

# *Vision - Potential*

*Vision Within Every Instructor – Potential Within Every Student*

Newsletter of the HBCU College Algebra Reform Consortium\*

Number 16, November 1998

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### [1] **Archimedes Text Sold for \$2 Million**

The New York Times on Friday, October 30, 1998 reported

“A scorched and moldy volume of thousand-year-old pages – the oldest surviving copy of important mathematical works of Archimedes – was sold at auction yesterday for \$2 million, double the expected price.”

Archimedes, killed by a Roman soldier in 212 B.C. during the sack of Syracuse, is considered the

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greatest mathematician of antiquity. Some of his works foreshadowed basic parts of the present-day calculus that were not formalized until over 1800 years later in the works of Newton (1642-1727) and Leibniz (1646-1716). His laws of flotation are instrumental in the design of ships as well as in the definition of specific gravity.

The book which is the oldest surviving copy of Archimedes mathematics is in palimpsest form. This means that the original text written in the 10th century was later washed off (in the 13th century) the sheepskin pages and the sheepskin reused for another text. The text was apparently lost in obscurity for hundreds of years, until it appeared on a catalogue of books in an ancient Greek monastery around 1900. Fortunately, enough of the original writing survived the washing to allow Heiberg to translate the original Greek work into English. This work, completed in 1906, warranted a front page story in the New York Times.

The book came into the possession of a French family in the early 1920s and “once again” was lost to scholars. In preparation for the recent sale, several pages were digitally scanned and then read under ultraviolet light. These technologies revealed several details that Heiberg was unable to see with the naked eye and a magnifying glass. The reconstruction of the text is only partially complete and some pages may be missing. Scholars are anxiously awaiting to see if the new owner, as yet unidenti-

fied, will allow access to the text for scholarly research.

[2]                   **Dear Mama, Daddy,  
                          and my dearest friend Kim**  
**Latonia Baker, Brandie Anderson,  
Jason Luckett, and Charla Wright  
Prairie View A & M University**

(The following letter was written as part of a small group project report. The project involved large numbers formed by doubling on a checkerboard. The particular question that prompted the following letter was: "Write a paragraph describing a creative way to help your parents and friends develop a sense of the comparative sizes of large magnitudes such as thousand, million, billion, etc.")

September 29, 1998

Dear Mama, Daddy, and my dearest friend Kim,

Hey, how are ya'll doing up North? I really miss you guys. Well, college is kind of hard, but I have learned so much. You wouldn't believe how much they use numbers in Texas. You wrote me in the last letter asking me to explain huge numbers to you. Let me share with you how much we use numbers.

Now I know I don't really have to tell you about the 100 dollars I sent you. Don't mistake it for 10 dollars, because 100 is 10x's that amount. It has two zeros. Did you know that we have the Texas Lotto twice a week? This week is the 1 million dollar drawing. \$1,000,000! Do you know how many zeros that is? 6 !!! And you would think that is the highest a number could go. Daddy with that money you can buy mommie fifty aprons and all the cookware in the world, so she can cook all day the way you want.

They are now having this big issue upon Bill Gates at P.V. He came to the campus and told us about the computer crash in the year 2000, and told us not to worry because the government is paying

him enough to solve this problem. Stacy, my crazy roommate, asked how much will they actually pay? He said, "Well, I guess I wouldn't mind telling you that I make 1 billion dollars a year." Mom, do you know how much that would be? Now, I know us Ohio people don't deal with numbers, so let me break it down. 1 billion dollars is 1,000,000,000 . . . nine zeros. Add three extra zeros. My goodness that's a lot of money.

Finally, today in economics class we were doing a project on national economics. Did you know we are a trillion dollars in debt? Now Kimmy, I know you haven't been throwing those pennies out on the street. We need to help the U.S. Do you know how many zeros that is? 1,000,000,000,000. That's twelve zeros, girl. If you save them pennies, we can save the earth by the time we're 200 years old. Get it 200, two zeros, man. I love numbers.

I guess, I shall end this letter and tell you how much of a good time I am having at P.V. Oh yeah, we won the first game last Saturday, out of 80 games. (That's one zero mama, we aren't that bad.) So I am gonna party all weekend. Tell my pet monkey I said, "Hi."

Love,  
Sandra

Editor's note: How many zeros in one quintillion?

### [3]   **Small Group: Counting Heart Beats**

(This is a 10 minute in-class, small group exercise.)

For reasons a heart would never understand, you and your true love part on New Year's Eve not to see each other until Valentine's Day. How many times will your heart beat during this separation? How many times has your heart beat in your life? How many times will your heart beat if you live until you are 90 years old?

### [4]                   **Insulating a Pipeline**

(This is a small group activity and writing assignment. Suggestion: let students, working in small

groups, begin this problem in class and then finish it along with the writing as a homework assignment.)

A local manufacturing plant needs to pipe temperature sensitive fluid between two buildings. You are called in to consult the management on how to do this in an economic manner. Having experienced the cool temperatures of an underground cave, you know something about the insulating factors of the ground. After a bit of study, you propose to bury the pipe in order to utilize the natural insulating factor of the soil rather than insulating an above ground pipe. Your model is

$$T(x, t) = T_0 + T_1 e^{-ax} \sin\left(\frac{2\pi}{365} - ax\right)$$

where  $T(x, t)$  represents the soil temperature in degrees Fahrenheit,  $x$  is the depth in feet,  $t$  is time measured in days,  $T_0$  is the base soil temperature, and  $T_1$  and  $a$  are positive constants determined by the soil conditions. Your study of the soil conditions, convince you that  $T_0 = 51$  degrees,  $T_1 = 10$ , and  $a = 0.2$ .

A 3-dimensional plot of your model looks like

The  $x$  direction is “coming out” of the page, the temperature is measured on the vertical axis, and the  $t$ -axis (time) is to the right (different scale).

The management team, after expressing its admiration of your expertise and insight into the problem, asks you to help them understand certain aspects

of the 3-dimensional plot and of the model. In particular, they ask you to

1. Provide graphs showing the temperature curve as the number of days goes from 0 to 365 for depth values: 0, 5, 10, 15. They would like to see the four plots separately and then superimposed on each other.
2. Determine the minimum (approximate) depth to bury the pipe if the temperature range is to be restricted to  $[50^0, 52^0]$ . (Note that a multiplot of the temperature when  $x = 10$  and when  $x = 15$  together with the lines  $T = 50$  and  $T = 52$ , show that  $x = 10$  is not deep enough and  $x = 15$  is too deep.)
3. Explain the physical significance of the  $e^{-ax}$  factor in the model.
4. Explain the physical significance of the term  $-ax$  in the expression  $\sin\left(\frac{2\pi}{365} - ax\right)$ . Hint: Plotting the temperature function for  $x = 5$  and for different values of  $a$  may indicate something about the physical significance of the  $-ax$  term.

## [5] Averages and Test Scores

(This is a small group, in-class activity)

Amy Lou is a member of a small honor’s class in mathematics whose entrance requirement is a commitment to prepare each assignment on time and to work each assigned exercise. The instructor often poses challenging questions for the students to think about between classes. One such problem follows

Suppose a class has ten students and each student scored 75 or 95 on the last test.

- a. What is the lowest possible class average if at least one student scored 75 and at least one student scored 95?

- b. What is the highest possible class average if at least one student scored 75 and at least one student scored 95?
- c. Could the class average have been 80? Explain your answer.

## Notices

1. The National Mathematics Meetings will be held January 13-16 in San Antonio, TX. Plan to attend and bring along a colleague or two. Some sessions of interest are:
  - a. General Marshall (Huston-Tillotson College) will be a panelist on the College Algebra Reform panel on Thursday afternoon.
  - b. Sarah Bush (Wiley College) and Gene Taylor (Grambling State Univ.) will hold a Poster Session on College Algebra Reform on Saturday morning.
  - c. Students from Texas Southern Univ. and Prairie View A&M Univ. will speak Thursday evening in the session on "Explorations in Using the World Wide Web to Enhance the Teaching of Mathematics."
2. There will be no Newsletter published in December. The Deadline for contributions to our January Newsletter is

Friday, January 8, 1999

Opinion articles, suggestions for writing assignments, small group in-class activities, small group out-of-class projects, Queries, CBL activities, announcements, and so on are all welcomed. Please send material to Dr. Della Bell, Chair, Dept. of Mathematics, Texas Southern University, 3100 Cleburne St., Houston, TX 77004.

4. To subscribe to this Newsletter, send your name and address to Dr. Della Bell, Department of Mathematics, Texas Southern University, 3100 Cleburne St., Houston, TX. 77004

## [6] ExCET Problem

The following problem was taken from ExCET (Examination for the Certification of Educators in Texas) Preparation Manuel, 17 Mathematics, Revised 1997.

When Eva was born, her grandparents established a certificate of deposit account and funded it with \$100. The account is dormant for 10 years, accruing interest compounded annually but receiving no additional deposits. The following plot shows the Total on Deposit (original deposit plus interest) for Years of Deposit. Your tasks are

- a. Determine the compound interest rate on this deposit to the nearest half per cent.
- b. Determine how many years it will take for the initial investment to double, triple, quadruple.