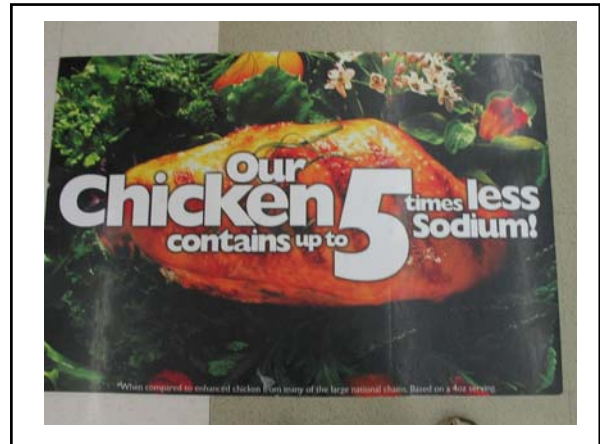


News Math: An Experimental Course

Bernard L. Madison
University of Arkansas

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| Item | First Class N=26 | Second Class N=35 | % correct | |
|------|---------------------|----------------------|-------------|----------|
| 1 | 24 | 23 | 77 | |
| 2 | 26 | 35 | 100 | |
| 3 | 14 | 8 | 36 | |
| 4 | 26 | 28 | 89 | |
| 5 | 6 | 4 | 16 | |
| 6 | 11 | 9 | 33 | |
| 7 | 21 | 12 | 54 | |
| 8 | 3 | 5 | 13 | |
| 9 | 5 | 4 | 15 | |
| 10 | 6 | 11 | 28 | |
| | | | Mean | |
| 11 | -9 | -11 | -0.33 | attitude |
| 12 | 8 | 1 | 0.15 | record |

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Information about Students

26 students in fall 2004
 40 students in spring 2005
 48 journalism majors
 18 others (English, political science, music, social work, etc.)
 8-10 honors students; some athletes; several who had multiple unsuccessful attempts in finite mathematics course
 17 freshmen; 6 sophomores; 15 juniors; 28 seniors
 All students had "credit" in college algebra - not much use.
 Grades in fall 2004: 12 A; 6 B; 4 C; 3 D; 1 W

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- ### Characteristics of the Course
- The primary source materials are newspaper and magazine articles that contain quantitative information and analyses.
 - Mathematics (including statistics, without saying it every time) is confronted, developed, and used as it occurs in the articles. The course is not organized by mathematical topics.
 - Mathematical concepts recur repeatedly, often cloaked in context dependent terminology.
 - Almost all the problems are ill defined in the sense that assumptions are made that are not specified in the articles.
 - Graphing calculators are used regularly.
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- ### Characteristics of the Course - Continued
- Estimation is often the most important lesson of problems.
 - Most exercises consist of gleaning information from the articles, formulating a mathematics problem, doing the mathematics, and reflecting the results back into the article.
 - Often, "doing the mathematics" is elementary.
 - Class sessions are casual and interactive. Students often work on group exercises. Every class begins with a discussion of quantitatively oriented newspaper or magazine articles that students have brought.
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Article Sources

- Regular articles, editorials, oped pieces, letters to the editor, columns, puzzles, etc.
- *NY Times, Washington Post, New Yorker, Lincoln (NE) Journal-Star, Arkansas Democrat-Gazette, Morning News of NWA, HortJournal, Better Investing, etc.*

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First Version of News Math Titles of Eleven Lessons

- Percent
- Petty thrift and buying stocks
- Condensed measures and indexes
- Lower math by Dave Barry
- Linear and exponential growth
- Measurement
- Visual representation of quantitative information
- Rates of change
- Weather maps and indexes
- The odds of that
- Risk

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Second Version of News Math

- Percent and percent change
- Linear and exponential growth
- Indices
- Graphical interpretation and production
- Counting
- Odds
- Risk
- Geometric measurement
- Weather maps and indexes

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Third Version of News Math

- Using numbers
- Percent and percent change
- Linear and exponential growth
 - Side trip into weighted averages
- Indices and condensed measures
- Graphical interpretation and production
- Counting
- Odds
- Risk
- Geometric measurement
- Weather maps, measurements and indices

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Class Activities

- News of the day
- Group (4's) class exercises
- Mathematical and statistical concepts
- Using calculator
- Homework
- Quizzes
- Two exams -- midterm and final

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Using numbers - sample

- Three bad numbers
 - DJIA
 - Unemployment rates
 - Batting averages

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Using numbers - sample

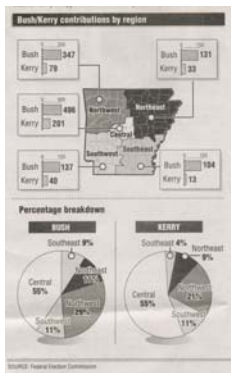
- **Numbed by the numbers - misuses**
 - Meaningless numbers stated to serve some particular purpose
 - Use or non-use of numbers that lack credibility
 - Flawed comparisons of numbers
 - Numbers without context
 - Numbers/statistics that have undeserved authority

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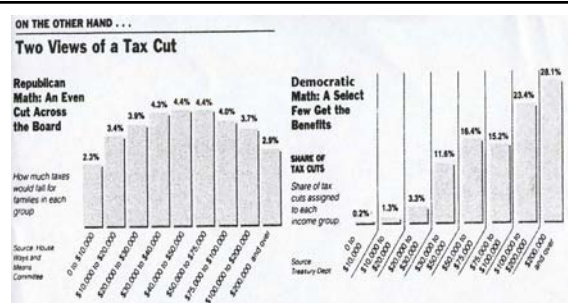


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- Sample tasks:
1. Can both of these views be correct? Explain.
 2. In each graph there is a "bar" over \$20,000 to \$30,000. Do these two bars represent the same quantity? Explain.

News Math

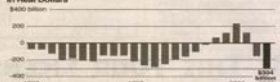
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GOP Disputes

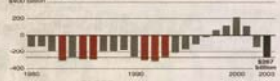
Vying To Set Deficit Record Straight

The \$324 billion budget deficit projected for the Bush administration for 2003 would be the largest ever. But Republicans are quick to point out the deficit would not be a record when adjusted for inflation or represented as a percentage of the gross domestic product.

Federal Budget Surpluses And Deficits In Real Dollars



In 1996 Dollars



As Percentages Of GDP



NOTE: All 2003 figures are based on projections.

SOURCE: Office of Management and Budget

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In this case:
 Democrats would support using present-day dollars.
 Republicans prefer to adjust the dollars by inflation or to use percent of GDP.

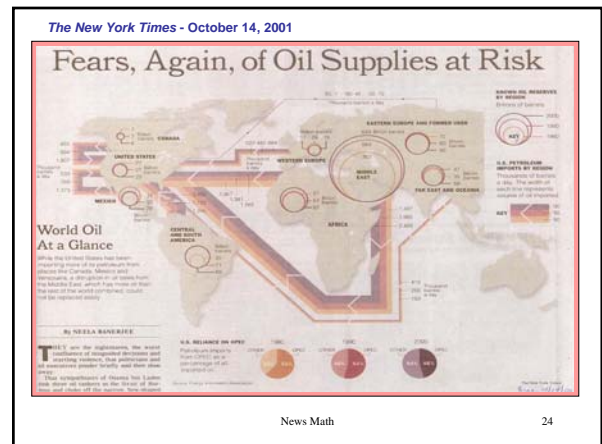
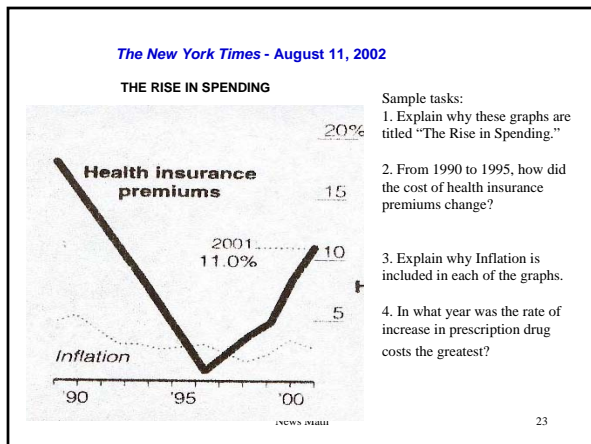
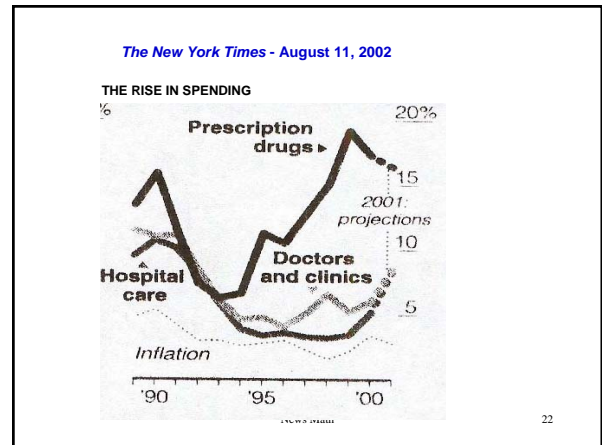
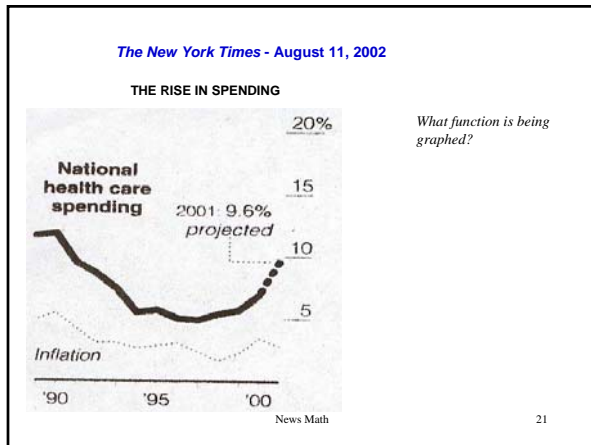
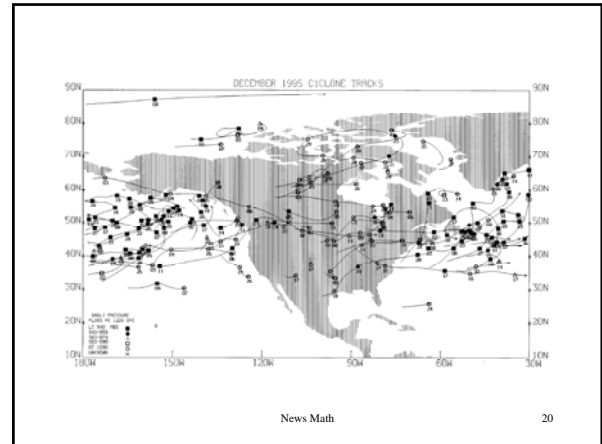
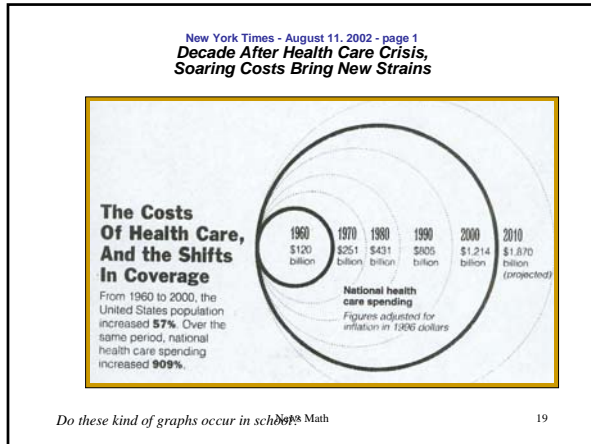


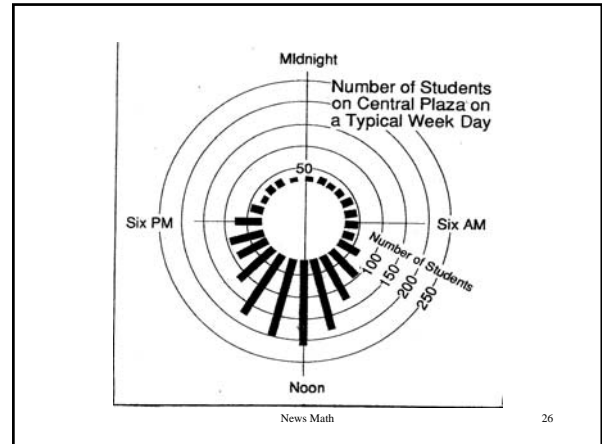
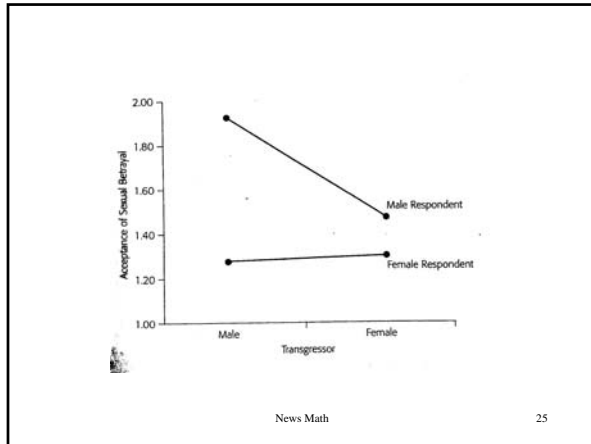
In this case:
 Conservatives prefer to use present-day dollars.

Liberals prefer to use percent of GDP.

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Headline: More Mothers of Babies Under 1 Are Staying Home

- Lead:** "...the percentage of women in the labor force who had babies under 1 declined last year."
- Graphic Header:** Fewer Mothers of Infants at Work
- Subhead:** The percentage of working mothers with babies decreased in 2000
- 2nd Para.:** "... report said 55% of women with infants were in the labor force in 2000 compared with 59% two years earlier." -- first decline since 1976.
- Later:** Of the mothers in the work force who had infants under 1, 34% worked full time, and 17% part time. Four percent were unemployed but wanted to work.

Tamar Lewin, *New York Times*, 11/2001 News Math 27

Math proves a point

A recent letter asserted that the Catholic Church did not have a problem with homosexual infiltration, but with pedophiles. The writer is misinformed. About 90 percent of the reported assaults have been against teen-aged boys. Pedophilia is before puberty; very few such cases have been reported.

If 20 percent of priests are homosexual and 90 percent of victims are teen-aged boys, these ratios can be mathematically represented by five hypothetical men, four heterosexual and one homosexual, who together make 100 attacks. The one homosexual will make 90 attacks, while the four heterosexuals combined make 10 attacks, or 2.5 attacks per heterosexual. Calculating $90/2.5$ shows that, based on information so far reported, homosexuals have a 36-times greater propensity to attack.

The actual percentages may vary slightly from these figures, but it is clear that homosexuals have a propensity to attack 30-40 times greater than do heterosexuals.

This has nothing to do with faith or whether one is comfortable about homosexuality. It is purely basic math.

Arkansas Democrat-Gazette -- May 27, 2002, Letter to the Editor

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Example 2.

Forgive your ancestors - *Arkansas Democrat-Gazette* 2002, Letter to the Editor

My children asked me how many ancestors and how many acts of these ancestors they are responsible for after reading and listening to the Razorbacks' coaching dilemma.

They have been taught that they are responsible for their own actions and sometimes the actions of their friends or even their parents. They just want to know how far this goes back.

My daughter had visited the slave ship exhibit at one of our downtown museums and recognized a family name as being a builder of slave ships back in the 1500s in Britain. She also knew that another relative brought six slaves over to Jamestown in the 1600s. How much was she going to have to pay in retribution? Was she the only one responsible or were there others?

Before this got even more out of hand, we decided to **do the math**. Assuming four generations per century and only one child per family, that would be 19 generations. Two to the power of 19 would be 524,288 people who shared the responsibility.

Then we started laughing at the total absurdity of the idea of one person today paying for the sins of another when there had been 524,288 people in between.

And that wasn't even counting brothers and sisters.

Conclusion: Get a life. Forgive and forget all 524,288 of them.

Sample tasks:

1. Explain how the writer can arrive at 524,288 "people in between" the slave-holding ancestor and her daughter.
2. Analyze this tree of ancestors and arrive at a different number of "people in between?"

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Changes in Pedagogy

- Mathematics should be encountered in many contexts such as political, economic, entertainment, health, historical, and scientific. Teachers will require broader knowledge of many of the contextual areas.
- Pedagogy is changed from presenting abstract (finished) mathematics and then applying the mathematics to developing or calling up the mathematics after looking at contextual problems first.
- Material is encountered as it is in the real world, unpredictably. Unless students have practice at dealing with quantitative material in this way they are unlikely to develop habits that allow them to understand and use the material. Productive disposition is critical for the students.

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Changes in Pedagogy

- Considerably less mathematics content is covered thoroughly.
- The mathematics used and learned is often elementary but the contexts are sophisticated.
- Technology – at least graphing calculators with CAS – is used to explore, compute, and visualize.
- QL topics must be encountered across the curriculum in a coordinated fashion. If I can coach writing then literature faculty can coach QL.
- An interactive classroom is important. Students must engage the material and practice retrieval in multiple contexts.

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Issues with Traditional Courses

- Emphases on components not processes
- Lack of mental constructs in lower level courses
- Lack of venues for continued practice beyond the course
- Not organized like the real world
- Tend to degenerate to methods and procedures
- Not enough ambiguity
- Not enough interpretation and reflection

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