



## Education Transfer Plan ABSTRACT

### Directions:

- 1) Please fill out this form electronically by downloading it from <http://iisme.org> under Summer Fellowships, Fellowship Forms.
- 2) Save As and change the file name to **Abstract\_yourlastname**
- 3) Print and attach to your ETP.
- 4) Acquire mentor signature, retain **ORIGINAL** and submit **COPY** to Peer Coach by 8/12/05.
- 5) Acquire administrator signature on **ORIGINAL** and submit to IISME by 10/3/05 to receive \$300 payment.

### ETP TITLE:

Graphing and Interpreting Data Plots

### FELLOW NAME:

Hong Pun

### FELLOW PRIMARY E-MAIL:

hong\_pun@prodigy.net

### SPONSOR COMPANY:

BAE Systems

### MENTOR NAME:

Carole Doan

### ABSTRACT (50 words or less:)

This project is a lesson on graphing data. Students are given various data sets as well as graphs to plot, interpret, and compare. They will choose from various graph types to compare and contrast how the data can be interpreted. An extension to the project includes using a graphing or spreadsheet program to graph the data.

ETP TYPE: Conventional

GRADE LEVEL: Middle School

Subject: Math

Document Format(s):  Word doc  PowerPoint  Excel  Other:  
If "Other," please describe:

---

Describe how your ETP aligns with NBC or State standards as stated in your proposal:

Statistics, Data Analysis, and Probability 1.0 Students collect, organize, and represent data sets that have one or more variables and identify relationships among variables within a data set by hand and through the use of an electronic spreadsheet software program.

Statistics, Data Analysis, and Probability 1.1 Know various forms of display for data sets.

Mathematical Reasoning 1.1 Analyze problems by distinguishing relevant from irrelevant information.

Mathematical Reasoning 1.1 Analyze problems by observing patterns.

Mathematical Reasoning 2.5 Use words, numbers, symbols, charts, graphs, tables, and diagrams to explain mathematical reasoning.

Describe the connection between your ETP and the Summer Fellowship.

The ETP focuses on graphing and interpreting data plots, and the Summer Fellowship work includes creating a user manual and training for a data management system that facilitates analysis and decision making through graphical representations.

Checklist for sections contained in ETP:

- |   |   |   |
|---|---|---|
| <input checked="" type="checkbox"/> Clearly Stated Outcomes & Standards | <input checked="" type="checkbox"/> List of Materials/Resources             | <input checked="" type="checkbox"/> Hard Copy Turned In to Peer Coach |
| <input checked="" type="checkbox"/> Specific Procedure/Plan             | <input checked="" type="checkbox"/> Rubric or plan for evaluating outcomes. | <input checked="" type="checkbox"/> Soft Copy Turned into Peer Coach  |

**I. FELLOW SIGNATURE-- Required Before August 12, 2005**

I, the IISME **Fellow** named above, affirm that the ETP I am submitting is my own work, that I acknowledged sources where appropriate, and that I avoided including any proprietary information of the Sponsor Company. By my submission I am assigning to IISME my entire copyright in the ETP. I understand IISME is simultaneously granting me a license to use the ETP for pedagogical purposes.

Signature \_\_\_\_\_ Date: July 25, 2005

**II. MENTOR SIGNATURE-- Required Before August 12, 2005**

I, the **Mentor** named below [please select one of the following],

have read the attached ETP, and my comments, if any, appear below.

have read the attached ETP, and, as outlined in the IISME-Company Fellowship Agreement, have reviewed it on behalf of the Sponsor Company, and have determined that the ETP does not contain any Sponsor-proprietary information. My additional comments, if any, appear below.

Mentor Comments:

Signature \_\_\_\_\_ Date: July 28, 2005

Printed Name: Carole Doan

**III. ADMINISTRATOR SIGNATURE-- Required Before October 3, 2005, submit to IISME on or before October 3 to be eligible for \$300 grant.**

I, the **Administrator** named below have read the attached ETP and my comments, if any, appear below.

Administrator comments:

Signature \_\_\_\_\_ Date

Printed Name: Dr. Alice Campbell



# Graphing and Interpreting Data Plots

Hong Pun

This lesson can be given during the first weeks of school or during the school year when graphing is reviewed and taught.

# Abstract

This project is a lesson on graphing data. Students will be given various data sets as well as graphs to plot, interpret, and compare. They will choose from various graph types to compare and contrast how the data can be interpreted. An extension of the project includes using a graphing or spreadsheet program to graph the data.

# California Math Standards

**SDP** – Statistics, Data Analysis, and Probability

**MR** – Mathematical Reasoning

**SDP 1.0** Students collect, organize, and represent data sets that have one or more variables and identify relationships among variables within a data set by hand and through the use of an electronic spreadsheet software program.

**SDP 1.1** Know various forms of display for data sets.

**MR 1.1** Analyze problems by distinguishing relevant from irrelevant information.

**MR 1.1** Analyze problems by observing patterns.

**MR 2.5** Use words, numbers, symbols, charts, graphs, tables, and diagrams to explain mathematical reasoning.

# Lesson Objectives

- Students will be able to compare and contrast among various graph types
- Students will be able to read and interpret the meaning of graphs
- Students demonstrate ability to accurately produce simple charts and graphs

# Lesson Outline

First, a graph with ambiguous interpretation is shown to capture the student's attention and intrigue. The graph will be discussed and analyzed. Next, students will be given a data set to interpret. They will work in pairs to come up with a potential graph representing the data. Various results will be shown and discussed. For independent practice, students will be asked to graph another data set.

# Assessment Rubric

CATEGORY	4	3	2	1
<b>Graph Title</b>	Title is creative and clearly relates to the problem being graphed. It is printed at the top of the graph.	Title clearly relates to the problem being graphed and is printed at the top of the graph.	A title is present at the top of the graph.	A title is not present.
<b>Units</b>	All units are described (in a key or with labels) and are appropriately sized for the data set.	Most units are described (in a key or with labels) and are appropriately sized for the data set.	All units are described (in a key or with labels) but are not appropriately sized for the data set.	Units are neither described NOR appropriately sized for the data set.
<b>Accuracy of Graph</b>	All circle sectors are drawn correctly and are easy to see. A ruler is used to neatly make the bars, if not using a computerized graphing program.	Most circle sectors are drawn correctly and are easy to see, or the bars were hand drawn without a ruler.	One or two circle sectors are drawn correctly and are easy to see, or the bars are unevenly drawn.	Looks completed in the last minute -- not accurate.
<b>Neatness and Attractiveness</b>	Exceptionally well designed, neat, and attractive. Colors that go well together are used to make the graph more readable. A ruler or graph paper are used.	Neat and relatively attractive. Colors used but graph not readable. A ruler or graph paper are used to make the graph more readable.	Graph appears quite plain without any colors used.	Appears messy and "thrown together" in a hurry. Lines are visibly crooked. No colors used.
<b>Conclusion</b>	A conclusion is clearly stated using complete sentences without mistakes.	A conclusion is unclear or has minor grammar errors.	A conclusion was not written in complete sentences.	A conclusion was not written or could not be easily found.
<b>SCORE:</b>	_____ / 20			

Graphing and Interpreting Data Plots

6

Originally created using <http://rubistar.4teachers.org/index.php> and modified

## Resources Needed

- data sets
- transparencies of data and graphs
- handouts of data and graphs
- transparency pens
- laptop and data projector (extension)

## Connection to the Workplace

This summer I had the opportunity to work for [BAE Systems](#) in San Jose, California

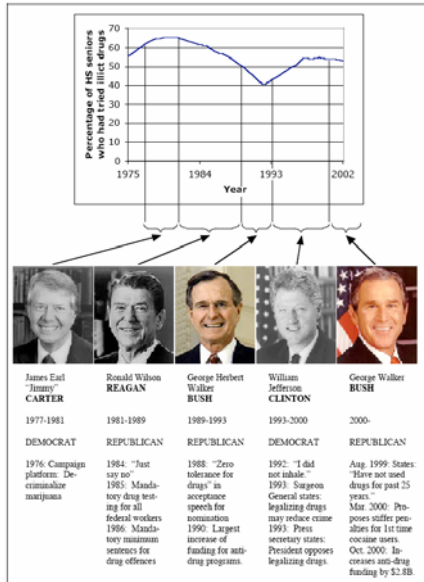
- Using and interpreting graphs is a part of some professions
- Decision makers and engineers use graphs to notice trends in data
- Solutions are determined for data that is out of bounds or unexpected in graphs

Management and decision makers use 'dashboards' which represent the status of various measurements.

Measurements can include data in the form of graphs representing schedule, cost, and defects to name a few.

Graphs provide a visual representation of data that can be interpreted more easily.

# Which factors seem to influence teenage drug use?



How do you interpret this graph?

When is the graph increasing?

When is the graph decreasing?

Is there a time when the graph shows no increase or decrease?

Graphing and Interpreting Data Plots

Day 1: [graph and data from <http://www-math.bgsu.edu/math112/> ]

Warmup – examine the x- and y- axis titles and interpret possible meanings from the graph

The 4 questions are PowerPoint animations which appear with each mouse click. The questions can be used after about 5 minutes to bring focus on the graph and data.

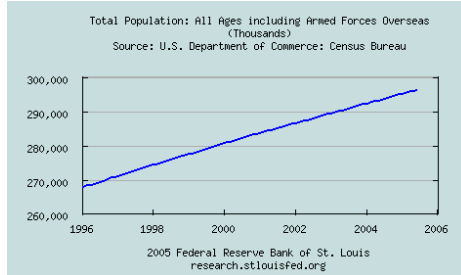
What conclusion or interpretation can be made from the graph if any?

[Incorrect Answer: political party of the President *causes* teenagers to behave differently

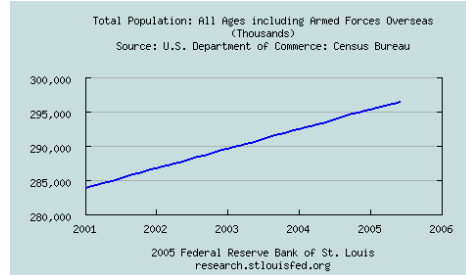
ANSWER: changes in political party accompany changes in the percentage of high school students who have tried drugs]

# Compare and Contrast

Graph A



Graph B



**What is different in the graphs?**

**What is the same in the graphs?**

**What is the population in 2005 for Graph A and Graph B?**

**What conclusion can be made from each graph?**

Students examine scale. For example, the y-axis is population in terms of thousands. So, the population in 2001 is not ~284,000 but ~284,000,000.

Both graphs show total population. Graph A contains data for 1996-2005, whereas Graph B shows data for 2001-2005.

Preview intuitive understanding of slope via “elevation” of the line.

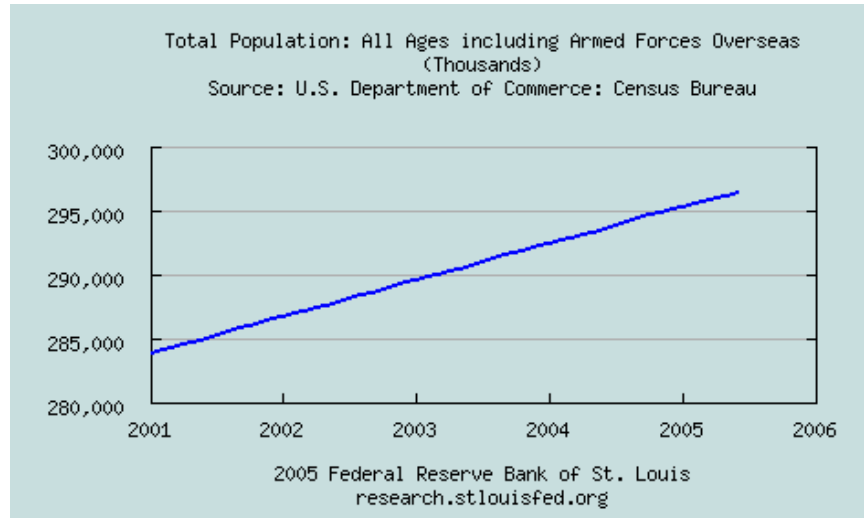
Slope can be taught later in the year when working with linear equations.

For Graph A, students practice interpolating that 2005 is in between 2004 and 2006 on the x-axis.

Students can find the population value for 2005 by drawing a dashed line up and across to the left starting from 2005.

The 4 questions are PowerPoint animations which appear with each mouse click.

# U.S. Total Population 2001-2005



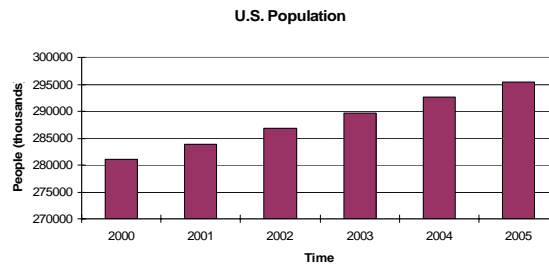
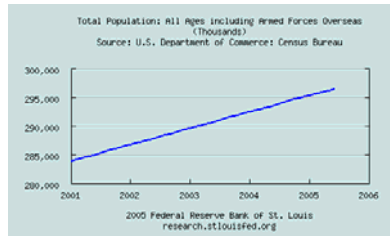
<http://research.stlouisfed.org/fred2/series/POP/104>

Graphing and Interpreting Data Plots

11

Practice/reinforce finding the population in 2003 (~289,000,000) and use estimation skills to find the value in 2004 (~292,000,000).

# Compare and Contrast



Graphing and Interpreting Data Plots

12

Questions to prompt understanding:

Do both graphs show data for 2005?

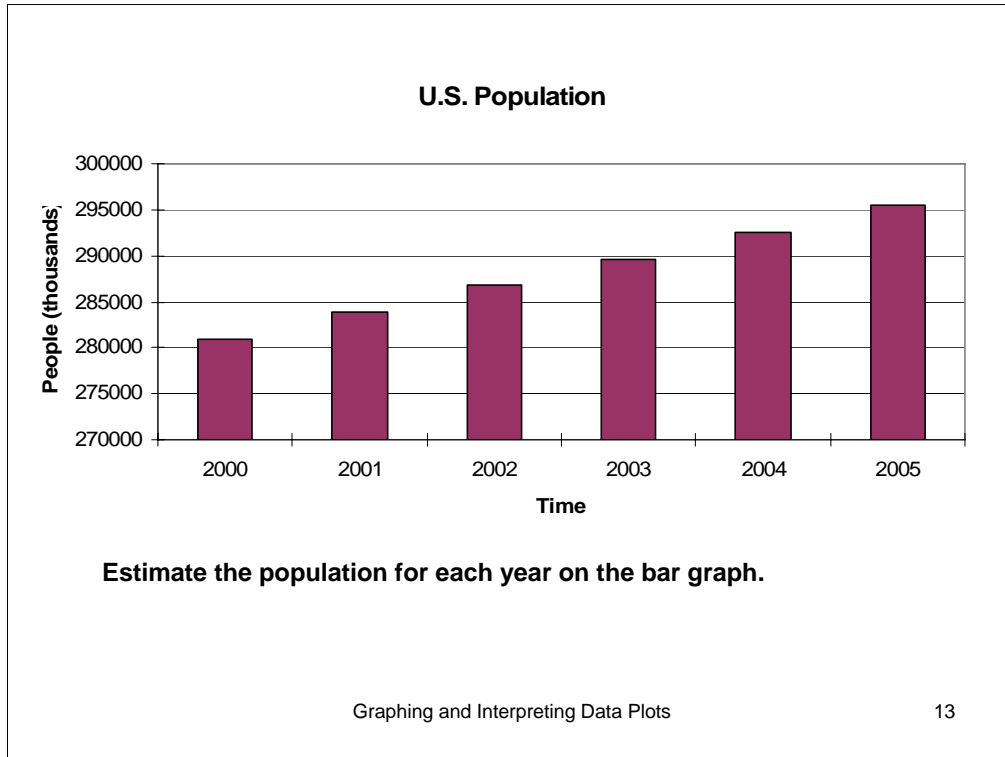
Do both graphs show data for 2000?

Do these graphs show different data or similar data?

Which is the best for showing the data and why?

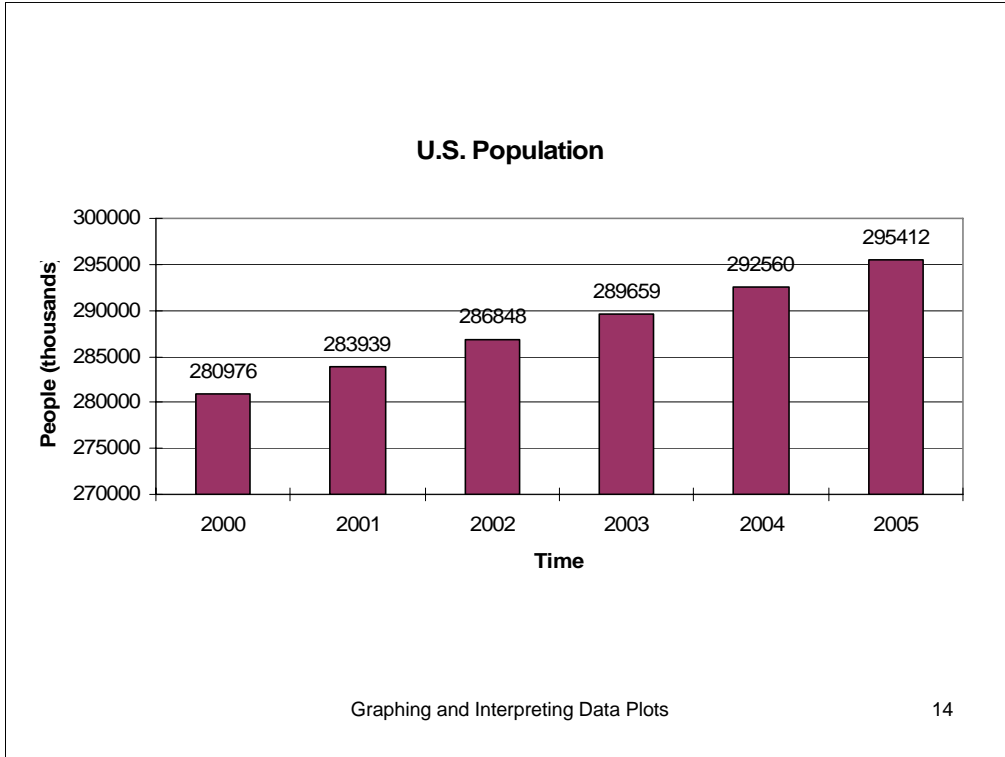
Guide students to see if they can conclude that the “tops” of the bar graph, if connected, would create the line graph.

Does the bar graph provide the same conclusion as the line graph? Why?

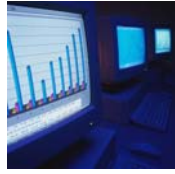


The prompt is a PowerPoint animation which appears after a mouse click.

Students practice reading a graph and estimating values.



Answers to previous slide



## Population Data



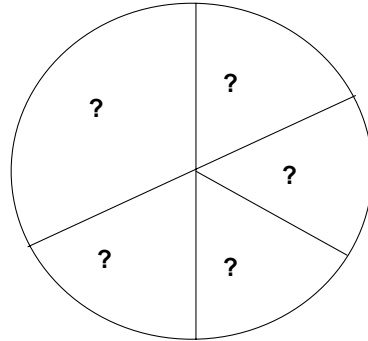
<u>Year</u>	<u>Population</u>
2000	280,976,000
2001	283,939,000
2002	286,848,000
2003	289,659,000
2004	292,560,000
2005	295,412,000

Population data in tabular format (emphasize it is another VALID data representation)

## Create a pie chart

Grades   Number

A	3
B	11
C	8
D	2
F	1



**Working in pairs, discuss what steps would be required to create a pie chart of the data including percentages.**

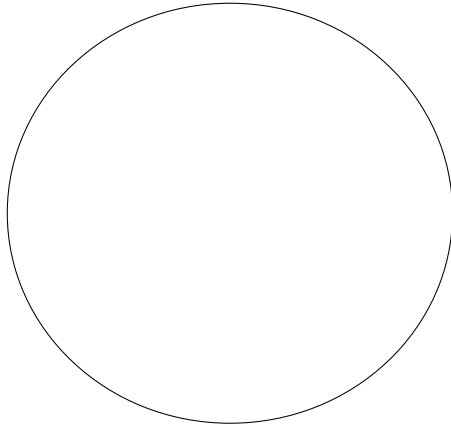
Graphing and Interpreting Data Plots

16

Have students work in pairs to brainstorm ideas for steps involved in making a pie chart with percentages for each region.

Whole class discussion on the steps required after 7-10 minutes.

# Create a Pie chart



## Steps to create a pie chart

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

Notetaking handout

# Homework

1. Create a pie chart or bar graph coloring the sections and labeling the axes.

<u>Hobbies</u>	<u># of People</u>
Video games	3
T.V.	2
Coins (25¢)	5
Sleeping	6
Shopping	4

2. If you make a pie chart, make sure to color in each hobby and label the # of people and percentage.

3. If you make a bar graph, make sure you label the graph as well as labeling the x-axis and y-axis. Put the # of people on top of each bar.

Choice of homework: pie chart or bar graph

# Homework Rubric

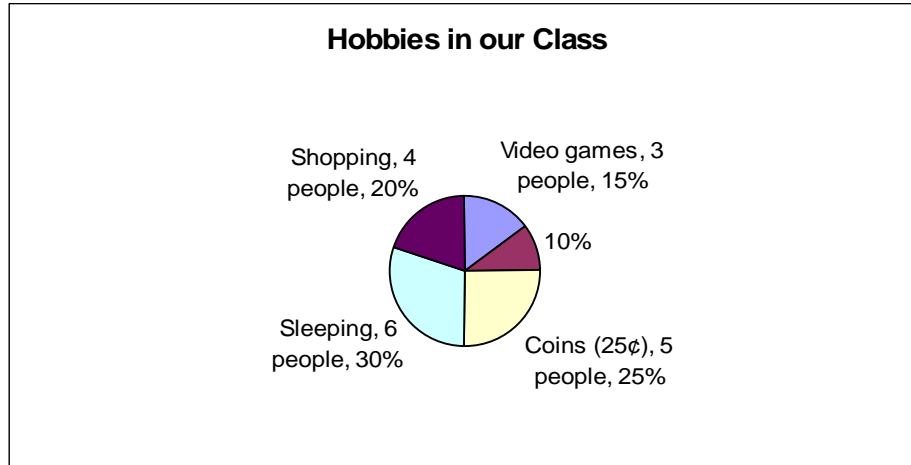
CATEGORY	4	3	2	1
<b>Graph Title</b>	Title is creative and clearly relates to the problem being graphed. It is printed at the top of the graph.	Title clearly relates to the problem being graphed and is printed at the top of the graph.	A title is present at the top of the graph.	A title is not present.
<b>Units</b>	All units are described (in a key or with labels) and are appropriately sized for the data set.	Most units are described (in a key or with labels) and are appropriately sized for the data set.	All units are described (in a key or with labels) but are not appropriately sized for the data set.	Units are neither described NOR appropriately sized for the data set.
<b>Accuracy of Graph</b>	All circle sectors are drawn correctly and are easy to see. A ruler is used to neatly make the bars, if not using a computerized graphing program.	Most circle sectors are drawn correctly and are easy to see, or the bars were hand drawn without a ruler.	One or two circle sectors are drawn correctly and are easy to see, or the bars are unevenly drawn.	Looks completed in the last minute – not accurate.
<b>Neatness and Attractiveness</b>	Exceptionally well designed, neat, and attractive. Colors that go well together are used to make the graph more readable. A ruler or graph paper are used.	Nest and relatively attractive. Colors used but graph not readable. A ruler or graph paper are used to make the graph more readable.	Graph appears quite plain without any colors used.	Appears messy and "thrown together" in a hurry. Lines are visibly crooked. No colors used.
<b>Conclusion</b>	A conclusion is clearly stated using complete sentences without mistakes.	A conclusion is unclear or has minor grammar errors.	A conclusion was not written in complete sentences.	A conclusion was not written or could not be easily found.
<b>SCORE:</b>	_____ / 20			

Graphing and Interpreting Data Plots

19

Review in class

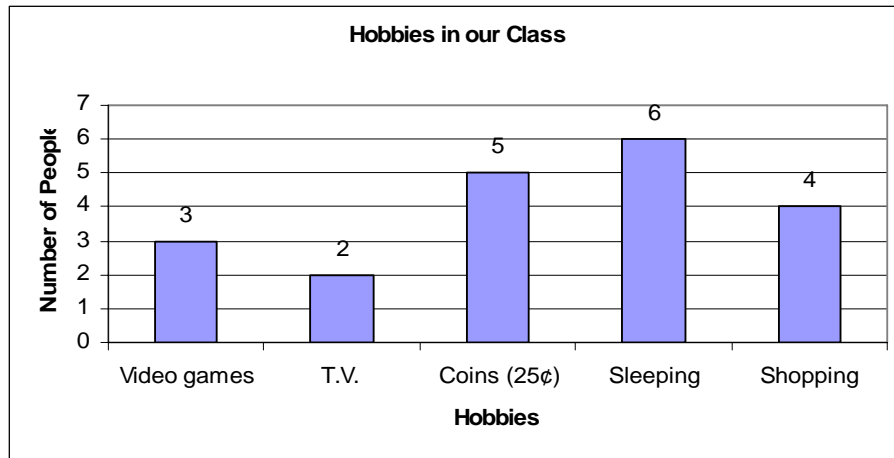
# Homework (Pie chart)



**Conclusion: In our class, 30% of the people like to sleep as their hobby.**

Possible homework answer for a Pie chart

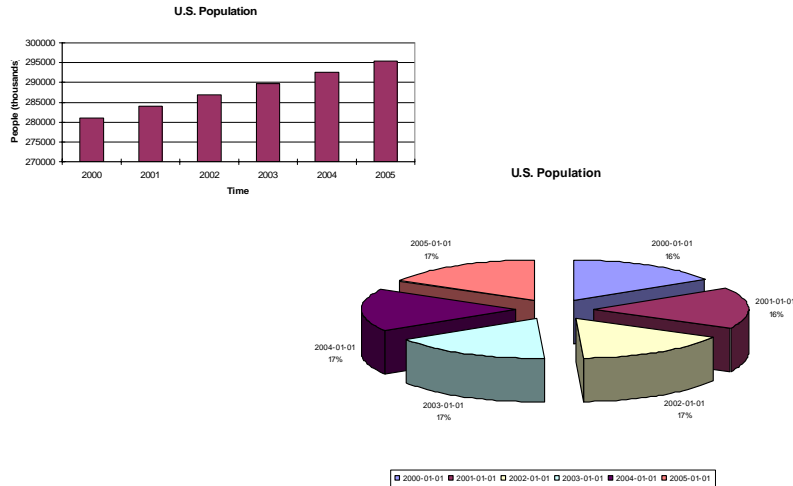
# Homework (Bar graph)



**Conclusion:** In our class, a majority of the people like to sleep as their hobby.

Possible homework answer for a Bar graph

# Compare and Contrast



Graphing and Interpreting Data Plots

22

Day 2: [review, summarize, and conclude lesson]

Collect homework and review answers from previous two slides.

Do these graphs show similar or different data?

Given a bar chart how would you create a pie chart?

Given a pie chart how would you create a bar chart?

## Extension

- Create a scatter plot by collecting class data on **shoe size** (rounded to nearest foot) and **height** (using inches)
- Use one of these resources for graphing:
  - [Valerie Cones' ETP on Creating Graphs in Excel](#)
  - [Web resource from the National Center for Education Statistics](#)

Provide a two column table to collect class data on shoe size versus height.

The goal of the experiment is for students to determine whether there is a correlation between these two factors.

For ease of use and graphing, ask students to round shoe size to the nearest foot and convert their height to inches.

The two hyperlinks above are also referenced in the Graphing Resources pages.

If students have access to a computer lab or the teacher has a laptop with a data projector, a demonstration could be shown how to use these great resources!

The teacher would demonstrate how to use the graphing resource. Students would follow by practicing and making their own graphs.



## Data Resources

- <http://www.cde.ca.gov/be/st/ss/mthmain.asp>  
California Math Standards
- <http://www.census.gov>  
U.S. census bureau data with people, business and geography perspectives
- <http://www.iisme.org/etp/ACF325.pdf>  
Carmen Belleza's ETP on Data Gathering
- <http://www-math.bgsu.edu/math112/>  
College Algebra 1 website with handouts



## Graphing Resources

- <http://nces.ed.gov/nceskids/graphing/>  
Creating graphs on-line
- <http://www.iisme.org/etp/Elem%20-%20Presenting%20with%20Excel%20and%20PowerPoint.pdf>  
Valerie Cones' ETP on Creating Graphs in Excel
- <http://rubistar.4teachers.org/index.php>  
Creating rubrics for projects

# Appendix

## Grade Point Average (GPA) data

<b>Student High School GPA</b>	<b>Freshman College GPA</b>
2.00	1.60
2.25	2.00
2.60	1.80
2.65	2.80
2.80	2.10
3.10	2.00
2.90	2.65
3.25	2.25
3.30	2.60
3.60	3.00
3.25	3.10

Graphing and Interpreting Data Plots

27

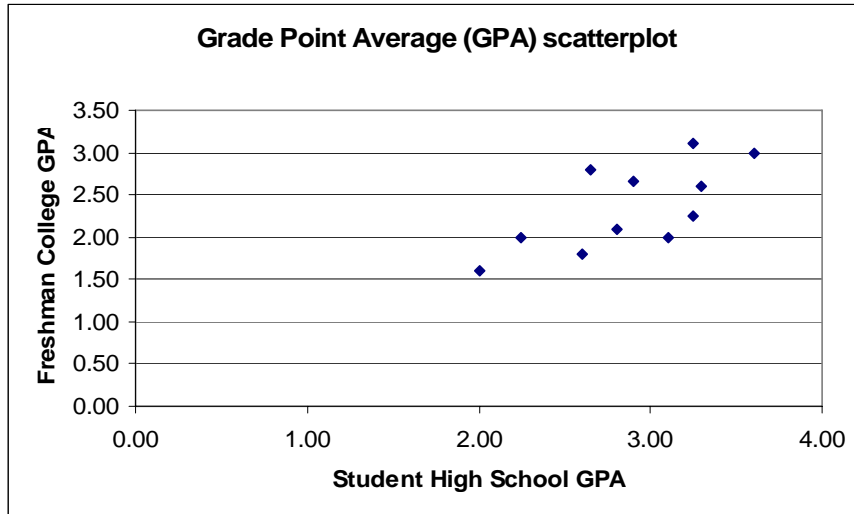
What is GPA?

Is there a relationship between high school GPA and college GPA from this data?

Can this data be graphed using a bar graph or pie chart? How?

[The sample data is from Carmen Belleza's ETP on Data Gathering (see Data Resources slide)]

# Grade Point Average (GPA)



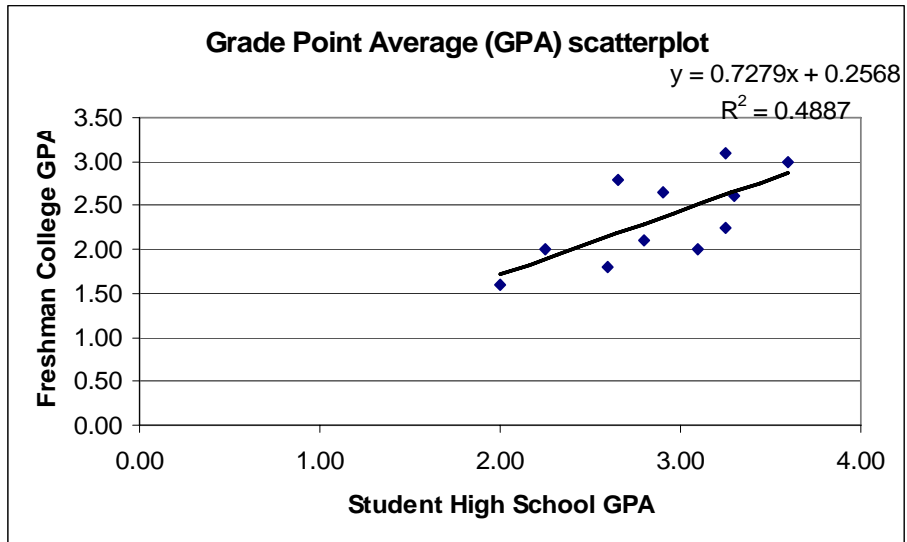
Graphing and Interpreting Data Plots

28

Demonstrate how to manually partition and graph a scatterplot.

Can a line be drawn that represents or summarizes all these points?

# Grade Point Average (GPA)



Graphing and Interpreting Data Plots

29

Describe line of best fit

# The End