

MPI

The Mathematics and Physics Institute NEWSLETTER

Director: Richard Waring
Mathematics Coordinator: Richard Delaware

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YEAR 5 THE ELECTION, THE OLYMPICS, AND NOT LEAST OF ALL, US!

In this memorable year of a presidential election, the summer Olympics in Seoul, and the return of the Space Shuttle, it is equally exciting for us to realize that at the end of this our fifth year our first class of MPI students will be graduating from college. In all the feedback we have received from former students and their parents, we are happily forced to conclude that this MPI 'experiment' over the last four years has been a clear success. In spite of the ongoing difficulties in funding this program, we are pleased that we have been able to maintain a high level of instruction, and perhaps laid a firmer foundation for our students' future studies.

We hope that all of our former students will continue to apprise us of their progress, as well as send us comments directed toward improving the program. (We will print selections of those comments here as we receive them.) But of course, much of our success must be credited to all the high school teachers who have participated in the program, especially those five (listed below in this newsletter) who have been with us all four years. Not only are they all excellent teachers (there is one Presidential Award winner among them, and another finalist who will hear whether he has won or lost in early October), but they have never hesitated to make suggestions and freely give that creative criticism which is absolutely necessary to keep any

program fresh and focused. To them again we say: Thanks.

Now, on with the year!

STUDENT ORIENTATION

SEPT. 7 - 9, 1988

Each year the first three days at the Institute are spent in giving our students an overview of how we operate, a discussion of our policies on attendance, grading, etc., and two diagnostic tests. Time is then set aside for the instructors to informally 'get to know' their classes before we all become preoccupied with classwork.

In particular, on the first day, Sept. 7, 1988, we'll provide each student with a packet of information and have each of them fill out a personal data form. This last requires that all students bring with them the following information:

Social Security Number.

Daily Schedule of High School Classes.

Schedule of Extracurricular Activities.

High School Counselor's Name.

Car License Number, Make and, Model for those ever planning to drive to the Institute.

Ideas for Enrichment Speaker topics.

Otherwise, we look forward to seeing our newest class on Wed. Sept. 7!

We also honored the TOP TEN students (ranked according to their composite calculus and physics grade point averages) by giving them a useful CRC science and mathematics reference book:

THE 1988 MPI AWARDS PRESENTATION

THE TOP 10 MPI STUDENTS OF 1987-88

Our final awards presentation was held on May 20, 1988, during which we were pleased to present many of our 1987-88 students with the following variety of awards:

Certificates for Outstanding Achievement (college grade of A or B) in:

CALCULUS I

(Name)	(School)
Ryan Baker	Truman
John Carmack	Raytown South
Reese Isbell	Van Horn
Michele Kliebert	Van Horn
Sean Mohn	William Chrisman
Nate Moore	William Chrisman
Charly Pine	William Chrisman
Jason Stabenow	Fort Osage
Duc Tran	East
Kim Wehmeyer	Fort Osage
Vanessa White	William Chrisman

CALCULUS I and II

Hien Tran	Northeast
Jeremy White	Truman

PHYSICS

Ryan Baker	Truman
Mike Horak	Raytown
Reese Isbell	Van Horn
Michele Kliebert	Van Horn
Teng Meng	Northeast
Chris Nielson	Truman
Jason Stabenow	Fort Osage
Duc Tran	East
Hien Tran	Northeast
Kim Wehmeyer	Fort Osage
Jeremy White	Truman

TOP 10 MPI STUDENTS 1987-88

1) Hien Tran	Northeast
2) Jeremy White	Truman
3) Duc Tran	East
4) Ryan Baker	Truman
5) Michele Kliebert	Van Horn
6) Vanessa White	Wm Chrisman
7) Reese Isbell	Van Horn
8) Nate Moore	Wm Chrisman
9) Jason Stabenow	Fort Osage
10) Teng Meng	Northeast

Finally, we list here those MPI students planning to attend UMKC who received various scholarships from UMKC; included here are those students to whom the MPI awarded Chancellor's Awards:

UMKC Scholar's Award Winners:

Ryan Baker	Truman
Reese Isbell	Van Horn
Hien Tran	Northeast

UMKC Chancellor's Award Winners:

Michele Kliebert	Van Horn
Teng Meng	Northeast
Duc Tran	East
Beth VanDierendonk	Northeast
Wendy Wilhelm	Fort Osage

UMKC Curators' Award Winners:

Reese Isbell	Van Horn
Cyndi Kleeman	Van Horn
Michele Kliebert	Van Horn
Sean Mohn	Wm Chrisman
Charly Pine	Wm Chrisman
Jason Stabenow	Fort Osage
Hien Tran	Northeast
Vanessa White	Wm Chrisman

THIS YEAR'S (TENTATIVE) CLASS

Section D

Section A

David Bush	Northeast
Melissa Chance	Wm Chrisman
Marc Compton	East
Hang Du	Northeast
Jon Fox	Fort Osage
Steven Gray	Van Horn
Jeff Grimes	Wm Chrisman
Angel Kelly	Fort Osage
Brian Lacher	Wm Chrisman
Rachel Mack	Truman
Tang Nguyen	Northeast
Dung Pham	Northeast
Tammy Phelps	Wm Chrisman
Jeff Reed	Wm Chrisman
David Roller	Truman
Brian Somers	Fort Osage
Quang Thanh Ta	Northeast
Jack Williams	Truman

Russell Browning	Fort Osage
Sean Combs	Fort Osage
Kevin Crosby	Wm Chrisman
Ngoc Doan	Northeast
Brian Edgar	Van Horn
Jesse Hafemeister	Fort Osage
Lyle Harris	Van Horn
Dean Keeling	Wm Chrisman
Audrey Linville	Fort Osage
Jon Morgan	Wm Chrisman
Tuan Nguyen	Northeast
Erica Olson	Northeast
Tri Pham	Northeast
Rashanda Rhodes	Van Horn
Jennifer Rondonanski	Wm Chrisman
Adam Skinner	Truman
Thaison Tran	Northeast
Patrick Windes	Wm Chrisman

Section B

Lane Butts	Wm Chrisman
Gary Ewer	Wm Chrisman
James Hitchcock	Wm Chrisman
Stephanie Holst	Northeast
Brian Kelsay	Truman
Steve Kuhn	Truman
Andrea Linville	Fort Osage
Diana McManigal	Fort Osage
Seth McMenemy	Truman
Ryun Middleton	Northeast
Todd Myers	Wm Chrisman
Loan Nguyen	Northeast
Van Phung	Northeast
Rodney Reed	Fort Osage
Cindy Roby	Wm Chrisman
Candi Smith	Van Horn
David Starr	Truman
Anthony Thornton	Van Horn

These are the total of 60 students (as of this newsletter) who will be enrolled. As usual there will be additions and deletions through September.

THE 1988-89 STAFF

Our staff once again includes those high school teacher veterans of the past four years:

In Physics,

Larry Harding from Fort Osage,
Calvin Nelson from Northeast,

and, in Calculus,

Sheri Adams from Truman,
Joe Kaifes from Van Horn,
& Al Morse from Wm Chrisman,

Section C
(Calculus I and II)

Anthony Aguilera	Fort Osage
Evan Carpenter	Truman
Jeff Coleman	Truman
Chad Morley	Truman
Huong Nguyen	Northeast
Mike Schmidt	Wm Chrisman

while our University staff is listed above in the heading of this newsletter. We should also mention our invaluable, but lamentably only half-time secretary and versatile assistant Gwen Morlang, without whom we would creak to a halt in short order.

UPCOMING ENRICHMENTS

One of the special features of the Institute is its biweekly enrichment series, in which on alternate Wednesdays either professionals in the sciences, engineering, mathematics, etc., speak to our MPI students, or, we have a field trip to such places as the nuclear reactor in Columbia, the GM Fairfax plant, or Worlds of Fun to do some 'hands on' physics.

The October 1 newsletter will report on those speakers scheduled for October and beyond. But as part of our first three days of orientation Dr. Mary Guttmacher of UMKC will speak on Fri. Sept. 9 about college admissions in general, and the importance of thinking about applications EARLY. (This is not intended to be a recruitment for UMKC, but a general discussion to help sensitize our students to the importance for colleges of deadlines.)

During the first two weeks of classes at the MPI we will also spend two days discussing four topics which we have come to believe are vital study and college survival skills that are too often not directly addressed. Specifically, these are: NOTE-TAKING, TEST-TAKING, READING A TEXTBOOK, and lastly, and perhaps most importantly, TIME MANAGEMENT. These sessions will be jointly presented by Kit Gordy from UMKC's Academic Support Services, and the MPI mathematics coordinator.

Then, on Sept. 28, our first 'regular' enrichment Wednesday of the year, we hope to have Dr. Wai Kim Ching of the UMKC Physics Dept. to update us on the the blitzkrieg pace of current superconductor research.

TO THE PARENTS OF THE 1988-89

CLASS AT THE INSTITUTE

[Reprinted in part from the August 1, 1987 newsletter.]

This newsletter is written for your information, and there will be one sent to you every two months during this year while your son or daughter is at the Institute.

We firmly believe that without your support and concern at home students cannot succeed in such a rigorous program as the MPI. Our classes are NOT high school classes -- they are regular college classes, and require both study skills and a commitment that students still in high school, however talented, have not experienced before. In both of these areas YOU as parents can be of enormous help.

One of the first facts we have learned to face in the last four years is that many bright students never learn to study efficiently; they have often gotten along very well with a 'wait and cram' attitude, giving textbooks only an occasional cursory look in time for testing, and relying on their innate ability to absorb information and skills in the classroom. However, in coming to the Institute these same students always find themselves at first, and suddenly, falling behind.

In general, in college classes MORE MATERIAL is covered, and MORE SKILL with concepts is required, i.e., THINKING is expected regularly. This comes as a shock to many talented students. One of the Institute's goals is to expose students to this shock, and help them overcome it by learning effective study skills in actual

practice. But YOU as parents can help this transition enormously, by suggesting that your children actually spend the minimum of one hour per subject, per night of study that we here at the MPI urge. They must come to realize that longer study times reflect the new rigor of the COURSES, not their lack of talent. This is a point of view that many students find hard to accept at first. Your encouragement can help them over this hump. Encourage them to seek the help of all the teachers involved in the program, and to put aside the false idea that only remedial students need to TALK about mathematics and physics. The fact is that true understanding comes only from learning to discuss and explain a subject, and this is ESPECIALLY SO in physics and mathematics.

Finally, we urge you to call us if you ever have a question, and we hope that you will find time to visit the Institute during our annual OPEN HOUSE on Sunday afternoon, November 6, 1988. (More about this in the October newsletter.)

MATHEMATICS AND SCIENCE VIDEOTAPES
 -- A LISTING --

As many of you know due to a grant (and its renewal) from the Missouri Coordinating Board for Higher Education we have nearly 16 videotapes of speakers presenting talks devoted to mathematics or science. We thought it might be helpful to list those currently, and those soon to be available to high schools for copying free of charge. The speakers include internationally known figures in mathematics and physics, as well as an astronaut and other experts:

- 1) Arithmetic Mean, Geometric Mean, and Doing Without the Calculus
- 2) What is Life Without Polyhedra?
- 3) The Harmonic Series
- 4) The NASA Space Shuttle Program
- 5) The Space Shuttle: Questions and Answers
- 6) The Manned Space Program: Past, Present and Future
- 7) Radiation Properties
- 8) Laboratory Studies of Interstellar Dust
- 9) Dioxin and the EPA
- 10) and 11) Pascal's Hexagon
- 12) The US Space Program and Space Law
- 13) The Bat - Strange Creature of the Night
- 14) Interesting and Weird Mathematicians
- 15) AIDS
- 16) Current Research in Superconductors

If any of these titles interest you, please call the MPI at 276-1272 for information on getting your own copies, once again, free of charge!

MPI T-SHIRTS

Beginning in about October, we will once again be selling our bright blue MPI T-shirts and sweatshirts to our students. These shirts have a classy 3D graph on the back and a clever student-designed logo on the left front.

MPI CALENDAR -- 1988-89

Institute Begins	September 7, 1988
Mid - Quarter 1 Progress Reports Sent	October 7, 1988
1st Quarter Grade Reports Sent	November 4, 1988
MPI OPEN HOUSE for Parents/Teachers/Etc.	November 6, 1988
Thanksgiving Holiday	November 24-25, 1988
Mid - Quarter 2 Progress Reports Sent	December 2, 1988
Institute Christmas Party	December 16, 1988
Christmas Holiday	December 17, 1988 -- January 2, 1989
Institute Classes Resume	January 3, 1989
College Credit WD Deadline (Math C only)	January 13, 1989
Martin Luther King Holiday	January 16, 1989
Final Exam -- Calculus I (Math C only)	January 17, 1989
Deadline for Transfer from Math C to Math A,B,D & Quarter 2/ Semester 1 Grade Reports Sent	January 20, 1989
Presidents' Day Holiday	February 20, 1989
Mid - Quarter 3 Progress Reports Sent	February 24, 1989
3rd Quarter Grade Reports Sent	March 31, 1989
High School Credit WD Deadline (A,B,C,D) & College Credit WD Deadline (A,B,C,D)	March 31, 1989
MPI Spring Break	March 23 - March 28, 1989
Institute Classes Resume	March 29, 1989
Mid - Quarter 4 Progress Reports Sent	April 28, 1989
Final Exams -- Calculus I (A,B,D) Calculus II (Math C only)	May 23, 1989
Final Exam -- Physics (A,B,C,D)	May 24, 1989
MPI Picnic Breakfast (McCoy Park)	May 25, 1989
MPI Awards Presentation (UMKC Truman Campus)	May 26, 1989
Last Day of Institute Classes & Quarter 4/ Semester 2 Grade Reports Sent	May 26, 1989

LETTERS FROM FORMER MPI STUDENTS

From JASON STONER (MPI 85-86):

Feb. 5, 1988

"As a second year student at the UMKC Medical School, I am continually reminded of the benefits I received from attending the Mathematics and Physics Institute... From my first semester as a medical student I found myself ahead of other classmates. My semester of Physics earned at the Institute has allowed me to pursue a double major in Chemistry/Biology. Many of my colleagues are unable to seek a double major similar to mine primarily because the problems of taking a rigorous course such as Physics along with an already demanding class schedule... My credits earned in Calculus may be the most important hours I took from the Institute... The Institute allowed me to widen my scope of study...

Outside of the college credit earned, the Institute prepared me to make the adjustment from high school student to college student. Courses at the Institute taught me hard lessons early regarding good study habits -- studying every night became a must.... Having met the challenge and made the necessary changes before entering college, the transition to full-time college student was made more easily... The Institute provided me an opportunity to get the 'bugs' worked out and form good habits. The more time I spend in college the more I truly begin to realize the importance of the time spent at the Institute.

I highly recommend the Institute for anyone who is serious about having a successful college experience."

From SHAUNDA WYATT (MPI 84-85):

Jan. 18, 1988

"Hi Everybody! I'm sorry I missed you all this year. [i.e., the annual MPI panel discussion with former students. ed.] I forfeited my Christmas break to take a 'Cultural Study Tour' in Asia! My chemistry professor is Indian, and he took a group of students to Asia for 25 days! We went to Taiwan (5 days) and saw the entire west coast; Calcutta, Durgapur (an Indian village) and New Delhi in India (14 days), and Bangkok, Thailand (5 days)... Some of the highlights included: interaction with natives from every country we visited (a lot of super wonderful people - we made some good friends!); a short visit with Mother Teresa in Calcutta; a day at the Taj Mahal and surrounding areas; a lot of great shopping everywhere - it was especially fun haggling the prices. It wasn't all paradise - India is a very overpopulated and dirty country - but it was a very good and memorable experience. I do hope to go back someday!...

I am taking a double major in Biology and Psychology and a minor in Chemistry, and yes, I WILL graduate in 4 years... So you can see my days are quite busy. I'm not sure what I'm going to do when I graduate, but I am seriously considering graduate psychology.."

Re: SUN HWA KIM (MPI 85-86).

From the K.C. Mo. 'District Report' of Dec. 1987:

"...Sun has a vivid remembrance of that mid-September day in 1985 when she met Mr. Kaifes, a teacher at Van Horn High School for 28 years [and at the MPI for the last 4 years], and

when she was accepted two weeks later in the [MPI] program... Due to her arrival time in the United States, the native born Korean relates 'Already I was about a month behind other students...' However, both Kaifes and his former student agree that a great aid to her overcoming the language barrier was the combination of English tutelage and support she received from fellow classmates during that time. Kaifes said, 'Every student enrolled in the program was there to learn, but what was impressive to me was, the teamwork attitude to help Sun understand English brought all of us closer together.'...

Sun says the transition to college studies was easier because of the level of course work she did in the program." [Sun is currently an Electrical Engineering major at UMKC.]

A SOLUTION TO
MATHEMATICS CHALLENGE # 5

Recall the problem statement:

Prove that:

$$\frac{1+3+\dots+(2n-1)}{n} > \sqrt[n]{1 \cdot 3 \cdot 5 \cdot 7 \cdot \dots \cdot (2n-1)},$$

for all positive integers $n \geq 2$.

SOLUTION:

Our solution is a direct application of the famous Arithmetic - Geometric Mean (A-G) Inequality, which states that if a_1, a_2, \dots, a_n are n real numbers, where $n \geq 1$, then:

$$\frac{a_1 + \dots + a_n}{n} \geq \sqrt[n]{a_1 \cdot \dots \cdot a_n}.$$

If we take the a_i 's to be the odd numbers in the statement of our problem, the inequality gives:

$$\frac{1+3+\dots+(2n-1)}{n} > \sqrt[n]{1 \cdot 3 \cdot \dots \cdot (2n-1)}.$$

NOTE: The inequality above is STRICT since the A-G Inequality attains equality only when all n numbers are equal.

Now, it can easily be proven, using Mathematical Induction for instance, that the numerator on the left above adds up to n^2 . So the left side reduces to simply n , and the inequality becomes:

$$n > \sqrt[n]{1 \cdot 3 \cdot \dots \cdot (2n-1)}.$$

Finally, raising both sides here to the n th power yields our solution.

MATHEMATICS CHALLENGE #6

If A and B are integers, when will the expression

$$\frac{A}{B} + \frac{B}{A}$$

also be an integer?

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The MPI Newsletter is published five times a year on the first of the month during the months of August, October, December, February, and April at The Mathematics and Physics Institute, 600 W. Mechanic, Independence, Mo. 64050, phone (816) 276-1272. Please address all correspondence concerning this newsletter to 'MPI Newsletter'.