DOCUMENT RESUME

ED 417 948 SE 061 243

AUTHOR	Tibbs, Peggy; Jordan, Susan; Sherrill, Donna
TITLE	Having It Your Way: How To Use Statistics Creatively.
PUB DATE	1997-11-14
NOTE	22p.; Paper presented at the Annual Meeting of the American Mathematical Association of Two-Year Colleges (Atlanta, GA, November 14, 1997).
PUB TYPE	Guides - Classroom - Teacher (052) -- Numerical/Quantitative Data (110) -- Speeches/Meeting Papers (150)
EDRS PRICE	MF01/PC01 Plus Postage.
DESCRIPTORS	*Educational Technology; Elementary Secondary Education; *Experiential Learning; Graphing Calculators; Learning Activities; Mathematics Instruction; *Statistics

ABSTRACT

This paper discusses different ways of using statistics more creatively. One method begins with two conflicting headlines from newspapers and analyzes them statistically by using a graphing calculator. Other activities using graphing calculators are also presented. (ASK)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED 417 948

HAVING IT YOUR WAY: HOW TO USE STATISTICS CREATIVELY

PRESENTED BY:

PEGGY TIBBS
SUSAN JORDAN
DONNA SHERRILL

ARKANSAS TECH UNIVERSITY
RUSSELLVILLE, ARKANSAS

AMATYC 1997
ATLANTA, GEORGIA
NOVEMBER 14, 1997

PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL HAS BEEN GRANTED BY

P.Tibbs

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

1

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

- This document has been reproduced as received from the person or organization originating it.
- Minor changes have been made to improve reproduction quality.

- Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

BEST COPY AVAILABLE

SE061243

ERIC

This is a presentation done at the AMATYC Conference in Atlanta, Georgia. Presenters were Peggy Tibbs, Susan Jordan, and Donna Sherrill. We are all instructors in the Mathematics Department at Arkansas Tech University, Russellville, Arkansas. We all teach Math 1103, a course that satisfies General Education requirements for those students who are not planning to take calculus. The text we are currently using is Explorations in College Algebra, (Wiley, 1998), written by Linda Kime and Judith Clark. The presentation is an adaptation of an Exploration in Chapter 3 of this book.

The presentation modeled cooperative grouping. The parts of the presentation were:

1) Introduction.
2) Review of concepts needed to do the activity.
    a) Three Ways to Describe Change
    b) Creating and Manipulating a Connected Scatter Plot
3) Group Activity.
4) Presentations by groups.

ERIC

INTRODUCTION

These two headlines appeared in the Arkansas Democrat-Gazette on November 6, 1997:

TRAFFIC DEATHS ROSE ON HIGHER-SPEED ROUTES

SPEED LIMITS UP, SAFETY TOO

How can both these headlines be true? Both authors were referring to a study released by the Arkansas Highway and Transportation Department. The first author says: "Traffic fatalities along routes where speed limits were raised a year ago have climbed 15%." The second author says: "After 1987, the higher speed limit reduced statewide fatality rates by 3.4% to 5.1%, compared to the rates in the states that did not raise limits. True, the actual number of fatalities continued to increase after 1987, but the volume of traffic increased even faster."

Each writer chose the part of the report that supported his opinion.

Now, refer to these graphs:(See I, II, and III) Is violent crime increasing or decreasing? It depends on what part of the data you use!

ERIC

Arkansas Democrat Gazette
November 6, 1997

Traffic deaths rose on higher-speed routes

Fatalities climbed 15 percent, study shows

BY NOEL E. OMAN
ARKANSAS DEMOCRAT-GAZETTE

Traffic fatalities along routes where speed limits were raised a year ago have climbed 15 percent, a state Highway and Transportation Department study showed.

But the study does not show how much, if at all, the increased speed limits contributed to the increased deaths.

"It's informational only," said department spokesman Randy Ort. "I don't think we're trying to draw any conclusions at this point in time."

While suburban freeways saw the death toll climb from 11 to 27 with the higher speed limits, or a 145 percent increase, deaths fell by 1 percent on rural highways where speeds were increased.

The study also noted that more vehicles were using the highways than a year ago. When the 7.4 percent increase in traffic was factored in, the adjusted fatality rate increase dropped from 15 percent to 6.7 percent.

"With more vehicles traveling these routes, there are more chances for crash occurrences," the report said.

The state Highway Commission heard a summary of the report Wednesday but took no action. The department is waiting for a more detailed federal study of the effect of increased speed limits nationwide. The federal study has been drafted but is under review,

See **FATALITIES,** Page 11A

BEST COPY AVAILABLE

ERIC

Arkansas Democrat-Gazette THURSDAY, NOVEMBER 6, 1997

Speed limits up, safety, too

George Will

Statistics and probabilities can be puzzling, even paradoxical, as the man knew who wrote:

Very, very, very few
People die at ninety-two.
I suppose that I shall be
Safer still at ninety-three.

Another example: In the movie "Fathers' Day," Billy Crystal wants Robin Williams to facilitate a deception by pretending to cry. Crystal suggests that Williams imagine that he is a tragic hero like Lou Gehrig. Williams asks, "Who's that?"

Crystal, dumbfounded, says, "Everybody knows Lou Gehrig—the baseball player, he died of Lou Gehrig's disease."

Williams, flabbergasted that someone named Lou Gehrig died of something named Lou Gehrig's disease, exclaims: "Wow! What are the odds on that?"

Which is prologue to today's subject: What were the odds in 1987 that the increases in states' speed limits would result in decreasing statewide fatality rates? Herewith a story about the vagaries of statistical analyses and social policies, a story with a happy ending.

Two scholars who can explain the counterintuitive results of increased speed limits are Charles Lave and Patrick Elias of the department of economics at the University of California at Irvine. The story they tell begins with the 1973 Yom Kippur War, the oil embargo, and the federal law coercing states to enforce 55 mph limits. Federal highway funding would be reduced for states not meeting compliance requirements, which included speed monitoring programs and reports of the proportion of drivers violating the new limit.

The primary reason for the 55 mph limit was fuel conservation, and when the energy crisis passed, Americans grew restless. In 1987, states were allowed to raise their limits on rural interstates and 40 adopted 65 mph limits. Opponents stressed not conservation but safety, predicting carnage. Their mantra was, "Speed kills."

Concerning developments immediately after 1987, Lave and Elias note that construing the evidence is a more complex task than some analysts realize. Their conclusion is that, up to a point, higher speed limits save lives.

After 1987, the higher speed limit reduced statewide fatality rates by 3.4 percent to 5.1 percent, compared to the rates in states that did not raise limits. True, the actual number of fatalities continued to increase after 1987, but the volume of traffic increased even faster. The critical measurement is fatalities per vehicle mile traveled *in the entire state*. Some studies found that raising speed limits on particular highways increased, or did not decrease, fatalities on those particular highways. However, such studies failed to gauge the ways in which all of a state's highways comprise a single interdependent system, and that highway systems and safety systems also are interdependent.

Lave and Elias say the 55 mph limit caused the misallocation of traffic and of police resources. The federal government had demanded strict compliance with the 55 mph limit, which forced state highway patrols to concentrate on speed enforcement on the interstate highways, which have the densest concentration of high-speed traffic. But these are also the safest highways.

And state police patrol resources were then decreasingly available for such safety programs as truck inspections and drunk driving checkpoints. Furthermore, many drivers who wanted to speed switched to less traveled, less patrolled but less safe roads.

The 55 mph limit might have decreased fatalities on some roads by increasing patrolling and decreasing traffic volume from what it would have been without that limit. However, the effect on a state's total highways system was apt to be a net subtraction from safety.

Raising speed limits lured some drivers back to safer, more heavily patrolled roads, and allowed highway patrols to shift resources back to the programs they thought most effective. And it decreased a real killer—speed variance among vehicles.

Many collisions occur when cars are overtaking and passing one another. Speed variance among drivers increases when speed limits are set so low that there is a high rate of noncompliance. Raising speed limits reduced turbulence in the traffic stream, leading Lave to say, "Variance kills, not speed."

When in November 1995 Congress empowered states to set such limits as they chose, fatalities did not increase the 10 percent to 14 percent predicted by the Cassandras who foresaw 4,400-6,000 extra deaths per year. Neither did fatalities increase even the 2 percent to 3 percent that would have been expected, extrapolating from recent trends. Instead, Lave concludes that fatalities have declined slightly (0.14 percent) even as total vehicle miles increased 2 percent.

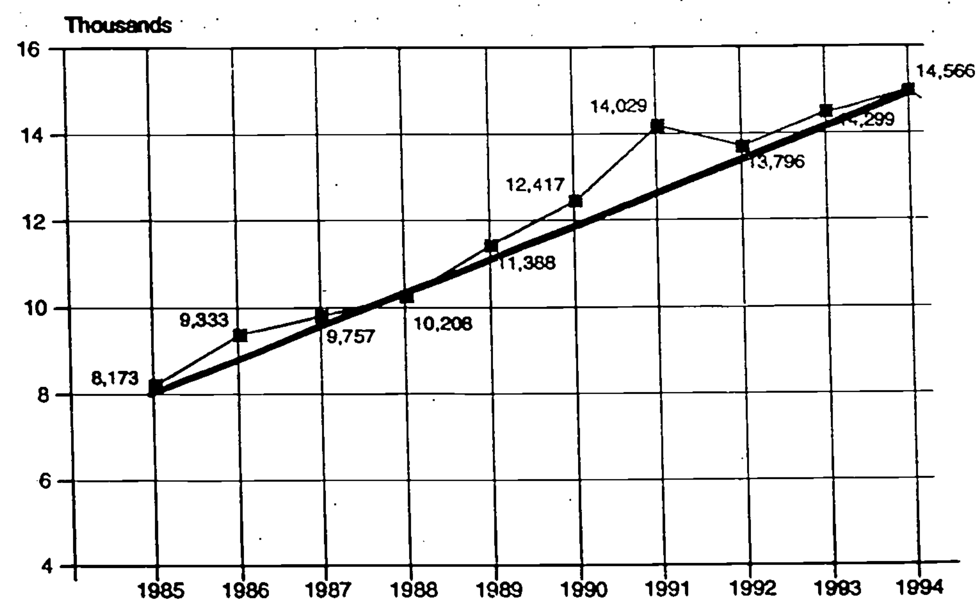
This is a cautionary tale about the complexity of discerning reality in a welter of statistics. It also is an encouraging tale. Sometimes the unintended consequences of a policy—in this case, increased safety from speed limits that were increased for reasons other than safety—are good.

George Will has won the Pulitzer Prize for commentary.

BEST COPY AVAILABLE

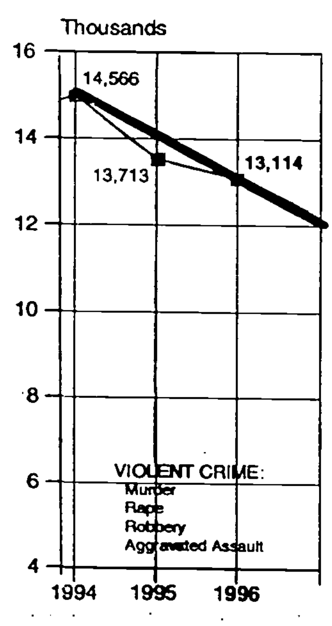
I. Violent crime in Arkansas is increasing at a tremendous rate. For the last 9 years, beginning in 1985, there has been an average increase of 710 cases per year. This is an increase of 78%.

Yearly Violent Crime Trend

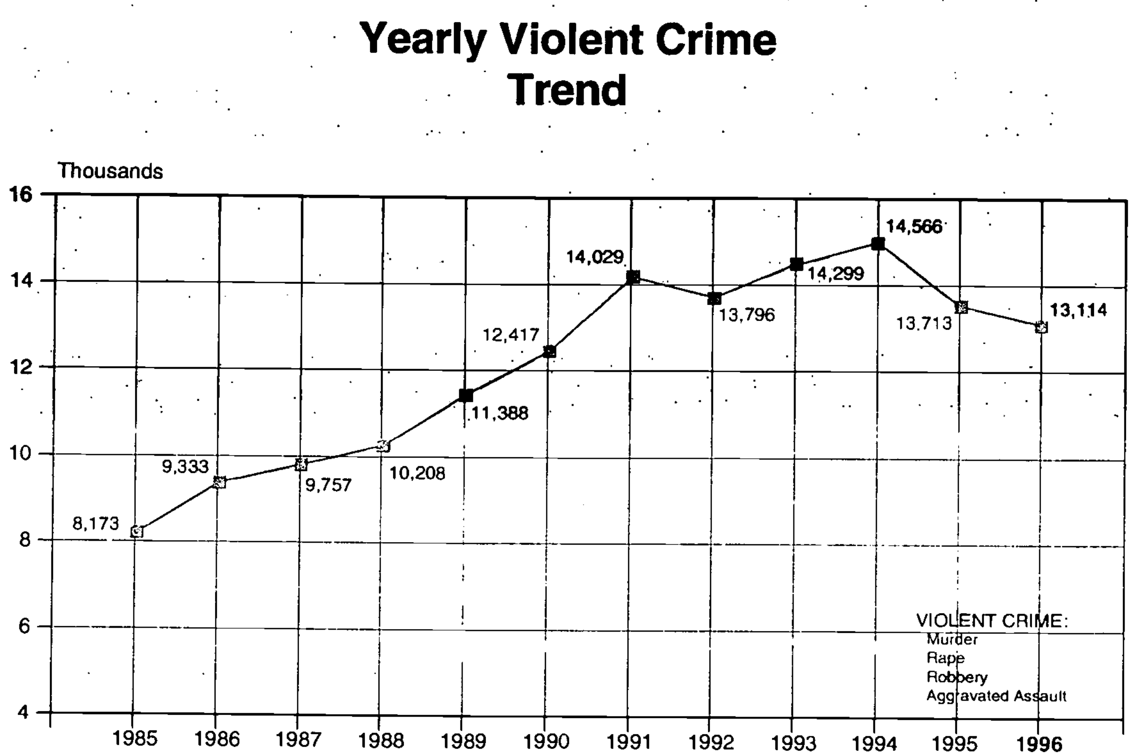


II. Violent crime in Arkansas is decreasing rapidly. Since 1994, there has been a record-setting 10% decline in murder, rape, robbery, and aggravated assault. This is a drop of 1422 cases.

Yearly Violent Crime Trend



III. COMPLETE GRAPH



BEST COPY AVAILABLE

ERIC

Three Ways to Describe Change

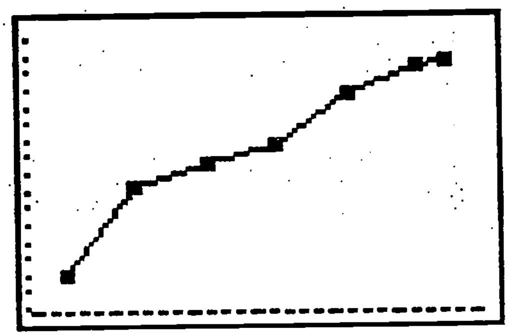
1. Average Rate of Change is one of the most useful measures of describing change.

$$\text{Average Rate of Change} = \frac{\text{change in vertical variable}}{\text{change in horizontal variable}}$$

$$\textbf{Units of Average Rate of Change} = \frac{\textbf{units of vertical variable}}{\textbf{units of horizontal variable}}$$

Below to the left is data of life expectancy at birth during selected years from 1940 to 1994 for all races in the United States taken from the National Center of Health Statistics found on the internet in the Data Warehouse. Below to the right is a connected scatter plot of the data with year on the horizontal axis and life expectancy on the vertical axis.

Year	Life Expectancy
1940	62.9
1950	68.2
1960	69.7
1970	70.8
1980	73.7
1990	75.4
1994	75.7



Example 1: Find the average rate of change in life expectancy from 1940 to 1970 and give the correct units.

Average rate of change $= \frac{70.8-62.9}{1970-1940} = \frac{7.9}{30} = 0.263$ years per year

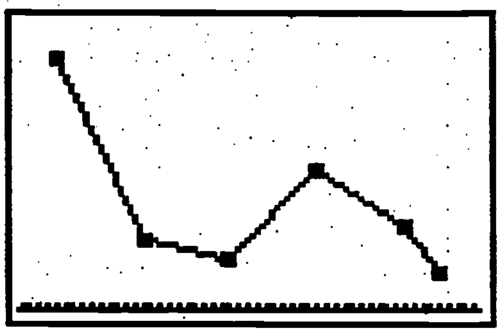
Example 2: Find the average rate of change in life expectancy from 1950 to 1994 and give the correct units.

Average rate of change $= \frac{75.7-68.2}{1994-1950} = \frac{7.5}{44} = 0.170$ years per year

BEST COPY AVAILABLE

* The average rate of change depends entirely on the endpoints you use to calculate the rate.

Below is a graph of the average rate of change versus the year.
As you can see the average rate of change is changing.



2. Absolute Change = **The change in the vertical variable.**

Example 1: Find the absolute change from 1960 to 1980.

Absolute change $= 73.7 - 69.7 = 4$ years

Example 2: Find the absolute change from 1940 to 1994.

Absolute change $= 75.7 - 62.9 = 12.8$ years

3. Percent Change $= \dfrac{\textbf{change in vertical variable}}{\textbf{original value of vertical variable}}$

Example 1: Find the percent change from 1970 to 1990.

Percent change $= \dfrac{75.4 - 70.8}{70.8} = \dfrac{4.6}{70.8} = 0.065 = 6.5\%$

Example 2: Find the percent change from 1940 to 1994.

Percent change $= \dfrac{75.7 - 62.9}{62.9} = \dfrac{12.8}{62.9} = 0.203 = 20.3\%$

BEST COPY AVAILABLE

ERIC

Creating and manipulating a connected scatter plot (xyLine)

Before we begin, so that we are all starting at the same point, let's reset our calculators. We do this by pushing 2nd +, #5 (Reset). Now push ENTER to select All Memory. Finally push #2 to reset, and all memory will be cleared. This sets the calculator up just as it would be straight from the factory. You may find at this point that your screen is either lighter or darker than you would like. If this is the case, push 2nd up arrow to darken, or 2nd down arrow to lighten.

In order to generate a scatter plot, we must first input some data for the calculator to graph. We will use the following data set, in which x represents the year and y represents the birth rate (number of live births per 1000 population) for all races combined in the U.S.[1]

x	y
1988	16
1989	16.4
1990	16.7
1991	16.3
1992	15.9
1993	15.5
1994	15.2

We enter data into our lists in the following manner. First push the STAT key, which gives the screen shown in fig. 1.

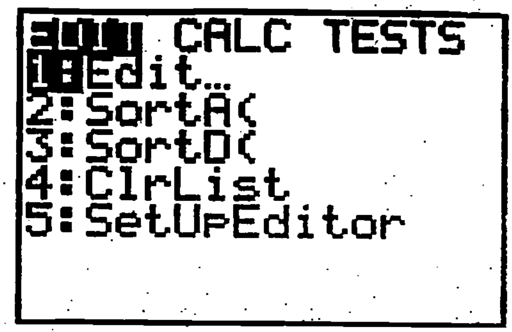


fig. 1

Then push ENTER, which will select the Edit feature and will give the screen shown in fig. 2.

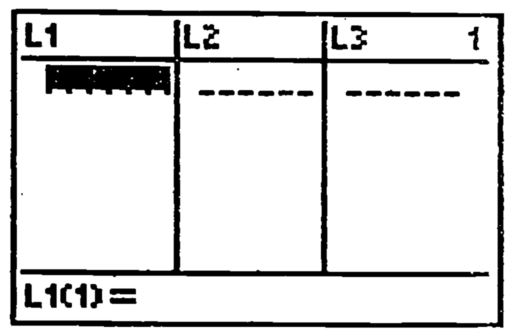


fig. 2

Starting with List 1, we input each piece of data by entering the appropriate number and then pushing ENTER. This automatically moves the cursor on to the next entry position. When List 1 is filled in, push the right arrow key to begin filling in List 2. Your lists should now appear as in fig. 3.

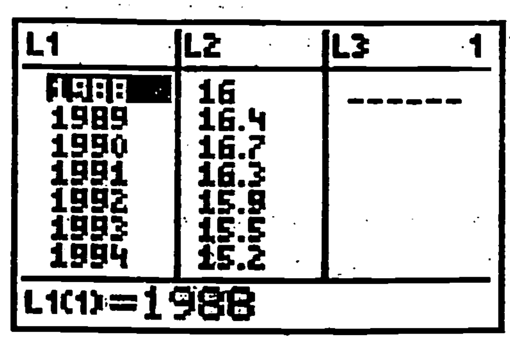


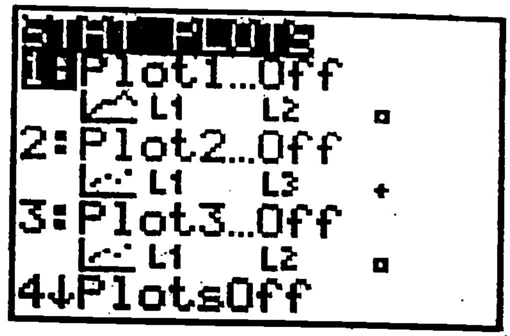
fig. 3

[1]Data Warehouse

BEST COPY AVAILABLE

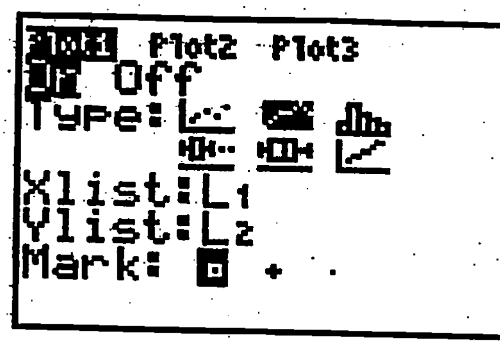
Now we are ready to graph our data. We access the statistical plots by pushing 2nd y=, which will give the screen shown in fig. 4.

fig. 4



To access Plot 1, push ENTER, which will yield the screen shown in fig. 5. This is how your screen should appear when everything is set as it should be.

fig. 5



Push ENTER again (with the cursor on On) to turn the plot on. Use your down arrow key to move to the second line, where we select the type of graph we want. The type we're doing is the connected scatter plot (or xyLine), which is the second option. Put your cursor on this type and push ENTER to select it. Now use your down arrow key to move to the third line. The Xlist should be L_1 (2nd 1) and the Ylist should be L_2 (2nd 2). Finally, the Mark can be whatever you choose.

Once the plot is set up the way we want it, we push ZOOM 9, (ZoomStat), which automatically sets our window optimally for the data we're graphing. You should now have the graph which is shown in fig. 6.

This graph shows how the birth rate has changed over time.

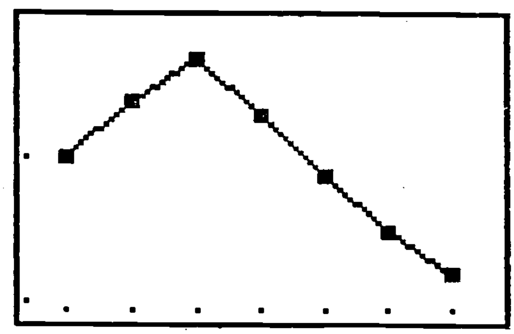
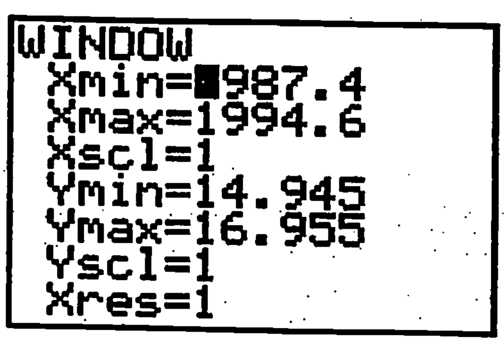


fig. 6

Now we can alter the appearance of this or any connected scatter plot (or xyLine) simply by manipulating the axes. To make a graph appear steeper (more dramatic), we stretch out the y-axis and/or condense the x-axis. Push WINDOW to see that the window is set up as shown in fig. 7.

fig. 7



BEST COPY AVAILABLE

Condensing the x-axis means putting a wider range of x-values in the same horizontal space, so if we change the window so that the x-axis goes from a minimum of 1980 to a maximum of 2000, as shown in fig. 8, we can see this result by pushing GRAPH. (fig. 9)

fig. 8

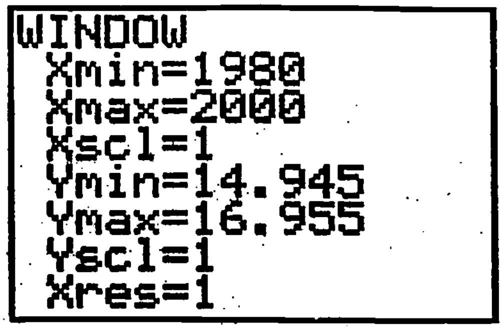
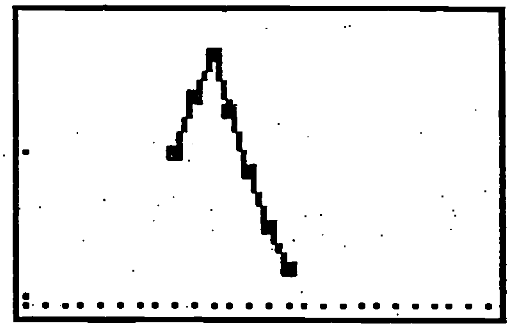


fig. 9



To get back to our original graph, push ZOOM 9.

To make a graph appear less steep (hence less dramatic), we stretch out the x-axis and/or condense the y-axis. Condensing the y-axis means putting a wider range of y-values in the same vertical space, so if we change the window so that the y-axis goes from a minimum of 12 to a maximum of 20, as shown in fig. 10, we can see this result by pushing GRAPH. (fig. 11)

fig. 10

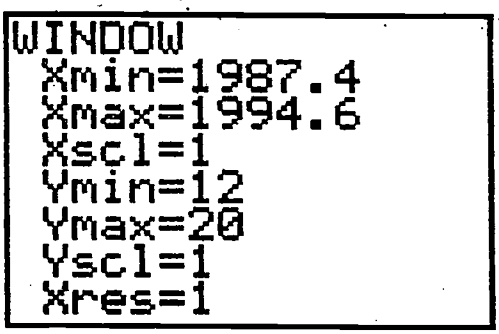
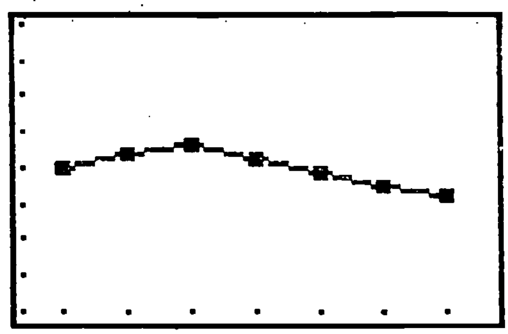
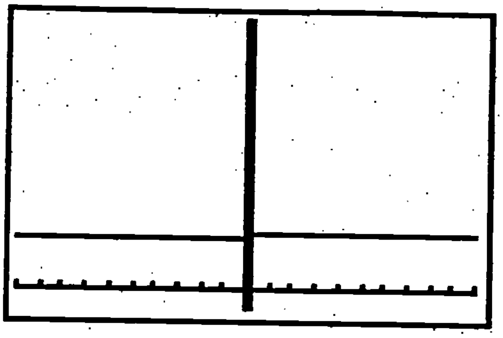


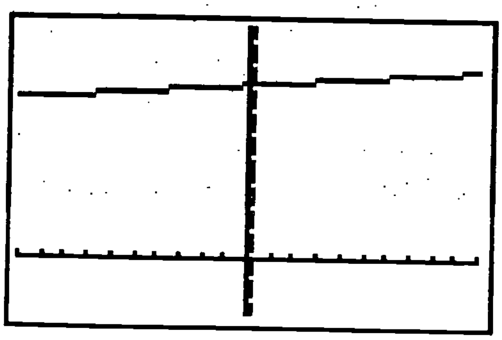
fig. 11



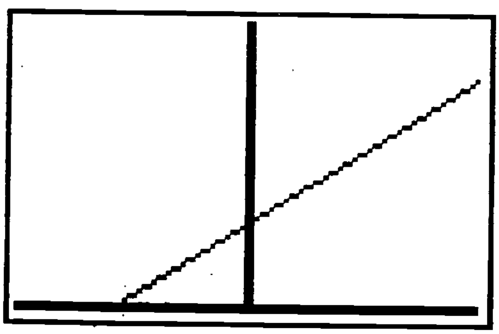
Consider the following four graphs. Although they appear very different, they are all graphs of the same linear function, $y = .25x + 30$. Their appearances have been altered simply by changing the viewing rectangle on the calculator. This effect could also be achieved with paper and pencil by altering the scaling on the two axes.



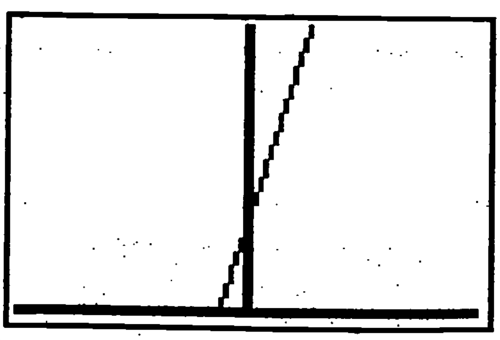
```
WINDOW
 Xmin=-10
 Xmax=10
 Xscl=1
 Ymin=-10
 Ymax=150
 Yscl=1
 Xres=1
```



```
WINDOW
 Xmin=-10
 Xmax=10
 Xscl=1
 Ymin=-10
 Ymax=40
 Yscl=1
 Xres=1
```



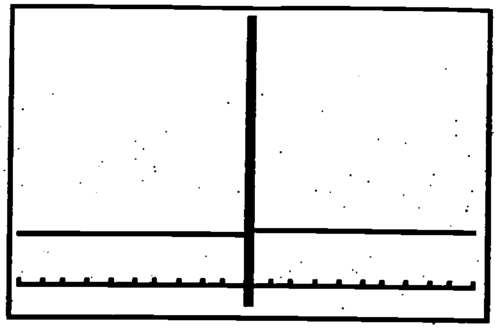
```
WINDOW
 Xmin=-200
 Xmax=200
 Xscl=1
 Ymin=0
 Ymax=100
 Yscl=1
 Xres=1
```



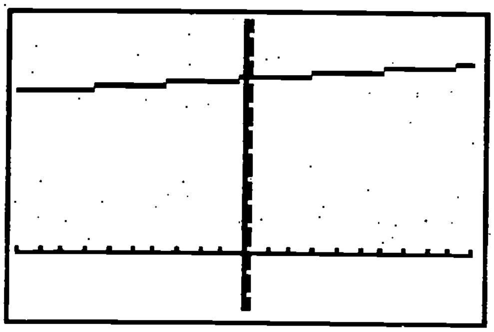
```
WINDOW
 Xmin=-1000
 Xmax=1000
 Xscl=1
 Ymin=0
 Ymax=100
 Yscl=1
 Xres=1
```

BEST COPY AVAILABLE

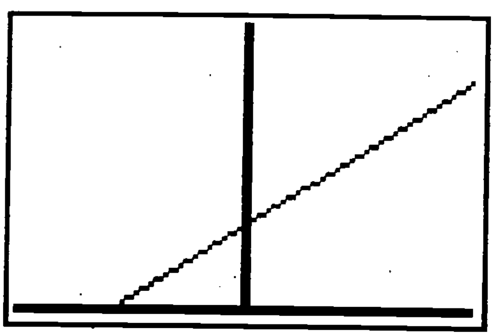
$$Y = .25x + 30$$



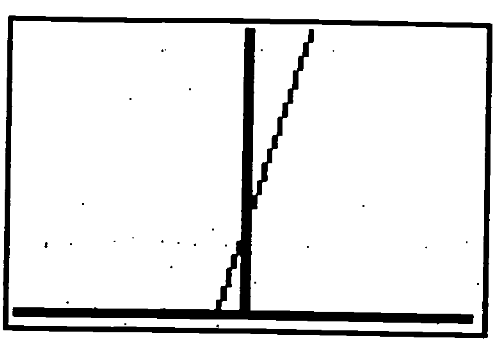
```
WINDOW
 Xmin=-10
 Xmax=10
 Xscl=1
 Ymin=-10
 Ymax=150
 Yscl=1
 Xres=1
```



```
WINDOW
 Xmin=-10
 Xmax=10
 Xscl=1
 Ymin=-10
 Ymax=40
 Yscl=1
 Xres=1
```



```
WINDOW
 Xmin=-200
 Xmax=200
 Xscl=1
 Ymin=0
 Ymax=100
 Yscl=1
 Xres=1
```



```
WINDOW
 Xmin=-1000
 Xmax=1000
 Xscl=1
 Ymin=0
 Ymax=100
 Yscl=1
 Xres=1
```


BEST COPY AVAILABLE

BEST COPY AVAILABLE

HAVING IT YOUR WAY: HOW TO USE STATISTICS CREATIVELY

GROUP ACTIVITY

Objectives:

1) To see how statistics can be slanted, so that you will be a more sophisticated consumer of statistics you will encounter.
2) To teach the principles of good statistical graphing by negative examples.
2) To reinforce the concepts of slope, rate of change, and scaling graphs.

Materials required:

For each group, 2 transparencies, pens, graph paper, data set, and calculator.

Procedure:

Your task is to construct the strongest possible case for two opposing points of view, using the same set of data. You must not "lie", but you may slant or misrepresent your data. You must construct a graph to support each point of view. You may use only numbers that are actually in the data set, but you are free to pick and choose the ones that best support your case. Prepare a short argument to support your case. Use rate of change between two appropriate endpoints as part of your discussion. Use "loaded" vocabulary. You may be outrageously biased, and you may commit sins of omission.

Prepare two transparencies showing your graphs. Choose two group members to make short presentations to the large group. The audience will decide who was most convincing.

BEST COPY AVAILABLE

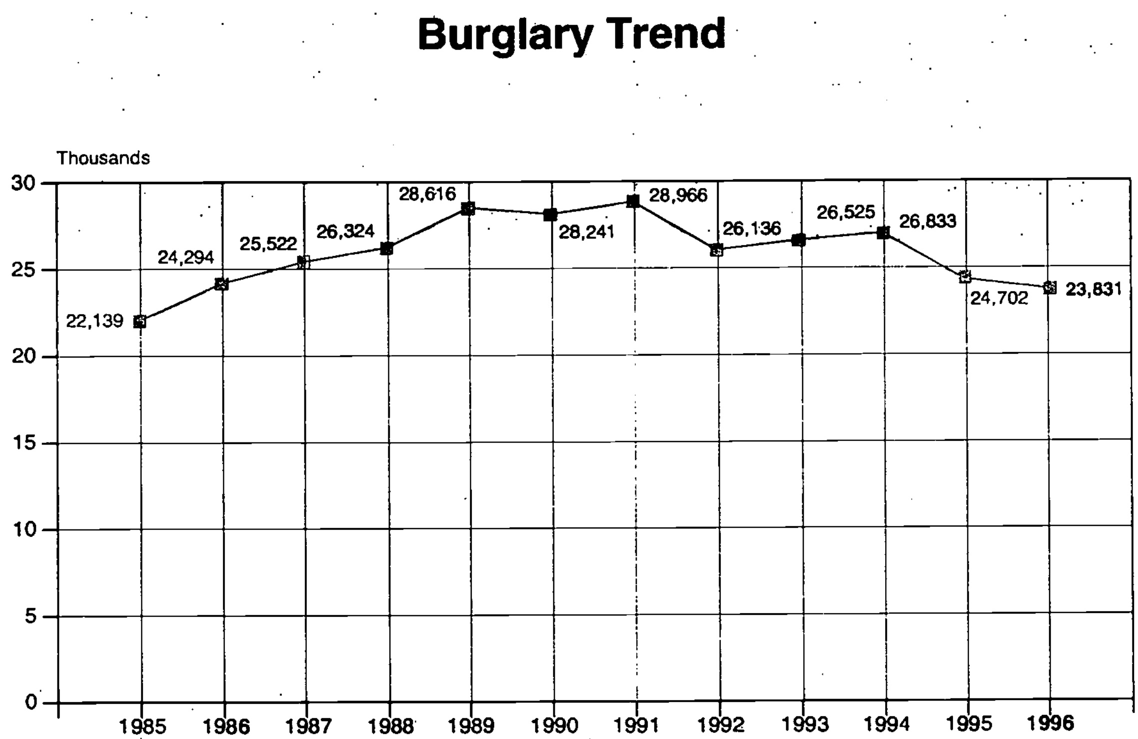
ERIC

BURGLARY TREND IN ARKANSAS

Source: Arkansas Crime Information Center
http://www.acic.org/

Using the information about burglaries in Arkansas over the last eleven years, your group must show:

1) Burglaries are increasing.
2) Burglaries are decreasing.



PUBLIC DEBT

Source: The Bureau of the Public Debt
http://www.public debt.treas.gov/opd/opd/.htm

year	Debt in billions of dollars
1968	358
1970	389
1972	449
1974	492
1976	654
1978	789
1980	930
1982	1,197
1984	1,663
1986	2,125
1988	2,602
1990	3,233
1992	4,065
1994	4,693
1996	5,225
1997 (so far)	5,427

Your group must show convincingly:

1) The public debt is rising catastrophically!
2) The public debt is rising very slowly.

DEATHS OF PERSONS WITH AIDS

Source: HIV/AIDS SURVEILLANCE REPORT, VOL. 9, NO. 1
Centers for Disease Control and Prevention, Atlanta Georgia
(Free copies available: 1-800-458-5231)

Year	Pediatric	Males	Females	Total
1991	390	31,900	4,250	36,600
1992	420	35,600	5,100	41,100
1993	530	38,100	6,000	44,600
1994	560	41,400	7,400	49,400
1995	530	42,000	8,100	50,700
1996	440	31,400	7,300	39,200

Note: "Pediatric" refers to children less than 13 years old. "Male" and "Female" refer to those 13 years old and older.

In your group, you must show:
1. AIDS deaths are falling dramatically.
2. AIDS deaths are increasing steadily.

FIREARM RELATED DEATHS IN GEORGIA

Source: Georgia Injury Mortality Statistics
http://www.cdc.gov/ncipc/osp/states

Year	Number of Deaths
1989	1,299
1990	1,284
1991	1,377
1992	1,242
1993	1,338
1994	1,271
1995	1,182

In your group, you must show:
1) Firearm related deaths are down.
2) Firarm related deaths are almost constant.

FERTILITY RATES FROM 1980 TO 1994

Source: Ventura SJ. Martin JA, Mathews TJ, Clarke SC. Advance report of final natality statistics, 1994. Monthly vital statistics report: vol 44 no 11, supp. p. 28. Hyattsville, Maryland: National Center for Health Statistics. 1996.

Internet: Data Warehouse

http://people. delphi.com/mickjyoung/statistics.html

Use this table to show:

1. The number of registered births of all races in the United States is decreasing dramatically.
2. The number of registered births of all races in the United States is increasing significantly.

Live births, birth rates, and fertility rates, by race: United States, specified years 1940-55 and each year, 1960-94

[Birth rates are live births per 1,000 population in specified group. Fertility rates per 1,000 women aged 15-44 years in specified group. Population enumerated as of April 1 for census years and estimated as of July 1 for all other years. Beginning with 1970, excludes births to nonresidents of the United States]

	Number					*Birth rate*				
Year	*All races*[1]	*White*	*Black*	*American Indian* [2]	*Asian or Pacific Islander*	*All races* [1]	*White*	*Black*	*American Indian* [2]	*Asian or Pacific Islander*
Registered births										
Race of mother:										
1994	3,952,767	3,121,004	636,391	37,740	157,632	15.2	14.4	19.5	17.1	17.5
1993	4,000,240	3,149,833	658,875	38,732	152,800	15.5	14.7	20.5	17.8	17.7
1992	4,065,014	3,201,678	673,633	39,453	150,250	15.9	15.0	21.3	18.4	18.0
1991	4,110,907	3,241,273	682,602	38,841	145,372	16.3	15.4	21.9	18.3	18.2
1990	4,158,212	3,290,273	684,336	39,051	141,635	16.7	15.8	22.4	18.9	19.0
1989	4,040,958	3,192,355	673,124	39,478	133,075	16.4	15.4	22.3	19.7	18.7
1988	3,909,510	3,102,083	638,562	37,088	129,035	16.0	15.0	21.5	19.3	19.2
1987	3,809,394	3,043,828	611,173	35,322	116,560	15.7	14.9	20.8	19.1	18.4
1986	3,756,547	3,019,175	592,910	34,169	107,797	15.6	14.8	20.5	19.2	18.0
1985	3,760,561	3,037,913	581,824	34,037	104,606	15.8	15.0	20.4	19.8	18.7
1984[3]	3,669,141	2,967,100	568,138	33,256	98,926	15.6	14.8	20.1	20.1	18.8
1983[3]	3,638,933	2,946,468	562,624	32,881	95,713	15.6	14.8	20.2	20.6	19.5
1982[3]	3,680,537	2,984,817	568,506	32,436	93,193	15.9	15.1	20.7	21.1	20.3
1981[3]	3,629,238	2,947,679	564,955	29,688	84,553	15.8	15.0	20.8	20.0	20.1
1980[3]	3,612,258	2,936,351	568,080	29,389	74,355	15.9	15.1	21.3	20.7	19.9

BEST COPY AVAILABLE

INTERNET SOURCES FOR DATA SETS:

Public Debt:

http://www.publicdebt.treas.gov/bpd/bpdhome.htm

Arkansas Crime Information Center:

http://www.acic.org/

State Injury Mortality Rates:

http://www.cdc.gov/ncipc/osp/states

Statistics and Research:

http://people.delphi.com/mickjyoung/statistics.html

Data Warehouse:

http://www.cdc.gov/nchswww/datawh/datawh.htm

BIBLIOGRAPHY

Helberg, Clay."Pitfalls of Data Analysis (or How to Avoid Lies and Damned Lies)", Internet Location: http://www.rdsu.wisc.edu/pitfalls/

Huff, Darrell. How to Lie With Statistics: W.W. Norton and Company,New York; 1954.

Kime, Linda and Clark, Judith. Explorations in College Algebra, Preliminary Edition: Wiley, 1997.

Oman, Noel E., "Traffic Deaths Rose on Higher-Speed Routes", Arkansas Democrat-Gazette, November 6, 1997.

Tufte, Edward R., The Visual Display of Quantitative Information: Graphics Press; Cheshire, Connecticut; 1983.

Will, George, "Speed Limits Up, Safety, Too", Arkansas Democrat-Gazette, November 6, 1997.

SE061243

ERIC

U.S. Department of Education
Office of Educational Research and Improvement (OERI)
National Library of Education (NLE)
Educational Resources Information Center (ERIC)

REPRODUCTION RELEASE

(Specific Document)

I. DOCUMENT IDENTIFICATION:

Title: Having IT YourWAY: How TO USE STATISTICS CREATIVELY

Author(s): Peggy Tibbs, Susan Jordan, Donna Sherrill

Corporate Source: ARKANSAS TECH UNIVERSITY

Publication Date: Nov. 14, 1997

II. REPRODUCTION RELEASE:

In order to disseminate as widely as possible timely and significant materials of interest to the educational community, documents announced in the monthly abstract journal of the ERIC system, *Resources in Education* (RIE), are usually made available to users in microfiche, reproduced paper copy, and electronic media, and sold through the ERIC Document Reproduction Service (EDRS). Credit is given to the source of each document, and, if reproduction release is granted, one of the following notices is affixed to the document.

If permission is granted to reproduce and disseminate the identified document, please CHECK ONE of the following three options and sign at the bottom of the page.

The sample sticker shown below will be affixed to all Level 1 documents	The sample sticker shown below will be affixed to all Level 2A documents	The sample sticker shown below will be affixed to all Level 2B documents
PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL HAS BEEN GRANTED BY Sample TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC) 1	PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL IN MICROFICHE, AND IN ELECTRONIC MEDIA FOR ERIC COLLECTION SUBSCRIBERS ONLY, HAS BEEN GRANTED BY Sample TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC) 2A	PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL IN MICROFICHE ONLY HAS BEEN GRANTED BY Sample TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC) 2B
Level 1 ☑	Level 2A ☐	Level 2B ☐
Check here for Level 1 release, permitting reproduction and dissemination in microfiche or other ERIC archival media (e.g., electronic) and paper copy.	Check here for Level 2A release, permitting reproduction and dissemination in microfiche and in electronic media for ERIC archival collection subscribers only	Check here for Level 2B release, permitting reproduction and dissemination in microfiche only

Documents will be processed as indicated provided reproduction quality permits.
If permission to reproduce is granted, but no box is checked, documents will be processed at Level 1.

I hereby grant to the Educational Resources Information Center (ERIC) nonexclusive permission to reproduce and disseminate this document as indicated above. Reproduction from the ERIC microfiche or electronic media by persons other than ERIC employees and its system contractors requires permission from the copyright holder. Exception is made for non-profit reproduction by libraries and other service agencies to satisfy information needs of educators in response to discrete inquiries.

Sign here, → please

Signature: Peggy Tibbs	Printed Name/Position/Title: PEGGY TIBBS - INSTRUCTOR
Organization/Address: Arkansas Tech University Russellville, AR 72801	Telephone: 501-964-0854 FAX:
	E-Mail Address: MAPT@ATUVM.ATU.EDU Date: 3/8/97

ERIC Full Text Provided by ERIC

III. DOCUMENT AVAILABILITY INFORMATION (FROM NON-ERIC SOURCE):

If permission to reproduce is not granted to ERIC, *or*, if you wish ERIC to cite the availability of the document from another source, please provide the following information regarding the availability of the document. (ERIC will not announce a document unless it is publicly available, and a dependable source can be specified. Contributors should also be aware that ERIC selection criteria are significantly more stringent for documents that cannot be made available through EDRS.)

Publisher/Distributor:
Address:
Price:

IV. REFERRAL OF ERIC TO COPYRIGHT/REPRODUCTION RIGHTS HOLDER:

If the right to grant this reproduction release is held by someone other than the addressee, please provide the appropriate name and address:

Name:
Address:

V. WHERE TO SEND THIS FORM:

Send this form to the following ERIC Clearinghouse:	Jonathan Kelly ERIC Clearinghouse for Community Colleges 3051 Moore Hall Box 951521 Los Angeles, CA 90095-1521

1997 AMATYC Conference
Nov 13-16, 1997
DeKalb College,
Atlanta, GA