AP Statistics
Unit 02 – Day 08 Notes
Categorical Data

Name Key
Period

Up to this point, we have talked about quantitative scatter plots. We are going to switch gears and start talking about what type of visuals we use when we are using categorical data.

Categorical data: data that uses categories rather than #s to describe a data set. We use counts/frequencies & convert to %.

Two-way table:
a table that describes 2 categorical variables

Row variable:
describes every value in that row for that category ex: education

Column variable:
describes every value in that column for that category. ex: age

EXAMPLE: Two-way Table

TABLE 4.6 Years of school completed, by age, 2000 (thousands of persons)

	Age group				
Education	25 to 34	35 to 54	55+	Total	%
Did not complete high school	4,474	9,155	14,224	27,853	15.9%
Completed high school	11,546	26,481	20,060	58,087	33.1%
1 to 3 years of college	10,700	22,618	11,127	44,445	26.4%
4 or more years of college	11,066	23,183	10,596	44,845	25.6%
Total	37,786	81,435	56,008	175,230	100%
%	21.6%	46.5%	32.0%	100%	100%

Marginal Distributions: categories that you relate to each other are @ the right/bottom of table.

Round-Off Error: you might notice totals are inaccurate/don't match the table data because we rounded at some point.

Evaluating the information in the two-way table:

1. Look at the distribution of each variable separately.
2. If the row and column totals are missing the first thing is to calculate them.
3. The use of percentages are often more informative than counts or frequencies.
   - To create percentages for row variable, we divide each row by the table total and multiple by 100
   - To create percentages for row variable, we divide each row by the table total and multiple by 100
   - The total should be as close to100% and possible (remember there might be some round off error)
4. You can use a bar graph to represent two-way table information.

EXAMPLE 1:

We want to find the percent of people 25 years of age or older and years of schooling!

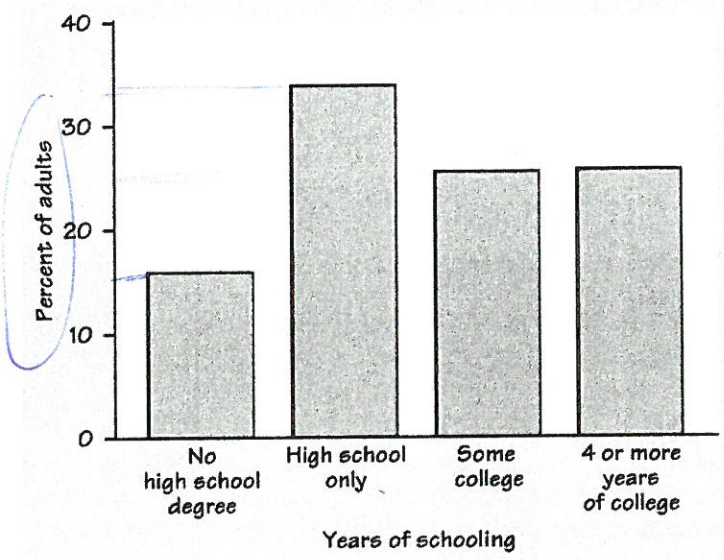
How to calculate percentages to put into a bar graph:

- **Take each row category and divide it by the table total**

$\frac{44,845}{175,230} = .256 \; or \; 25.6\%$ = total with 4 years of college

EXAMPLE: The bar graph below describes the distribution of 25 + people and their schooling. Find the percentages for students who:

- did not finish school 10%
- completed high school 34%
- completed some college 25%
- completed 4+ years of college 25%

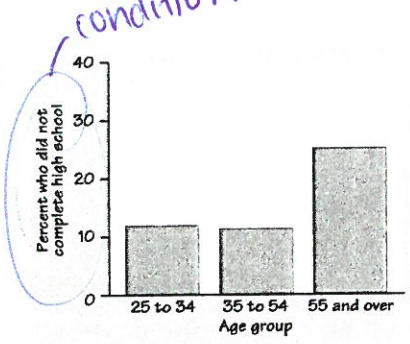


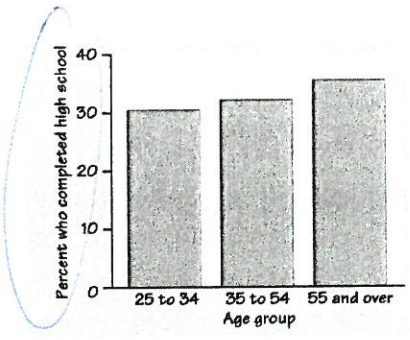
CONDITIONAL DISTRIBUTIONS: the percentage calculated that represents only the people who satisfy a specific condition.

condition

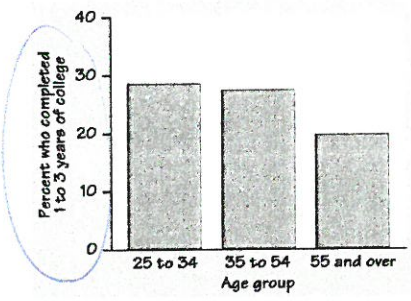
In this case we need to find 4 categories:

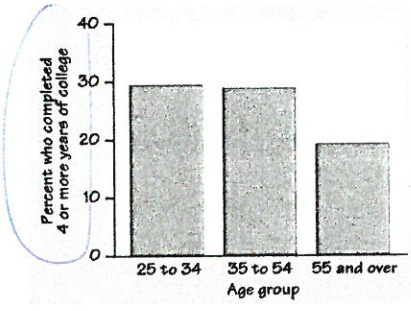
- % for no HS
- % for completed HS
- % for some college
- % for 4+ years of college





Each one of the graphs represents a conditional distribution because they all show the age group but each graph represents a certain condition.





EXAMPLE 2:

The Pennsylvania State University has its main campus in the town of State College and more than 20 smaller "commonwealth campuses" around the state. The Penn State Division of Student Affairs polled separate random samples of undergraduates from the main campus and commonwealth campuses about their use of online social networking. Facebook was the most popular site, with more than 80% of students having an account. There is a comparison of Facebook use by undergraduates at the main campus and commonwealth campuses who have a Facebook account:

Use Facebook	Main Campus	Commonwealth	Total Usage of time
Several times a month or less	55	76	131
At least once a week	215	157	372
At least once a day	640	394	1034
Total Facebook users	910	627	1537

% : 8.5%, 24.2%, 67.3%, 100%

1 : 59.2%, 40.8%, 100%

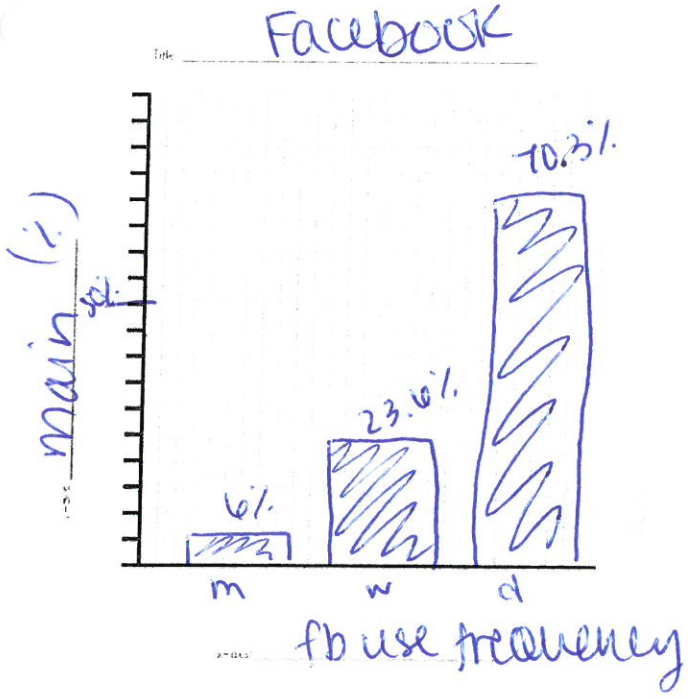
a) Calculate the conditional distribution (in proportions) of Facebook use for each campus setting.

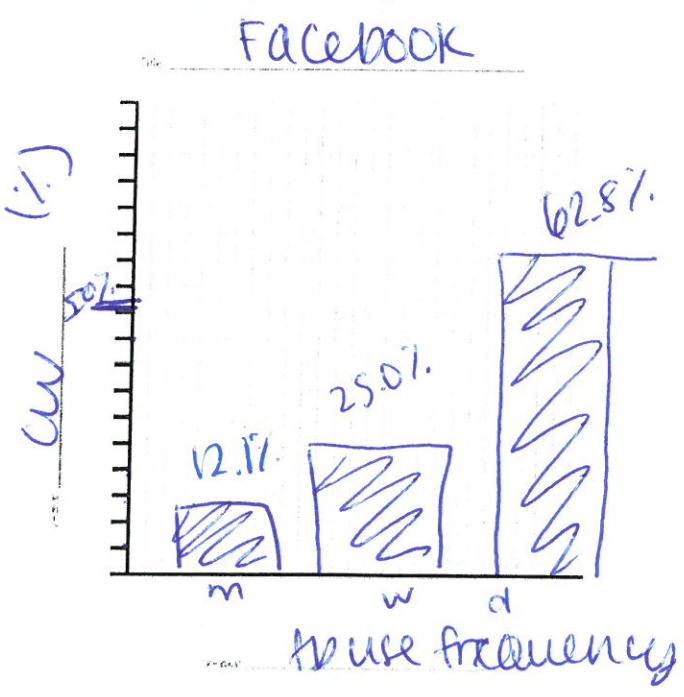
	FBuser
M	910/1537 = 59.2%
CW	627/1537 = 40.8%
total	1537/1537 = 100%

	main
m	55/910 = 6.0%
w	215/910 = 23.6%
d	640/910 = 70.3%
TOTAL	910/910 = 100%

	CW
m	76/627 = 12.1%
w	157/627 = 25.0%
d	394/627 = 62.8%
total	627/627 = 100%

b) Make a bar graph that compares the two conditional distributions. What are the most important differences in Facebook use between the two campus settings?





c) Why is it important to compare proportions rather than counts in Question 1?

EXAMPLE 3:

At many large universities there is an independent student organization that rates the faculty and publishes these ratings in a book that all students can purchase. Last year there were 4 professors teaching Intro Stats at State U: Drs. Arnold, Murphy, Ryan and Shafer. Each was rated on the GOOD FAIR POOR scale. The organization that does the ratings knows full well that many students have trouble in such a course because of a dislike for anything remotely resembling mathematics. Just for kicks (and hopefully to make some interesting conclusions) the rating form also asks each student to answer the question: Are you a good math student? Possible answers are YES and NO. Here are the results.

All Students				
	QUALITY OF INSTRUCTION			
Professor	GOOD	FAIR	POOR	**Totals**
Ryan	41	21	20	82
Arnold	48	18	15	81
Murphy	43	17	21	81
Shafer	43	17	18	78
Totals	175	73	74	322

Students Good at Math				
	QUALITY OF INSTRUCTION			
Professor	GOOD	FAIR	POOR	**Totals**
Ryan	25	19	18	62
Arnold	6	8	7	21
Murphy	23	8	10	41
Shafer	7	15	15	37
Totals	61	50	50	161

Students Not Good at Math				
	QUALITY OF INSTRUCTION			
Professor	GOOD	FAIR	POOR	**Totals**
Ryan	16	2	2	20
Arnold	42	10	8	60
Murphy	20	9	11	20
Shafer	36	2	3	41
Totals	114	23	24	161

1. Who was preferred, Murphy or Schaefer? Explain your reasoning.

$43/81 < 43/78$

2. Who was preferred, Ryan or Arnold? Explain your reasoning.

$41/82 < 48/81$