

Vision - Potential

Vision Within Every Instructor - Potential Within Every Student

Newsletter of the HBCU College Algebra Reform Consortium*
Number 48, April 2003

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accounting for grant funds, most of the Program's transactions involved Della "walking" requisitions through the "system" from one office to another, from one official to another. She then completed the process by writing a personal note to accompany the payment.

[1] **Thanks, Dr. Della Bell**

We offer our sincere thanks and appreciation to Dr. Della Bell for her work and counsel in guiding the HBCU Consortium for College Algebra Reform since its founding in 1996. She has been instrumental in securing funding for the program - four grants from the EXXON Education Foundation, multi-year grants from the National Science Foundation (NSF) and the Brown Foundation, and financial support from Project INTER-MATH through the U.S. Military Academy. When Della submits the final report to NSF this month, she will have accounted for every penny of our grant funds - no small task! In addition to the normal record keeping and

Della has organized numerous conferences, retreats, and faculty development workshops for the Consortium. In addition, she has effectively promoted the refocusing of college algebra at national mathematics meetings as a frequent panelist, organizer of poster sessions, and contributed talks. She represented the HBCU College Algebra Reform Project at the conference on *Rethinking the Preparation for Calculus* and participated in the West Point *Conference on Improving College Algebra*.

In the early years of the Consortium, Della often distributed calculators and textbooks to Coordinators. In fact, for the first year she copied the pages of the text at a Kinko's, assembled them into notebooks, and then

* Supported by the National Science Foundation and the U.S. Military Academy.

mailed them to the Coordinators. Della's attention to detail, her detailed record keeping will be sorely missed as well as will be her oversight of the production and distribution of the *Vision-Potential* Newsletter.

Della has facilitated a cultural change in her department at Texas Southern University. This is evident in the Contemporary College Algebra course, her introduction of technology for teaching mathematics, and in the level of cooperation with other departments. Of even greater importance, she has imbued her department with a strong concern and caring for the individual development of students.

Thanks Della for a job well done!

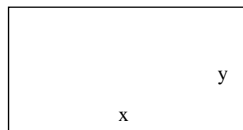
[2] Optimization Problems

Solving optimization problems used to require calculus. Now, however, optimization problems involving one independent variable are part of college algebra, thanks to modeling and graphing calculators. Several optimization problems consist of an **objective** function that involves the variable to be minimized or maximized and one or more **constraint** relations that establish the constraint(s) on the variables. We illustrate the modeling and solving of this type of problem.

Example. Find the dimensions of a rectangle with perimeter 100 m whose area is as large as possible.

Model.

Step 1. Sketch and label a picture. (Because both length and width of the rectangle may change, their lengths are labeled as variables.)



Step 2. Define variables:

x = length of rectangle in meters

y = width of rectangle in meters

A = area of rectangle in meters squared.

Step 3. State what is given and what the question is asking:

Perimeter, $P = 100$ meters

Find values for x and y that will maximize the area.

Step 4. Identify objective and constraint functions

Objective function: $A(x, y) = xy$

Constraint relation: $2x + 2y = 100$

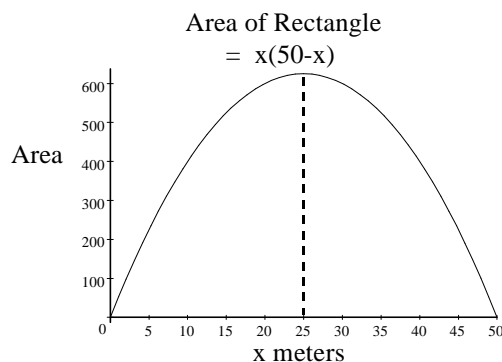
Solution.

Reduce the objective function to a function of a single variable by solving the constraint relation for one variable, say y , and then substituting into the objective function.

$$y = \frac{100-2x}{2} = 50 - x$$

$$A(x, 50 - x) = x(50 - x)$$

Plot the function and approximate the x and y coordinates of the highest point on the curve.



The maximum value occurs for $x = 25m$ and thus $y = 25m$. These are the dimensions of the rectangle with perimeter 100 meters having the maximum area.

Interpretation and Follow-on Questions.

Does the result imply that when a given length is divided into two lengths such that the product of the two lengths is a maximum, the two lengths must be equal? (Think of the two lengths as representing the sides of a square.)

If the problem were modified so that the area was fixed (rather than the perimeter), would the resulting rectangle still be a square?

Model, solve, and interpret the following exercise:

Consider a cardboard box with a square base and an open top that has a volume of $3,375 \text{ cm}^3$. Determine the dimensions of the box that minimizes the amount of cardboard used.

(Similar exercises can be found in calculus texts under applications of differentiation.)

[3] Age of Presidents

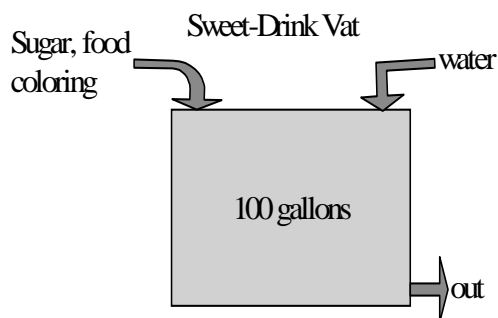
**Roosevelt Gentry
Jackson State University**

George Washington was born eleven years before Thomas Jefferson. In 1784, Washington's age was four years more than six times

the age of Jefferson in 1751. How old was each man in 1768?

[4] Mixing a Sweet Drink

A 100 gallon vat is used to make a sweet drink consisting of water, sugar, and food coloring. The vat is initially full of water (no sugar). Every 10 minutes 5 pounds of sugar plus some food coloring is added to the vat while 3 gallons of solution is removed to be bottled. Assume the solution is continuously stirred to produce a uniform concentration and a sufficient amount of water is added every 10 minutes to keep the vat full. How long will it take to stabilize the sugar concentration in the vat?



[5] Reasoning

On March 24, 2002, 46% of the televisions in the United States in use were tuned in to ABC's telecast of the Academy Awards. Meanwhile 12% of the American viewership watched the movie "Independence Day" on Fox. It is also estimated that 4% of the TV viewers that night watched both programs, thanks to their VCRs. Be careful not to double count in answering (a) and (b).

(a) What percentage of the television watchers viewed either the Academy Awards or “Independence Day“?

(b) What percent viewed only the Academy Awards?

[6] Dissemination Workshop

A three day Dissemination Workshop for the Contemporary College Algebra program will be held May 29-31, 2003 at Cy-Fair College Fairbanks Center, 14955 NW Freeway, Houston, TX. (Cy-Fair College is part of the North Harris Montgomery Community College District.) Laurette Foster and Don Small will be the facilitators. Activities will feature:

(a) Hands-on, small group activities and projects

(b) Use of the graphing calculator in teaching and learning college algebra

(c) Inclusion of elementary data analysis in college algebra

(d) Problem solving in the modeling sense

(e) Modeling using recursive sequences

Several discussions are planned for the workshop. A sampling of topics include the roll of college algebra in a student’s academic program; formulation of goals for a college algebra course; the national movement to refocus college algebra, and the use of technology.

All participant expenses will be paid by a grant to support the Contemporary College Algebra program. Further information can be obtained by contacting Lau-

rette Foster at Prairie View A&M University <Laurette_Foster@pvamu.edu>.

[7] Notices

1. PREP 2003 Programs of the MAA “INTEGRATING TECHNOLOGY INTO MATHEMATICS INSTRUCTION (A FOCUS ON PRECALCULUS/CALCULUS)” May 26-30, 2003, Houston Community College, Houston, TX, Jacqueline Brannon Giles (Organizer), Wade Ellis (Facilitator) Application materials available at <http://www.maa.org/prep>

2. Preliminary announcement: The fall Retreat for Contemporary College Algebra faculty will be held October 9-11, 2003.

3. Deadline for contributions to the September Newsletter is Monday, September 1, 2003. Opinion articles, suggestions for writing assignments, small group in-class activities, small group out-of-class projects, Queries, announcements, etc. are welcomed.

4. To subscribe to this Newsletter, write to Don Small, Dept. of Mathematics, U.S. Military Academy, West Point, NY 10996 or contact him via email at don-small@usma.edu.