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YEAR 8 - IN BRIEF

Currently enrolled in the MPI are 70 students, 69 in Calculus, and 67 in Physics, from Fort Osage (14), Northeast (17), Truman (12), Van Horn (12), and Wm Chrisman (15) high schools. Of these, 26 (37%) are women, and 20 (29%) are minorities.

This year, as mentioned in the last newsletter, the MPI staff is experiencing the usual trauma of the first four weeks right along with our students. What with meeting earlier (7 am instead of 7:10 am), a new Week I - Week II schedule of classes, a new calculus text, and the addition of calculus laboratories, much is new, and old habits are being challenged daily. But it is all to the good; the changes were not made lightly, and we hope for a more responsive program in the end.

**! MPI OPEN HOUSE !
SUNDAY NOV. 3, 1991, 2-4 PM**

Sunday Nov. 3, from 2-4 pm, the MPI will hold its annual OPEN HOUSE for parents, teachers, counselors, administrators, and anyone else interested in talking to the faculty, staff or students of the Institute.

We'll be in the Truman Campus Building of UMKC behind the Truman Library just North off Hwy 24 in Independence. There will be several rooms organized with physics demonstrations and laboratory equipment, mathematics demonstration problems on chalkboards, and videotapes of recent problem-solving sessions. The Engineering PC Lab in Room 120, which we are currently using, will be open with student assistants to demonstrate the program Derive to our visitors. In Room 102

at 2:30 pm, there will be some brief remarks by the MPI director and the introduction of the MPI teachers, followed by a 10-minute slide presentation. And of course, there will be refreshments (!), all staffed by this year's students and faculty. If you have questions, please call 235-1272. We invite you on:

SUNDAY, NOV. 3, 1991
2-4 PM

CALCULUS LABS: FIRST REPORT

As of this newsletter all MPI calculus students have had three 50 min. calculus laboratory sessions using the software program: Derive. The lessons those of us teaching calculus have learned include just how much real work to expect out of 50 minutes, what common technical mistakes need to be addressed early, and how to control our eagerness to help. But, except for minor confusions, learning how to use the program seems to be the least of our difficulties. The true challenge seems to be how best to encourage our students to think about the ideas of the calculus in the presence of the computer, giving it and the software no more thought than they do to their pencils or pens. The well-written and thoughtful laboratory manuals by Leinbach, and Gilligan/Marquardt are furnishing us a place to begin, but it has quickly become clear that the best labs will be those without a meticulously laid-out plan, those with, instead, a well-chosen problem which can be solved in many ways, by active, pursuing minds.

Already we have seen students searching for the graphs of functions which mysteriously fail to appear on the screen, by using the notions of

windows and scaling, thereby being forced to closely re-examine the function's domain before blindly trusting to the graphing software. And, by seeing the graph of a function and its derivative on the same coordinate axes, the discovery that the sign of the latter has bearing on the shape of the former is a quite natural observation, and in fact fun to realize. If we can continue to elicit such responses, the effort put into these labs will be well worth it. We'll keep you posted.

CONVENTIONS: THERE AND HERE

From Oct. 21-23, Richard Waring will attend the National Issues in Higher Education: Quality in Off-Campus Credit Programs conference in Fort Lauderdale, Florida. There he will give a talk entitled: The Mathematics and Physics Institute: Having an Impact? The talk will include statistics concerning the college careers of former MPI students from our first three years, 1984-87. For instance, not including foreign-exchange students, 153 students completed the MPI program during those first three years, of which 149 (97%) entered college, 71 (46%) have now attained college degrees, and another 40 (26%) are still in school.

Also, at some time during Nov. 6-8, we will be visited by conveners from the 38th Annual National Association for Gifted Children Convention being held here in Kansas City, Mo.

ENRICHMENTS

PREVIOUSLY

On Sept. 13, and Sept. 20, Augusta Nichols of UMKC's Academic Support Services, and the mathematics coordinator gave 50 min. lectures on TEST-TAKING, READING A TEXTBOOK,

NOTE-TAKING, and TIME MANAGEMENT. Here are some selections from student comments about those talks:

--Test-Taking--

--I'm glad you mentioned working problems before going in to take the test. Sometimes it takes me awhile to get my brain working!

--I thought it was a very good idea to start working problems in the hall before the test. I'd never thought of doing that, but I know it would help me.

--I liked getting a test that will help me study for my first tests.

--Reading a Textbook--

--I have been very worried about these college courses, and I just want to say thank you for these enrichment classes that will hopefully help make these classes easier.

--I've never really read textbooks in this manner before, and I am glad that it was shown to me.

--Note-Taking--

--I think most people have never had to take good notes to reflect on and this enrichment made me think about the kinds of notes I'm going to take.

--The only change I think is needed is for everyone to take this session on note-taking.

--Our class wasn't real talkative but I guess that's because we're not totally comfortable yet. The speaker handled the situation great.

--Time Management--

--It's important to present these topics since they are essential to college life and also help with normal everyday activities.

--I enjoyed the enrichment and I plan to start using a schedule. (Well, try anyhow.)

--The lecture was alright and maybe a little helpful, but time management is most learned by experience.

UPCOMING

On Oct. 4, our speaker will be Dr. Deborah Mossman from UMKC's Civil Engineering Dept. She is currently doing research for the US Air Force Office of Scientific Research to develop a new test for detecting pollution in soils. Her talk, which will include slides and a 'hands-on' experience, is entitled: A Field Survey of River Hydraulics, and is about measuring the dispersion of pollution in rivers.

Oct. 18 will see the return of Ed Kiker, a Harvard graduate who majored in Lunar Geology, former Alaska State Director of Project High Frontier, and a member of the National Space Society. He is currently director of OSIRIS (Outer Space Industrial Resources Investigations Systems: International Space Consultants. His talk is entitled: Moon Base Design.

On Nov. 1 Dr. Rona Hirschberg, Associate Dean of UMKC's School of Basic Life Sciences will be our guest. Her talk is entitled: The Impact of Molecular Biology on Science and Society. Dr. Hirschberg is a microbiologist who has received many research grants from the USDA and the NIH (National Institute of Health).

Finally, Nov. 15 we'll take our first field trip of the year, spending all day visiting the Research Reactor in Columbia and the MU Physics Dept. This enrichment is of course a perennial favorite with our students.

PAST STUDENTS WRITE TO US

CINDY GILLESPIE (86-87)
(Mechanical Engineering Major)

"I'm co-oping again, this time with Union Electric at their Rush Island Power Plant. It's a coal fire plant, and I'm finding it fascinating. I have to conquer my fear of heights for this job because the upper floors are just grating. I'm handling it pretty well. I think this will be a good experience. I have only been here a week, but I feel at home already. I live in Festus, a town about 30 miles south of St. Louis. I found a clean, cozy apartment 15 min. from the plant.

If all goes well,...I should graduate in Dec. 1992. Co-oping has really set my graduation date back, but it's worth it. The experience with electronics, as well as people has taught me a lot. I would encourage everyone to try it. I've learned to live on my own away from family and friends. I don't get lonely like I used to. I know people that get jobs away from home and become lonely and depressed. My grades have been increasing, too. I received a 3.0 in the spring and a 4.0 this summer. I think my confidence is increasing."

PROFILES IN SUCCESS

Gina (Sun Hwa) Kim participated in the MPI during 1985-86. The fact that she successfully completed the program is remarkable considering she began the program nearly a month late, having just arrived from South Korea. Added to this handicap was the fact that she had great difficulty in speaking and understanding the English language. The progress she made during the next eight months was absolutely amazing.

Gina enrolled in the Coordinated Undergraduate Engineering Program at UMKC the following fall

and completed her B.S. degree in Electrical Engineering in May, 1991.

She is currently employed as an Engineer by the city of Kansas City where her responsibility is monitoring air quality. She takes air samples from twelve monitoring sites and analyzes the samples for ozone, nitric oxide, sulphur diazide and carbon monoxide. In addition she trains personnel from local industries on smokestack emissions at a "Smoke School" operated by Kansas City.

I am sure it was a proud moment in Gina's life when she completed the requirements to become a citizen of the United States in April, 1991.

We at the MPI are very proud of this young lady and her accomplishments. We wish her continued success as she strives to become a productive and contributing member of our society.

Richard Waring

**FIRST IMPRESSIONS
FROM THE STUDENTS OF YEAR 8**

"The first week I was here I felt like I wasn't going to make it, and seriously thought about dropping out. The MPI was the only time in my life, where I couldn't succeed without studying. I had some doubts as to whether or not I would make it. I decided to stay and try my hardest to succeed. During class, when they are explaining something, and you are understanding it, it makes you feel good."

Christina Echavarria
Northeast High School
Kansas City School District

"When I first set foot on the campus, I was nervous. This would be my first college course. I realized that for the first time in my life, I would have to study. Others had told

me how different it was from high school classes. All of this only added to my fears."

Chris Gross
Fort Osage High School
Fort Osage School District

"Starting at the MPI has created mixed feelings for me. I'm really scared and nervous, but I am also excited. Although there is a lot of work involved, I feel that it will better prepare me for college and make it easier to adjust next year."

Jennifer Barnes
Van Horn High School
Kansas City School District

"When I first came to MPI I thought that the instructors would teach the course without caring for individuals, but I found out that the professors have a general caring for their students."

Justin Heather
Wm Chrisman High School
Independence School District

**A SOLUTION TO
MATHEMATICS CHALLENGE #19**

Recall the problem statement:

If $n > 2$ is a positive integer,
PROVE that in the sequence

$\frac{1}{n}, \frac{2}{n}, \frac{3}{n}, \dots, \frac{(n-1)}{n}$,

an EVEN number of members of the sequence are fractions in lowest terms (meaning, the only positive divisor of both the top and bottom is 1).

SOLUTION:

The solution rests on the following FACT:

If k/n is a fraction in lowest terms then so is $(n-k)/n$. (Here $k = 1, \dots, n-1$)

Proof: By way of contradiction, suppose that $(n-k)/n$ is NOT in lowest terms. Then $n-k$ and n share a common divisor $d \neq 1$, meaning both $n-k = ld$, hence $n = k + ld$, and $n = md$, for some l, m . It follows that $k + ld = md$, meaning $k = (m - l)d$. [Notice that $l \neq m$ since $k \geq 1$ by definition here.] So, we see that also k and n share d as a common divisor, meaning k/n is NOT in lowest terms. This contradicts the assumption above.//

Using this FACT, it is clear that fractions in lowest terms occur in PAIRS of the form k/n and $(n - k)/n$. So, an EVEN number of members of the original sequence are fractions in lowest terms.

**A SOLUTION TO
PHYSICS CHALLENGE #10**

Recall the problem statement:

Pitchers sometimes threw Babe Ruth slow balls because they thought it would be harder for him to hit a home run if the ball were moving slower when struck. Does this belief have any physical basis?

SOLUTION:

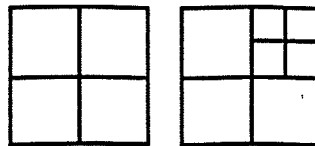
No. Babe Ruth could have hit home runs off STATIONARY balls! So, unless he was fooled by the ball and swung too soon, a slow ball merely ADDED to the chances of a home run.

MATHEMATICS CHALLENGE #20

By drawing line segments inside a square parallel to the sides, we can partition a square into 4 smaller squares, or 7 smaller squares, as illustrated below.

For WHICH integers among 2, 3, 4, ..., 100 can we partition a square in this way into that number of smaller squares? EXPLAIN your answer.

[From the AMP-LINE Newsletter, Winter 1991]



PHYSICS CHALLENGE #11

If you had a stack of new \$100 bills as high as Mt. Everest, how much would this stack be worth (in dollars)?

[The object here is to estimate the amount to the nearest power of 10 (order of magnitude.)]

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