Vision - Potential

Vision Within Every Instructor — Potential Within Every Student

Newsletter of the HBCU College Algebra Reform Consortium*

Number 21, September 1999

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[1] Vignette: Mae Jemison

The First African American Woman in Space

Dr. Mae Carol Jemison was born on October 17, 1956 in Decatur, Alabama. When very young, she and her family moved to Chicago. As a young child, she loved to work on school projects and spent many hours at the public library reading books about science and space. Her early fascination with space flights and Moon Landings sowed her future interest in becoming an astronaut. She had many other interests, including dance. By the time she entered high school, she was an accomplished dancer.

In 1973, Mae Jemison graduated from Chicago's Morgan Park High School where she had been an honor student and excelled in science and mathematics. She received her Bachelor of Science degree from Stanford University in 1977 in Chemical Engineering and Afro-American Studies. Four years later Mae Jemison graduated from Cornell University Medical College. During her years at Stanford and Cornell, she was very active in student organizations and served as president of the Cornell Chapter of the National Student Medical Association.

Mae Jemison served her internship at the Los Angeles County/University of Southern California Medical Center and then remained in Los Angeles to establish her medical practice. During 1983-85, Dr. Jemison served as a Peace Corps Medical Officer for Sierra Lione and Liberia where she was in charge of health care for all the Peace Corps Volunteers and U.S. Employees in these two countries. In 1985, she returned to her medical practice in Los Angeles.

Having never forgotten her fascination with space that was nurtured through the library books she had read as a child, she applied to the National Aeronautics and Space Administration to become an astronaut. In 1987 she was accepted into the program, only one of fifteen people chosen from nearly two thousand qualified applicants. Five years after joining NASA and undergoing extensive train-

* Supported by the EXXON Education Foundation and the U.S. Military Academy.

ing, Dr. Jemison fulfilled her childhood dream and became the First African-American woman to travel into space.

Dr. Mae Jemison made her historic flight on the Space Shuttle, Endeavor, on September 12, 1992. She was part of the seven-member crew of STS-47 that carried Spacelab-J into orbit on a joint venture for the United States and Japan. Over the course of the seven day mission, the crew lived and worked in Spacelab-J, conducting forty-three experiments, one of which was Dr. Jemison's experiment on the use of biofeedback techniques to reduce space sickness.

After the STS-J landed, Dr. Jemison returned to Chicago where eight-thousand school children attended her homecoming party and celebration. One of the many awards she received was the American Black Achievement Awards' Trailblazer Award for being the first African-American woman in space. In 1993, Dr. Jemison was inducted in the National Women's Hall of Fame in Seneca Falls, NY.

After the successful completion of STS-47, Dr. Jemison took a leave of absence from NASA in order to accept a fellowship to teach a course on Space Technology and Developing Countries at Dartmouth College in Hanover, NH. Her course attracted more women and minorities than any other undergraduate course in engineering in Dartmouth's history.

Dr. Jemison writes

> "My participation in the space shuttle mission, helps to say that all peoples of the world have astronomers, physicists, and explorers." Her message to young people is "Don't be limited by other's limited imaginations."

[2] Gauss and Triangular Numbers

Carl Friedrich Gauss (1777-1855) is often ranked with Archimedes and Newton as one of the three great mathematicians of all time. Legend has it that his genius was evident before he was three years old when he discovered an error in his father's weekly payroll calculations.

At the age of seven, Carl Friedrich started elementary school, and his potenital was noted almost immediately. His teacher, Buttner, and his assistant, Martin Bartels, were amazed when Gauss summed the integers from 1 to 100 instantly by spotting that the sum was 50 pairs of numbers each pairing to 101.

In order to illustrate Gauss' insight, we will apply his method to summing the integers from 1 to 5. Consider the following table. The first column contains the integers to be summed in their natural order. The second column contains the same integers, but in reverse order. The elements of the third column are the row sums of the first two columns.

1^{st}Col	2^{nd}Col	3^{rd}Col	1	5
1	5	6		
2	4	6		
3	3	6		
4	2	6		
5	1	6		

Because each entry in the 3^{rd} Col is 6 and there are 5 rows, the sum of the elements in the 3^{rd} is (5)(6)=30. This number must also be the sum of the elements in the first two columns. However, because these two columns contain the same numbers, 30 must be equal to two times the sum of the 1^{st} column. Thus the sum of the integers 1 to 5 is $\frac{30}{2} = 15$.

Generalize this illustration by answering the following questions.

a. Use Gauss's method to sum the first 10 integers.

b. Use Gauss's method to sum the first 100 integers.

c. Use Gauss's method to develop a formula for the sum of the first n integers.

d. Fill in the 2^{nd} column of the following table

n	Sum 1^{st} n integers
1	
2	
3	
4	
5	
6	

e. The numbers in the 2^{nd} column in Part d. are the first six elements of a sequence known by the Ancient Greeks as the Triangular Numbers. Explain why they were called this. (Hint: think bowling.)

f. How many triangles are in each of the following figures. (The second figure contains 3 triangles.)

g. For the above sequence of triangles, what is the relation between the number of segments in the base of a triangle and the number of triangles contained in the triangle?

h. If everyone in a group of n people shakes hands with everyone else in the group, how many handshakes will occur? Is this number related to a triangular number?

[3] Cutting Clapboards

Clapboards are used for siding on many houses. A standard clapboard is five and one half inches wide and tapers from 3/16 of an inch on the thin edge to 1/2 an inch on the thick edge. Last summer, Bob Small decided to honor one of his long time Scouting friends, Chip House, by volunteering to saw out the lumber needed to construct a building at Chip's Scout Camp. Bob has his own sawmill where he does custom sawing for his friends. He decided to make extra heavy clapboards for Chip's building, cutting them 8 inches wide and 1 inch thick on the thick edge. The clapboards are to be overlapped so that 6 inches of each board shows to the weather. Bob's problem, which is now your problem, is how thick should the clapboard be on the thin edge?

The bottom clapboard must fit tight against the side of the building with the tapered side out. Succeeding clapboards must be placed so that each lies smoothly on the preceeding one, shows 6 inches to the weather, and has the thin edge resting firmly against the side of the building. The following diagram shows a cross section of a clapboard wall (the wall is shown lying horizontally in order to conserve picture space). Let x denote the thickness of the thin edge.

Hint: The line through points A and C must have the same slope as the line through points B and D. Compute the distance of C from the wall.

[4] Mathematical Analysis of a Poem

One way of mathematically analyzing a poem is to count the number of letters in each word and then form a number by writing down the number of letters in the first word, followed by the number of letters in the second word, followed by the number of letters in the third word, and so on. Using this method, mathematically analyze the following poem to determine what Joseph Shipley was thinking about when he wrote it in 1960.

> But a time I spent wandering in bloomy night; Yon tower, tinkling chimewise,

loftily opportune. Out, up, and together came sudden to Sunday rite. The one solemnly off to correct plenilune.

[5] Displaying Data

The data for the following two exercises was taken from the August 27, 1999 Almanac Issue of The Chronicle of Higher Education.

A. The degrees conferred on African Americans in the 1995-96 year are listed by category in the following table.

Category	No. Degrees	*Percentage*
Associate	50,927	
Bachelor	89,264	
Master	662	
Doctorate	1,563	
Professional	4,913	

   a. Fill in the Percentage column.

   b. Display this data in a pie chart.

   c. Display this data in a bar chart.

   d. Would it make sense to display this data with a scatter plot or a line plot? Explain.

   e. Decide which is the best way to display this data. Describe your reasoning.

B. The average cost for a student to attend a four year, public college for the school year 1998-99 is reported to be $10,458. A breakdown of this cost is shown in the following pie chart.

Using the information in the pie chart, fill in the following table.

Category	Amount
Tuition and Fees	
Books and Supplies	
Room and Board	
Transportation	
Other	

[6] Notices

1. The Fourth Annual Retreat of the HBCU College Algebra Reform Consortium will be held September 30-October 2, 1999 at Wiley College, Marshall, Texas.

2. The next issue of *Vision-Potential* Newsletter will appear in September. The Deadline for contributions to the October Newsletter is

   Monday, October 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.

3. The AMATYC 25^{th} Annual Meeting will be held in Pittsburgh, PA, November 18-21, 1999. Jackie Giles and Don Small will present a 4 hr. workshop: "Contemporary College Algebra: A Reformed Program."

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

clapboards

wall

A

B

C D