AP Statistics
Unit 02 – Day 08 Notes
Categorical Data

Name_____
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:

Two-way table:

Row variable:

Column variable:

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
Completed high school	11,546	26,481	20,060	58,087
1 to 3 years of college	10,700	22,618	11,127	44,445
4 or more years of college	11,066	23,183	10,596	44,845
Total	37,786	81,435	56,008	175,230

Marginal Distributions:

Round-Off Error:

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
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   - 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 vs. years of schooling!

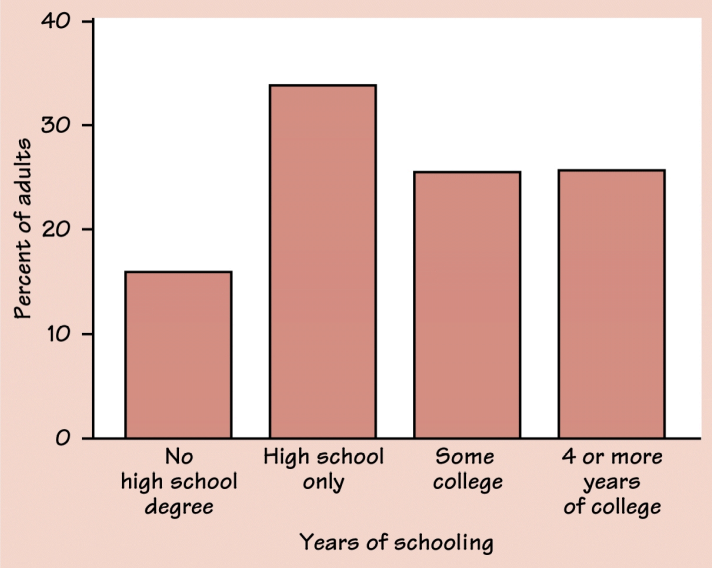
How to calculate percentages to put into a bar graph:

- **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
- completed high school
- completed some college
- completed 4+ years of college

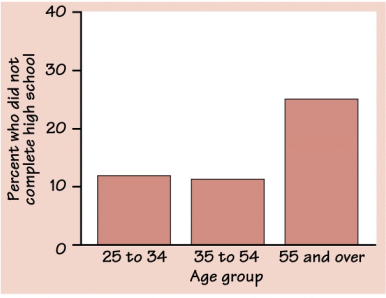


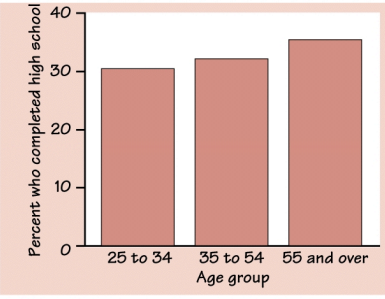
CONDITIONAL DISTRIBUTIONS:

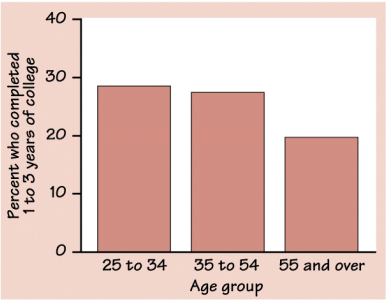
In this case we need to find 4 categories:

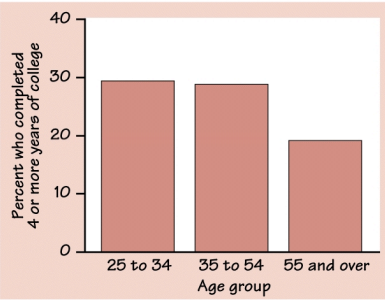
- % for no HS
- % for completed HS
- % for some college
- % for 4+ years of college

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









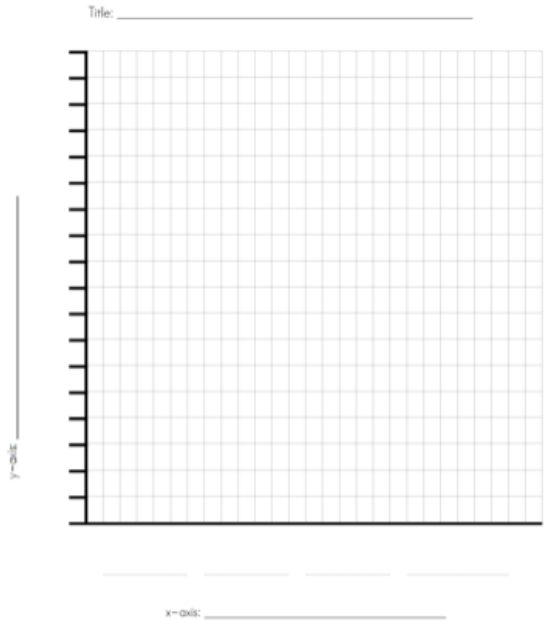
EXAMPLE 2:

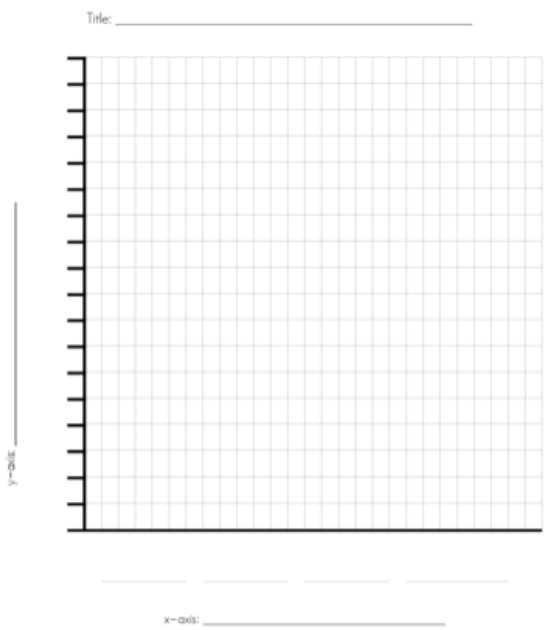
The Pennsylvania State University has its main campus in the town of State College and more than 20 smaller "commonwealth campuses" around the state. The Penn State Division of Student Affairs polled separate random samples of undergraduates from the main campus and commonwealth campuses about their 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	
At least once a week	215	157	
At least once a day	640	394	
Total Facebook users			

a) Calculate the conditional distribution (in proportions) of Facebook use for the Main Campus and display in a table. Then, calculate the conditional distribution of Facebook use for the Commonwealth Campuses and display in a separate table.

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?

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	40
Shafer	36	2	3	41
Totals	114	23	24	161

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

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

3. Out of students who are good at math, was Shafer or Arnold preferred? Explain your reasoning.

4. Out of students who are not good at math, was Ryan or Murpy preferred? Explain your reasoning.