

Homework Questions?

- Two Types of Questions
 1. Conceptual questions
 - Answered in the beginning of class, as part of class... Just ask.
 2. HW questions on specific problems
 - Answered during office hours
 - Answered during the class work portion (if there's time)

- At the end of class last time, you completed a survey so that we would have data to examine over the semester.
- Thoughts on survey questions? Phrasing? Intent?
- Answer the W's for this data
 - What are the categorical variables?

Math 140 Survey

1. Pick a random integer between 1 and 10.
2. What is your gender?
 Female
 Male
3. In what year were you born?
4. How old are you (in years)?
5. What is the month of your birthday? (Enter as a number 1 to 12)
6. How much do you weigh (in pounds)?
7. What is your height (in inches)?
8. What color is your hair?
 Black
 Brown
 Blond(e)
 Red
 Other
9. What color are your eyes?
 Blue
 Brown

A Look at Categorical Variables

- 349 Results... How can we organize this data table into anything meaningful?

C12-T	C13-T	C14-T	C15-T	C16-T	C17-T	C18-T	C19-T	C20	C21	C22-T	C23-T
gender	smoke	california	political	hair	eyes	glasses	transfer	coin	random	ipod	hand
female	yes	yes	democratic	black	blue	yes	yes	3	3	yes	left
male	no	yes	democratic	blond	blue	yes	yes	4	5	yes	right
male	no	yes	other	brown	brown	yes	yes	8	8	yes	right
male	no	yes	democratic	black	brown	yes	yes	6	7	yes	right
male	no	yes	republican	brown	brown	no	yes	5	7	yes	right
female	no	no	other	black	brown	yes	yes	6	5	yes	right
female	no	yes	democratic	brown	hazel	no	yes	6	9	yes	right
female	no	yes	republican	brown	blue	yes	yes	4	7	yes	right
female	no	no	democratic	black	brown	no	yes	4	4	no	right
female	no	yes	democratic	black	brown	yes	yes	4	2	yes	right
female	no	yes	republican	brown	green	yes	yes	6	7	yes	right
male	no	yes	republican	brown	blue	no	yes	6	7	yes	right
female	no	yes	other	brown	hazel	no	yes	5	7	yes	right
male	no	yes	democratic	black	brown	yes	yes	2	1	yes	right
female	no	yes	other	brown	brown	yes	yes	8	9	yes	right
female	no	yes	other	brown	hazel	yes	yes	6	6	yes	right

Key to Statistical Analysis: GRAPH!!!

- Not all graphs are created equal though...

The collage includes: a bar chart titled 'Number of Viewers (millions)' with categories 'Lastenders', 'Casualty', 'Peak Practice', and 'The Bill'; a grouped bar chart titled 'Market Share' with categories 'Year' and 'Sales'; a 3D pie chart; and a standard pie chart.

(Relative) Frequency Tables

- Frequency Table** – Count occurrence of each category
- Relative Frequency Table** – Convert counts to percents
- Minitab > Stat > Tables > Tally Individual Variables
 - Select variables to examine.
 - Choose how to display them
 - Counts for frequency
 - Percents for rel. freq.
 - Try it with our data...
 - Are math 140 students
 - Republican?
 - Female?
 - Smokers?

The screenshot shows the 'Tally Individual Variables' dialog box with variables C1 (gender), C2 (smoke), C3 (california), C4 (political), C5 (hair), C6 (eyes), C7 (glasses), C8 (transfer), C9 (spot), and C10 (hand) listed. The 'Display' section has 'Counts' checked and 'Percents', 'Cumulative counts', and 'Cumulative percents' unchecked.

www.canyons.edu/faculty/morrowa/140/datasets/

Just Checking...

Tally for Discrete Variables: political, gender, smoke

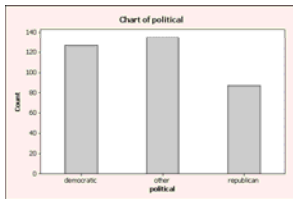
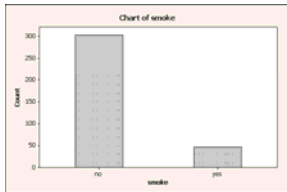
political	Count	Percent	gender	Count	Percent	smoke	Count	Percent
democratic	127	36.39	female	189	54.15	no	303	86.82
other	135	38.68	male	160	45.85	yes	46	13.18
republican	87	24.93						
	N=	349		N=	349		N=	349

Visual Display: Bar Chart

- Bar Chart**: Shows counts of categories for comparison
- Minitab > Graph > Bar Chart
 - Bars represent: Counts of Unique Values (for the raw case table)
 - Given a summarized table for homework? Enter data down column, and select Values from a Table
 - Use "Simple" for now
 - Select variables and select "OK"
- Create graphs for gender, political, and smoke

The first screenshot is the 'Bar Charts' dialog box with 'Counts of unique values' selected under 'Bars represent:'. The second screenshot is the 'Bar Chart - Counts of unique values, Simple' dialog box with 'Categorical variables: political, gender, smoke' selected.

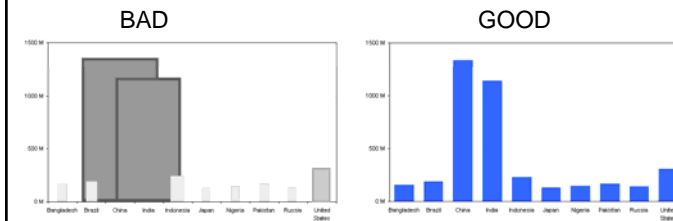
Just Checking...



- To copy a graph, first select the graph, then either
 - Ctrl-C
 - Right Click > "Copy Graph"
 - Edit > "Copy Graph"
- Can't quite tell what's going on? Play with the options.

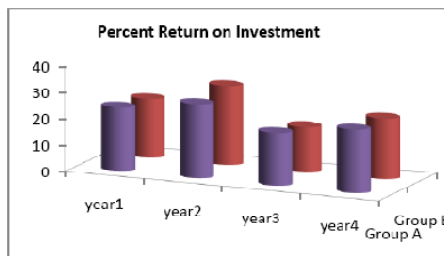
So... What Makes a 'Good' or 'Bad' Graph?

- Graphs should make the data stand out. A picture should be worth a thousand words (numbers)...
- Area Principle
 - <http://peltiertech.com/WordPress/bad-bar-chart-practices-or-send-in-the-clowns/>



The Prettier, The Better?

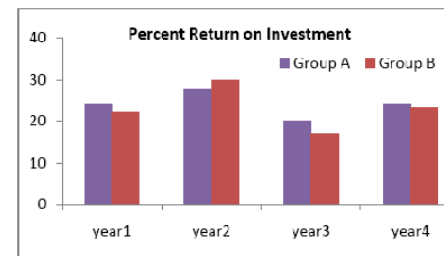
- In what years did Group A have a higher percent return?



From <http://www.ravenanalytics.com/Articles/Misuse%20of%20statistics.pdf>

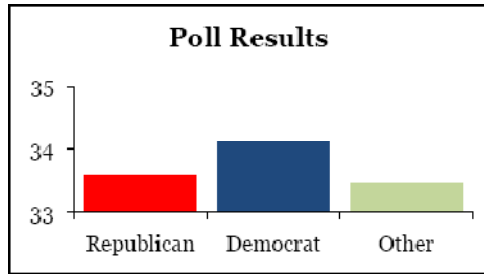
The Actual Data

- In what years did Group A have a higher percent return?



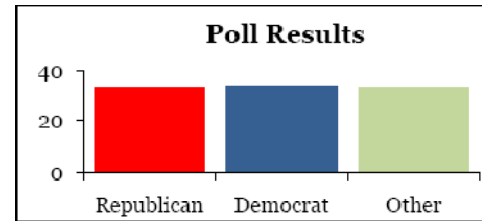
From <http://www.ravenanalytics.com/Articles/Misuse%20of%20statistics.pdf>

Are the Percents Different?



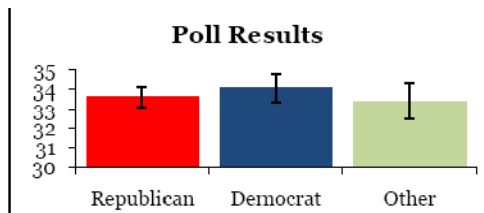
From <http://www.ravenanalytics.com/Articles/Misuse%20of%20statistics.pdf>

Are the Percents Different?



From <http://www.ravenanalytics.com/Articles/Misuse%20of%20statistics.pdf>

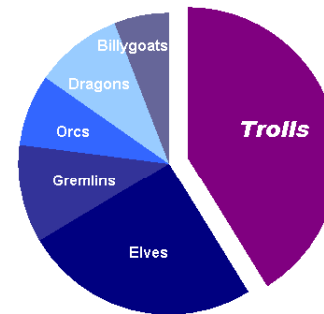
Are the Percents Different?



From <http://www.ravenanalytics.com/Articles/Misuse%20of%20statistics.pdf>

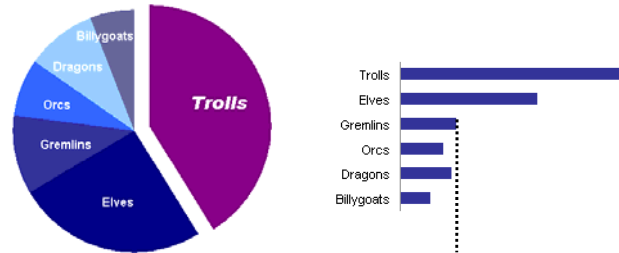
What About Pie?

- <http://peltiertech.com/WordPress/bar-graphs-vs-pie-charts/>
- Gremlins or Dragons?



None for Me...

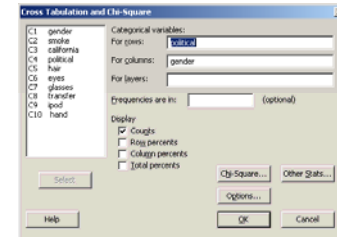
- Often Abused; hard to compare



- <http://peltiertech.com/WordPress/bar-graphs-vs-pie-charts/>

Compare Two Variables

- Contingency Table:** Organize counts of categorical data according to two variables
 - (AKA: Two-Way Table)
- Minitab > Stat > Tables > Cross Tabulation and Chi-Square...
 - Select a variable to describe rows and another to describe columns
 - Use Counts



- Let's see if there's a relationship between political and gender

Just Checking...

Tabulated statistics: political, gender

Rows: political Columns: gender

	female	male	All
democratic	78	49	127
other	62	73	135
republican	49	38	87
All	189	160	349

Cell Contents: Count

•Marginal Distributions

- One for the row variable
- One for the column variable
- Same as frequency distributions!!!

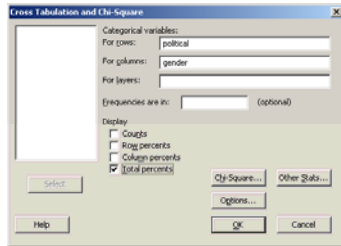
Calculate Some Percents...

	female	male	All
democratic	78	49	127
other	62	73	135
republican	49	38	87
All	189	160	349

- Microsoft Calculator
 - Start Menu > Programs > Accessories > Calculator
- What percent ...
 - ... are women?
 - ... of females are democrats?
 - ... of democrats are female?
 - ... are democratic females?

Converting Those Numbers to Percent

- Another Way:
 - Total Percents



Tabulated statistics: political, gender

Rows: political Columns: gender

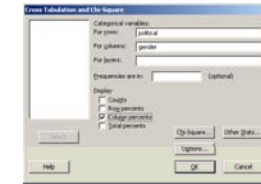
	female	male	All
democratic	22.35	14.04	36.39
other	17.77	20.92	38.68
republican	14.04	10.89	24.93
All	54.15	45.85	100.00

Cell Contents: % of Total

- Which percent questions can we answer from this table?

Column/Row Percents

Tabulated statistics: political, gender



Rows: political Columns: gender

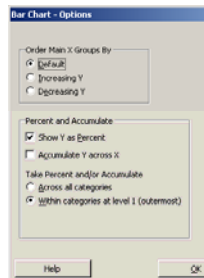
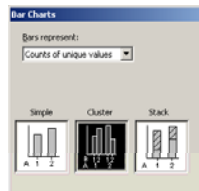
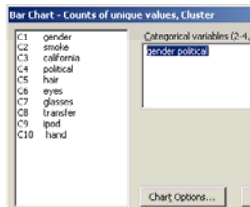
	female	male	All
democratic	41.27	30.63	36.39
other	32.80	45.63	38.68
republican	25.93	23.75	24.93
All	100.00	100.00	100.00

Cell Contents: % of Column

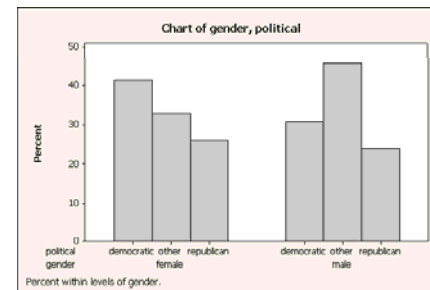
- **Conditional Distributions**
 - Show the distribution of one variable just for those cases that satisfy a condition on another variable.

Graph Two Way Data

- **Side-By-Side Bar Chart**
 - Minitab > Graph > Bar Chart > Cluster
 - Enter Variables
 - Under "Chart Options"
 - CHECK "Show y as percent"
 - Take percent "within categories at level 1"



Just Checking...

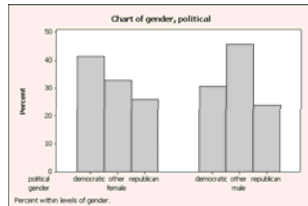


Why use percents instead of counts?

Independence

- Two categorical variables are **independent** when the distribution of one variable is the **same** for all categories of another
 - Dependent** otherwise

- Example: Are gender and political orientation **independent**?
 - Or does the distribution of political orientation **depend** on the student's gender?



Before Today's Class Work: Homework

- Both assignments from this week are due next week.
- In the beginning of class, we will run 2 (25% success) random number generators, one for the chapter 2 assignment and one for the chapter 3 assignment.
- If an assignment gets a success on collection, you have 5 minutes to turn the assignment in.
- Come to class prepared to hand in each assignment separately.

Class Work

- Rules for the front: No Pens!!!
- <http://www.canyons.edu/faculty/morrowa/140>
- The class work is online as a .doc file
- Download it, and answer directly on it (using word)
 - Copy/Paste graphs/output directly from Minitab
- Option (green): Save it, email it to yourself.
- Option (semi-green): If you make your write-up small, you can always print on the back of printed prompt.
 - Adjust sizing of copied/pasted images by dragging a corner of the image
 - Print in Word: Round button on top left -> Print
 - Change "Pages per Sheet" to the number of pages you used to fit all your work on one sheet
- Option (tactile): Bring your own paper for printing.

Class Work

- To get credit, it is your responsibility to get checked off.
 - Chapter 3 Handout
 - Rules for checking answers: No Pens in the Front!!!

Homework

- Textbook/Routine Homework
 - Due Next Time (25% chance of collection)
 - Read Chapter 3
 - Pg 40-47 #1, 5, 7, 11, 13, 19, 23, 25, 29, 31, 33
- Project/Exploration Homework
 - None this time