

Vision - Potential

Vision Within Every Instructor – Potential Within Every Student

Newsletter of the HBCU College Algebra Reform Consortium*

Number 31, January 2001

Contents

- [1] Our Class Data
- [2] Distance/Time Plots
- [3] An Aging Population
- [4] Interpreting Plots
- [5] Coordinating Traffic Signals
- [6] California's Population Growth
- [7] Notices

[1] **Our Class Data**
suggested by
Carrington Stewart
Texas Southern University

Carrington Stewart suggests calling students' attention to the role of data in the *Contemporary College Algebra* program by involving them in a data gathering activity near the beginning of the semester. During the first week, Carrington circulates a chart, labeled "Our Class Data," through his class with column headings: age, height, weight, sex, shoe size, eye color, hand orientation, etc. He asks each student to fill in a row of the table with

* Supported by the EXXON Education Foundation and the U.S. Military Academy.

their information (corresponding to the column headings). He then duplicates the chart and hands copies to the students during the following class. In subsequent classes, he creates exercises and small group activities involving the use of Our Class Data. For example:

- a. Is the average weight of the students in the class greater than their median weight? What conjecture would you make about a group of people if you were told that their average weight was less than their median weight?
- b. If you were told that the mode of the weights of the students was the weight of the heaviest person, what conjecture could you make about the relationship between the average and median weights of the students?
- c. What percentage of the students in the class are left-handed? What percentage are right-handed?
- d. Plot student weight (vertical axis) against shoe size (horizontal axis). Does the plot suggest a relationship between shoe size and weight? Explain.
- e. What is the median height of the students?
- f. What is the mode of the eye color data?

Carrington Stewart assigned a small group project to his class based on their class data. He asked the students to develop a class profile based on their Class Data using pie charts, bar charts, line plots, and scatter plots as well as written descriptions of relationships between categories of data. He challenged the students to think of creative ways to use and interpret the data in creating their profile.

In Chapter 2, Our Class Data could be used as a basis for modeling exercises. For example, fit a curve to the weight/shoe size data. Another exercise could be to model the weight/height data and compared it to a tabular model found in a doctor's office.

Instructors are encouraged to individualize their Class Data by choosing other column headings. The purpose of beginning the course with data collecting and data analysis activities is to emphasize the primary goal of the course: develop students' ability to answer the categorical questions

- * How to display data?
- * How to transform data into information?
- * How to transform information into knowledge?

[2] Distance/Time Plots

The distance/time data for the movement of two vehicles, A and B, is shown in the following plot.

Answer the following questions:

- a. What do the slopes of the lines represent?
- b. Which vehicle was traveling at the greater rate of speed?
- c. How fast is vehicle A moving? How fast is vehicle B moving?

[3] An Aging Population

The December 18, 2000 issue of The New York Times contained the following chart. (Source: Bureau of Labor Statistics; Census Bureau.)

Draw three pie charts to display this data. One for 2001, one for 2011, and one for 2021. Write a half page essay on the implications that an aging population has on the nation's economy. (For example, how will an aging population affect the cost of the Medicare program or a contemplated government funded prescription drug program?)

[4] Interpreting Plots

Cora and her brother, Chester, both drove from their home to their aunt's house 100 miles away.

The Distance/Time plots for their trips are shown below.

- a. Which driver had the larger average speed or were the averages the same? Explain.
- b. One driver encountered heavy traffic and the other one did not. Which driver encountered the heavy traffic? Explain.
- c. One driver stopped to buy gas. Which one was it? Explain.
- d. Both plots are either increasing (“going up to the right”) or are flat. What would it mean if one of the plots decreased over a time interval?

[5] **Coordinating Traffic Signals**

Lei Yu

**Chair, Department of Transportation
Texas Southern University**

The flow of traffic on any street or highway is greatly affected by the flow of traffic through the intersection points on that highway or street because the intersections usually create more traffic delays than other sections of the road. For both safety and delay considerations, traffic engineers use various means to control traffic through intersections (e.g., traffic signals, stop signs, etc.) When properly coordinated, traffic signals can provide for an orderly movement of traffic and, under favorable conditions, can provide for continuous traffic at a definite speed along a given route. For example,

a sequence of traffic lights on a highway passing through an urban setting are often coordinated in order to allow uninterrupted travel at a specified speed.

Problem.

Alfrieda wants to drive down Main Street at 30 mph without stopping at either of the two traffic lights. The lights are 2,000 feet apart and each one cycles through a green, yellow, and red phase every 65 seconds. The green and red phases each hold for 30 seconds and the yellow phase for 5 seconds. How much should the green phase of the second light be *offset* from the green phase of the first light in order that Alfrieda can make her uninterrupted trip? (“*offset*” is a technical term representing the minimum time lapse in seconds between the beginning of a green phase of a traffic signal and the beginning of the green phase at the next traffic signal.)

Hint: There are 5,280 feet in a mile. Use the relation (distance) = (rate) x (time) to determine the time (in seconds) it takes Alfrieda to travel the distance between the lights.

[6] **California’s Population Growth**

The 2000 census officially set the population of the United States at 281,421,906 revealing a 33 million increase during the past decade. This represents a 13.2% gain during the last decade.

What was the country’s population in 1990?

Every state registered a population gain with California having the largest at 4,111,627. However, Nevada had the largest percentage gain at 66.3%. North Dakota had the smallest percentage gain at 0.5%.

There are several consequences to shifts in population. One of the most important is a redistribution of congressional seats mandated by the Constitution’s requirement that representation in the House of Representatives be based on the distribution of state populations. The 2000 census figures will result in Florida, Georgia, and Texas each gaining two additional House seats while New York and

Pennsylvania each lose two seats. Arizona, California, Colorado, and Nevada will each gain one seat while Connecticut, Illinois, Indiana, Michigan, Mississippi, Ohio, Oklahoma, and Wisconsin each lose one seat.

The following table shows California's population growth by decade starting in 1850 (Source: U.S. Census Bureau).

<i>Year</i>	<i>Population</i>
1850	92,597
1860	379,994
1870	560,247
1880	864,649
1890	1,213,398
1900	1,485,053
1910	2,377,549
1920	3,426,861
1930	5,677,251
1940	6,907,387
1950	10,586,223
1960	15,717,204
1970	19,971,069
1980	23,667,764
1990	29,760,021
2000	33,871,648

Analyze this data by:

- Express the population figures in terms of 100,000 rounded to one decimal place and then plot the data. (For example, express the 1860 population as 3.8.)
- Using a graphing calculator, graphically fit an exponential function to the plotted data. (That is, determine values for the parameters A and B in the expression $y = Ae^{Bt}$ such that the plot of y closely approximates the data.)
- Using a bar chart, display the percentage increase in the population from one decade.
- Group the first hundred years together (1850-1940) and display that grouping along with

the data for the following 6 decades in a pie chart. (There are 7 pie slices.)

- Conjecture the reason(s) for the "jump" in population during the 1850-60 decade and also during the 1940-50 decade. Describe your reasoning in support of your conjectures.

(Instructors are encouraged to individualize this problem by substituting their own state's population data for California's.)

[7]

Notices

- Tribal College Program**
The National Science Foundation recently provided a two-year grant to Dull Knife Memorial College to adapt and implement the Contemporary College Algebra program in all the Tribal Colleges in Montana. Russ Lungren, Director of the mathematics program at Dull Knife Memorial College, is the Principal Investigator of the project. The adaptation will involve incorporating Native American culture into the program through problem settings, projects, and vignettes.
- The Third Edition of the *Contemporary College Algebra* text is now available from McGraw-Hill Publishing Co. The revisions include two new sections: "Systems of Linear Equations" and "Modeling in Art and Music;" a collection of Fun Projects for Chapters 1, 2, & 3; several new exercises and worked problems. Examination copies can be obtained by contacting: Regional Sales Office, Glencoe Sales Division/McGraw-Hill, Woodland Hills, California 91367 or calling 1-800-423-9534. A Teacher's Guide can be obtained by contacting Don Small [don-small@usma.edu].
- The Deadline for contributions to the February Newsletter is Monday, February 5, 2001.

4. To subscribe to this Newsletter or to submit articles write to Dr. Della Bell, Chair, Dept. of Mathematics, Texas Southern University, 3100 Cleburne St., Houston, TX 77004.