Vision - Potential

Vision Within Every Instructor - Potential Within Every Student

Newsletter of the HBCU College Algebra Reform Consortium*
Number 52, January 2004
www.ContemporaryCollegeAlgebra.org

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[1] Mathematics—Play or Work?

What is the difference between play and work? In general, the process of playing is more important than winning, even though people are playing to win. People play because they enjoy the process. On the other hand, it is usually the end result that is more important when people work. The enjoyment in work is often centered in completing the task or in the quality of the end result. How do we view teaching mathematics? Is it play or is it work? How do students view learning mathematics?

* Supported by the U.S. Military Academy, West Point, NY 10996

Think back to a time when you were six or seven and your Saturday morning task was to empty all of the wastebaskets. Can you remember expanding this fifteen minute task into an hour or more of contentiousness arguing with your Mom or Dad about why you should have to do all this work? Can you also remember occasions when your Mom or Dad turned emptying wastebaskets into a game and you did the fifteen minute task in ten minutes and enjoyed doing it? Is there a parallel to what happens in our classrooms? Are we so fixated on covering material that we turn learning into a chore? Might we and our students be better off if we attempted to cover less and enjoyed it more? Might our students actually learn more?

Extremes are usually bad in any situation. "All play and no work" and "all work and no play" may be equally poor strategies for learning. How can we achieve a balance?

[2] 5th Edition of *Contemporary College Algebra: Data, Functions, Modeling*

This new edition contains a section on optimization, a CD, new Fun Projects, several new exercises, and an Index. Also the revised text has been completely copy edited. The section on optimization reflects the growing impact of technology on the curriculum. Prior to the widespread use of graphing calculators, optimization was a central topic in Calculus I (single variable calculus). Today, optimization is a college algebra topic. Graphing calculators provide a graphical approach to approximating maximum and minimum values of a function as well as containing built-in programs for obtaining maximum and minimum values of a function.

The CD was created in conjunction with the Tietronix Software, Inc of Houston, TX. Thomas Dyson was the principle programmer and designer. The CD offers a multitude of interesting and realistic activities for each section of the text. A strong feature of the CD is its capability of "what-ifing" as most activities contain a "New Set" button that, when pressed, resets the parameters yielding a similar exercise of the same problem type.

Requests for examination copies should be made to Chris Bowie, McGraw-Hill representative at 800-228-0634 ext 2785 or by e-mail <christine_bowie@mcgraw-hill.com>. ISBN 0-07-2994061

[3] Small-Group Activity

How is the recommended length of a boot lace determined? In this activity, your group will use two different ways to model the length of a boot lace as a function of the number of pairs of eyelets in your boot and then will compare the results. The first model will be developed without benefit of data and thus the coefficients will be unknown, and the second model will be developed from data.

1. Develop a model for the desired length of a lace for a boot that has n pairs of eyelets, where n is greater than or equal to three.

   (a) Without doing any measuring, think about what type of function would provide an appropriate model.

   (b) Describe the physical significance of each of the coefficients in your model. (For example, what is the physical meaning of the constant term, the x-intercept, in terms of length of the lace.)

   (c) Explain your reasoning to the class.

2. Model the following data taken from a boot lace package. (Data supplied by John Maceli, Ithica College.)

Pairs of Eyelets	Length of Lace (cm)
3	61
4	69
5	91
6	102
7	114
8	137
9	160
10	183

3. Predict the length of a shoe lace needed for a boot with 12 eyelets.

4. Compare your models from Questions 1 and 2. If they agree, celebrate the wisdom and insight of your group. If the models differ, explain, in physical terms, the possible sources for the differences.

[4] A BIG Prime Number

Michael Shafer, a 26 year old graduate student in chemical engineering at Michigan State University, has discovered the largest known prime number. The number is $2^{20,996,011} - 1$ and when expanded is over 6.3 million digits long. (The previously largest known prime was $2^{13,466,917} - 1$ which is merely 4 million digits long when expanded.)

Prime numbers are positive integers whose only integer divisors are themselves and one. (For example, five is a prime number and eight is not.) Prime numbers act as building blocks for the natural numbers in the sense that every natural number is either a prime number or a composite number meaning it is a product of prime numbers.(Ten is a composite number as it is the product of the prime numbers two and five.) The study of prime numbers is one of the oldest studies in mathematics. For instance, the proof that there are infinitely many primes is attributed to the ancient Greets (ca. 300 BC) and Euclid is known to have studied primes of the form $2^p - 1$ where p is a prime. Today these are called Mersenne primes. Three and seven are Mersenne primes as $3 = 2^2 - 1$ and $7 = 2^3 - 1$. What is the next largest Mersenne prime? The abundance of small Mersenne primes is a bit misleading with respect to the density of these primes since this newest discovery is only the fortieth known Mersenne prime.

Part of the lure of prime numbers is that even though over 6,000 prime numbers are known, the distribution pattern of prime numbers through the natural numbers is not understood. Thus there is no formula for determining the next prime number. The Sieve of Eratosthenes is the most common approach used to determine small primes, those less than one million. In this approach, the integers are listed in their natural order. Then starting with the first number and working through the list, each prime and its multiples are eliminated. The numbers remaining are prime. For example, eliminating two (which is prime) and its multiples eliminates all of the even integers from the list.

Large prime numbers are used in public key cryptography. Security of a code depends, in part, on the difficulty of prime factorization of very large integers. The larger the prime numbers involved, the more difficult is the factorization, and thus the greater security of the encryption. There are several primes having a thousand digits, now there is one having over six million digits.

Activity. Use the Sieve of Eratosthenes to determine the prime numbers less than 100.

[5] Playing with a Function

(This problem was adapted from the "Sharing a Lifetime" problem in *Workshop Precalculus*, a text being written by Nancy Hastings and Allan Rossman.)

Ella met Louis when she was 18, spent her life with him until he died when she wass 68, and then lived 19 more years until her death at age 87.

a. Fill in the following table showing the number of years Ella spent with Louis and the percentage of years that Ella had spent with Louis at that age.

Age	Yrs.with Louis	% of Yrs. with Louis
20		
30		
40		
50		
60		
70		
80		
89		

Consider the function that maps Ella's age to the percentage of her life she had spent with Louis up to that time.

b. What is the domain of the function? What is the range?

c. Where is the function in Part b increasing? Decreasing?

d. Sketch the function.

e. Define this function with a piecewise formula with one piece modeling the increasing portion of the sketch and the other piece modeling the decreasing portion. (Let "a" denote Ella's age and "p(a)" denote the percentage of her life spent with Louis.)

[6] FedEx's Air Fleet

FedEx is one of the major package delivery services in the world with over 600 planes in its air fleet and over 70,000 trucks in its ground fleet. The result of the company's decision in the 1990s to expand its air operation is reflected in the following data.

Year	No. of Planes
1996	557
1997	584
1998	613
1999	634
2000	663

a. Use this data to form a scatterplot and then fit a line to the data. Explain how you determined the slope of the line?
b. Compute the equation of a line fitting the scatterplot by using the data for 1996 and 1998.
c. Compute the equation of a line fitting the scatterplot by using the data for 1997 and 1999.
d. Are the equations of the lines you computed in Parts a, b, and c different? If so, explain why you can have more than one line fitting a scatterplot and then, how you determine which line provides the "best fit".
e. Describe what you mean by "best fit".
f. Explain the physical meaning of the slope of the line in the context of the situation.

[7] Notices

1. The winter meeting of the Consortium of Tribal Colleges for College Algebra Reform will meet February 27-28, 2004 at Stone Child College, Box Elder, MT.

2. Deadline for contributions to the February Newsletter is Ground Hog Day, Monday, February 2, 2004. Opinion articles, suggestions for writing assignments, small group in-class activities, small group out-of-class projects, Queries, announcements, etc. are welcomed.

3. In ordr to subscribe to this Newsletter, write to Don Small, Dept.of Mathematics, U.S. Military Academy, West Point, NY 10996 or contact him via e-mail at don-small@usma.edu.

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Welcome to a new year, a new semester with high expectations, and opportunities to develop students into exploratory learners.