Sum	Percentage
	Republican	Democratic	Independent		
Obama	58	691	20	769	57%
McCain	444	63	16	523	39%
Other	5	8	1	14	1%
Not Sure	21	23	3	47	3%
Sum	528	785	40	1353	
Percentage	39%	58%	3%		

Solutions:

The marginal distribution for candidate choice says that 57% of the respondents are voting for Obama, 39% are voting for McCain, 1% are voting for candidates other than Obama or McCain, and 3% of the respondents are not sure who they are voting for.

TWOW	D	E	F
2	20	769	.56837
3	16	523	.38655
4	1	14	.01035
5	3	47	.03424
6			
7	40	1353	
F2: =E2/E7			[Menu]

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 the Home screen instead.

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

58/528	.1098484848
444/528	.8409090909
5/528	.009469697

691/785	.8802547771
63/785	.0802547771
8/785	.0101910828

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 have learned in the activity to calculate the marginal and conditional distributions for the data given on the cell sheet data file **NUCLEAR**.

NUCL	A	B	C
1		ECHO	GEN X
2	FAVOR	48	62
3	MOD FA	60	94
4	MOD OP	64	57
5	OPPOSE	51	59
6	UNSURE	81	63
A1:	[Menu]		

Marginal distributions:

Age		Opinion	
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%