



The Mathematics and Physics Institute NEWSLETTER

Director: Jennifer Snyder
Associate Director: Richard Delaware

October 1, 1999

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YEAR 16 – WE BEGIN

Currently 51 students are enrolled at the MPI, consisting of 10 from Fort Osage, 11 from Northeast, 5 from Paseo, 12 from Truman, 5 from Van Horn and 8 from William Chrisman high schools. Of these 19 are female and 32 are male.

!! MPI OPEN HOUSE !!

Sunday, Nov. 7, from 2-4 p.m., 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 MPI.

We'll be in the Truman Campus Building of UMKC behind the Truman Library, just north off of Hwy. 24 in Independence. There will be:

- 1) Physics demonstrations and laboratory set-ups.
- 2) Mathematics demonstration problems on chalkboards with SHARP graphing calculators on display, and
- 3) the MPI Calculus Lab in Room 223 will be open with MPI student assistants ready to demonstrate mathematics software to our visitors.

In Room 207 at 2:30p.m., the MPI Director and Associate Director will make some brief remarks and introduce the MPI teachers. And of course, there will be refreshments. If you have any questions please call 235-1272. You're invited!

!! MPI OPEN HOUSE !!
SUNDAY, NOV. 7, 1999, 2-4 P.M.

SOME STATISTICS FROM OUR 98-99 ANNUAL REPORT

- 721 students have completed the MPI program (Years 1-15, Sept. 1984 – May 1999); 425 (59%) of these were male and 299 (41%) female.
- On average, 75% of all MPI students who start the program actually finish
- Of the 425 MPI Alumni from Years 1-9 (1984-93) (excluding foreign-exchange students), 40 (94%) entered college, receiving 316 college degrees (to the best of our knowledge), including at least 178 degrees in Science, Mathematics, or Engineering, and 9 Medical Doctors.

TO ALL MPI ALUMNI:

HAVE YOU GRADUATED FROM COLLEGE?

IF SO:
PLEASE CONSIDER BEING AN
- ENRICHMENT SPEAKER -
CALL (816) 235-1272
or contact us at our NEW E-MAIL:
mpi@umkc.edu

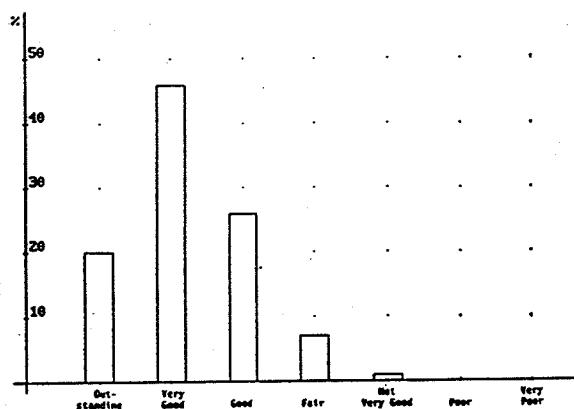
MPI Alumni who have spoken:

Brent Harding	(84-85)
Pam Deters/Stephen Koop	(84-85)
Seth McMenemy	(88-89)
Tony Thornton	(88-89)
Mitch Dobson	(89-90)
Rachel Allen	(92-93)

Where 73% of MPI Alumni Go:

25%	UMKC
15%	UM-Columbia
11%	UM-Rolla
5%	Truman State Univ. (NEMSU)
4%	University of Kansas
3%	Central Missouri State University
3%	Penn Valley Community College
3%	Rockhurst
2%	Northwest MO State University
1%	William Jewell College

In answer to the end of year MPI evaluation question, "Overall, how would you rate the MPI?", students responded:



ODDS AND ENDS

On Friday, Sept. 17, Larry Harding, who has taught physics at the MPI for 16 years, and retired in 1996 from teaching mathematics, physics and chemistry at Fort Osage High School, was inducted into the Fort Osage Sports Hall of Fame. While at the Fort, he coached varsity golf, football and five years of basketball, four of which were winning seasons.

In October we will be sending flyers, encouraging juniors to join the MPI next year, to both Blue Springs High Schools, accompanied by this newsletter. All mathematics and science teachers and all counselors will receive copies for distribution and posting.

On October 1-2, Richard Delaware will attend the 9th Annual Kansas City Regional Mathematics Technology EXPO at Rockhurst University in Kansas City, MO, as a member of the steering committee. He will moderate a discussion

on "Differentiating Student Skills with Respect to On-Line Courses", and give a talk entitled "Virtual Office Hours and More - Year One of the University of Missouri System Project."

On November 30, Richard Delaware will give a talk at Benedictine College in Atchison, KS, entitled "Kissing Numbers: How Many Congruent Polygons Can Kiss Another of Their Kind?"

ENRICHMENTS

FOLLOW UP

On Friday, Sept. 17, Ed Kiker, a Harvard graduate who majored in Lunar Geology, member of the National Space Society, and the CEO of Outer Space Industrial Resources Investigations Systems, spoke on **MARS BASE: OUR NEXT FRONTIER.**

Students responded:

This was very exciting for me and he had a lot of information to share. I found the statistics he told us about very amazing.

I really enjoyed Mr. Kiker's lecture. It enlightened me about new applications for math and science. I particularly enjoyed hearing about propulsion and energy sources for travel and life on Mars. I was most interested in speed of light travel and ion-drives.

Keep this just the way it is! Awesome subject!

I found this session very interesting. I had no idea that we were that far along in our exploration of Mars. I would have liked to know more about the theories of life and Mars and more about what their past research found.

I consider it very informative that he was able to answer any question. He had to relate some difficult aspects of this project to people who know a lot about Mars and those who know nothing.

His speech was terrific, especially the conclusion.

I would like to talk more about this; that one day people can go to Mars to live!

I enjoyed the subject very much. Space travel has always fascinated me and I always enjoy learning more or new things about it.

■ I would like to hear more about how they are going to get to Mars. I would also like to hear about the Alcubierre warp drive. Perhaps that could be another enrichment.

■ It was great; extremely interesting!

UPCOMING:

Friday, Oct. 1, brings Tony Thornton (MPI 88-89), a Network Design Engineer working on Broadband Operating System Development for Sprint, to speak on **A CAREER PATH: MPI TO SPRINT**.

On Oct. 15, James Case, a medical physicist at Cardiovascular Consultants will speak.

On Oct. 29, Jim MacDonald, On-Scene Coordinator for the U.S. Environmental Protection Agency will speak on **EPA: EMERGENCY RESPONSE**.

On Nov. 12, paleontologist and dinosaur hunter Craig Sundell of KU will speak about **THE REAL JURASSIC PARK: A WINDOW INTO PALEOECOLOGY**.

WE HEAR FROM PAST STUDENTS

Jenny Green (97-98)
(Chemistry Major)

E-mail received 8/8/99:

"I am sitting here this summer trying to organize all my calculus and physics stuff. I must be crazy for wanting to take another semester of both. But since I'm a Chemistry major, it's also required. I've been looking over things that I did (at the MPI) and wonder how I ever made it. Then I look at something else and wonder how I could have missed that. It was a year in my life that I will never forget. While getting reading for my upcoming class, I pulled out my trusty ole' calculator (HP 38G) and realized that it isn't as trusty as I thought. Some of my buttons won't work. I've been looking at getting a new one and have been procrastinating. (One of my bad habits that MPI didn't rid me of.) I don't like the TI's. Probably because I don't know how to use them. So I am writing you (Mr. Delaware) to ask if you still have any of the HP's or know where I can get one. I hope that you still have some. I don't

know if I can tackle Calculus 2 and learn how to use a new calculator at the same time. I am still trying to figure out what the constant on the front stands for. Nobody I ask seems to know. Thanks for your help and good luck with next year's class. Unfortunately my sister won't be one of them...she transferred to the Shawnee Mission school district last year."

E-mail received 8/31/99:

"I have a really huge question to ask. I am taking Calculus 2 with a professor who couldn't speak a word of English if his life depended on it. We're doing definite integrals and antiderivatives. The directions say to evaluate the integral. I can get the problem down to the substitution part but don't know what to do with it. The problem is:

$$\int_{a=-e}^{b=-e^2} (3/x) dx.$$

The following steps I took are using b and a from above:

$$3 \int_{a=-e}^{b=-e^2} (1/x) dx = 3(\ln x) \text{ from } -e^2 \text{ to } -e \\ = 3[\ln(-e) - \ln(-e^2)].$$

When I try to solve the first step, I am getting two different values for each ln. The first one I get (1.00, 3.1415) and the second one I get (2.00, 3.1415). I didn't multiply by 3. Am I on the right track? No one in my study group seems to have any idea on how to do this. It's an even problem so the answers aren't in the back of the book. Thank you so much for looking at this.

E-mail response 9/1/99 (R. Delaware):

"In answer to your question:

Remember that the value of (in your notation) $\int S(1/x) dx$ is $\ln(\text{abs}(x))$, not just $\ln(x)$, where $\text{abs}(x)$ means absolute value of x . So, with $a=-e^2$ and $b=-e$ as you have here, the final answer for $\int S(3/x) dx$ from $a=-e^2$ to $b=-e$ is -3 .

Remember along the way, of course, that $\ln(e^2) = 2\ln(e)$ and that $\ln(e) = 1$.

The answers you were getting were your calculator's way of giving you a complex number, meaning your pair (c,d) represents the complex number $c+di$. You see if you **DON'T** use absolute value, then the \ln function becomes extended to the complex domain, which is not a subject for basic calculus. Remember we only look at $\ln(x)$ for $x>0$. Got it?

Hope that helps. I have to get going. The MPI starts today!"

Katie Allen (98-99)
(Chemical Engineering Major)

E-mail received 8/19/99:

"I started my Engineering Mathematical Systems class today; differential equations. We got a homework assignment, due tomorrow, and a lab due Monday. I am even more overwhelmed then I was at MPI, if it's possible. The stuff we're doing today, direction fields and first-order differential equations, is a review. It's just hard to jump-start my summer brain into functioning mode. I met two freshmen who are my new lab partners; much better than M. I might add; are just as smart as B., but friendlier. They helped me jump-start my brain and we already got our lab done. I'm trying to break that whole procrastination problem I have. It's not working however. My Calculus homework is sitting here next to me, not quite completed. There are approx. 100 kids in my class. Tomorrow I start Chemistry with the modest number of 900 students in one class. It's thrilling and all I can think is how I want to go back to Independence again. Jennifer Jecker is my roommate and she is all done with math (she's an architecture major). I had an epiphany this summer and decided that my eventual family, the one with a husband and kids, not the current one, is what is really important to me, so I'm just doing Chemical Engineering and abandoning my whole pre-med kick. School for eight years plus a dedicated 24-hour job is not really conducive to a happy motherhood. So, that's my life path for now. I know how you really wanted an update on Katie Allen's life plans, but hey, after you share a year's worth of Calculus with a person, you have a special bond! I want to hear about your new students as soon as they arrive so please keep in touch.

Your most favorite and memorable MPI student ever, Katie (as if it's necessary) Allen.

E-mail received 8/22/99:

"Well, 2 days down and only 73 more to go before I'm done with this confounded math class! I worked on my homework, a whole five problems, for the last 2 1/2 hours. So, MPI wasn't so bad. It sure does feel good when I finally understand, and even

better when I get done. Tomorrow we start Euler's Method. Hmmmmm, that sounds familiar... I went home this weekend so as of Sunday night my homesickness is alright. While this whole Math 250 is tough, it is going to keep me on my toes and it will hopefully keep my mind off home. So, students all over will be learning from you this semester, cool! I wish you would send a tape to Professor C. on Euler's Method for tomorrow. In fact, why don't you send one for the rest of the semester...he is way confusing! Not that I didn't get slightly befuddled last year, but at least I understood when we were doing "If/Then" statements or examples. He wanders and asks questions to a room of 100 engineers who are, of course, quick to answer out loud. NOT! I'm just building character...actually building a character for my next scary novel! I went to my Chemistry class, which has 900 kids. Let me say that again; 900 kids! The professor is much more entertaining than my former science professor but he does have a major flaw in that he scheduled all four of our exams for Thursday nights from 8:00-10:00pm! Not that my mind doesn't work fabulously that late, but a walk clear across campus at 10 at night is not the best thing in the world, and there is no way I'm giving up my parking spot once I've found one in the dorm lot. If I have any questions on Euler's Method, I may have to e-mail you. I hope you don't mind. I hope you have a good start at UMKC and enjoy your decreasing time away from the fabulous MPI crowd."

Your most memorable and all time favorite Section C-er, Katie Allen

Holly Buxter Cruz (90-91)
(BS: Mechanical Engineering)

E-mail received 8/30/99:

"This is Holly Buxter from the 90-91 Van Horn MPI crew. Well it's been Holly Cruz for the last three years and we've finally bought a house. I enjoy reading the newsletters and would like them forwarded to my new address. All is well here. After receiving my BSME from UMC, I accepted a position with a small manufacturing company in Dallas, LGD Technologies. I just wanted to say thank you again for continuing the MPI. Although it was a struggle, it was well worthwhile."

Al Morse (84-98)
(MPI Instructor – Retired May 1998)

E-Mail received 8/31/99:

“Just a line to wish all of you a great school year. I enjoyed the newsletter, but I just smiled knowing that I didn’t have to worry about a new year. We have been busy canning this summer. In fact we are concocting recipes involving tomatoes today. I’ll try to stop by someday. Once again, have a great year!!!”

Rodney Caudle (91-92)
(BS Electrical Engineering)

E-Mail received 10/2/99:

“I have moved to California and am working for a website as the Webmaster. I am in charge of maintaining and upgrading all of the servers on the website. The address is www.on24.com.

I really enjoy getting the MPI newsletters. Lots of good stuff in there. How is the institute doing these days? I think that I’ve lost touch with people from there. If anyone wants to e-mail me they can reach me at: rcaudle@slip.net.

Talk to you later.”

NEW MPI E-MAIL ADDRESS:

mpi@umkc.edu

A list of known MPI Alumni e-mail addresses is available upon request.

1999-2000 STUDENT FIRST IMPRESSIONS

“My first impression of MPI was frightening. I thought that the teachers were going to be very mean and the work was going to be very hard. Well, now that I have been here for about three weeks, I feel that I was wrong about one thought and

right about the other. I can see that the work is going to be challenging, but I think that the teachers are very friendly and willing to do whatever they can to help us (students) do well in the classes. Right now, I’m doing okay in both classes, but I hope that I will improve on my work skills throughout the year.”

Reshawn Fields
Paseo Academy
Kansas City, MO School District

“I’m technically not the person to be writing about my first impression of the MPI, since I missed my first day of class. However, the second day I was able to attend and my initial thought was, “Oh my...there are a lot of stairs!” Oh, you meant about the classes. Well, the thing that I like about MPI is that the teachers get started on the material right away. In normal high school classes, the teachers took two weeks just to pass out textbooks, establish a seating chart, give us a writing assignment covering our summer vacation and then give everyone a gold star. This isn’t high school anymore. These classes aren’t for children; they’re for adults. The professors assign challenging homework and they expect us to do it. I really like the fact that the MPI instructors don’t undermine our intelligence simply because we’re teenagers.”

Lyndsey Main
William Chrisman High School
Independence School District

“I think UMKC’s MPI is a very good program for people who want to be in advanced classes in their high school year. It is also hard for some people like myself. The hard part is that you have to wake up in the morning and try to remember what the professors are talking about. I think that is hard but I will try to do my best to pass both classes.”

Nirmal Bhakta
Northeast High School
Kansas City, MO School District

"My first impression of MPI has been a very good one. I get the feeling that this is a place where I will really learn a large quantity of interesting information. I've been looking for this type of setting for a long time."

Cassy Pallo
Truman High School
Independence School District

"On Wednesday, September 1, 1999, my alarm went off at 6:05 a.m. For most students at my school there was still 1 hour and 55 minutes before classes began, but today was special (for me). I had only a matter of minutes before beginning my wonderful, early morning math and physics classes (two things that don't mix well at all). I arrived shortly before 7:00 a.m. and received all the necessary equipment. After leaving the first day, my once empty backpack now weighed 40 pounds (18.2kg)... Now 18 days later, my brain is mush but my muscles are getting considerably bigger from all the books I'm carrying around."

Ben Gatrost
Center Place Restoration High School

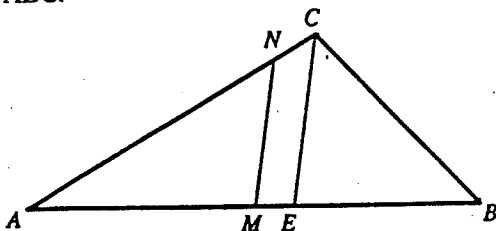
"MPI is going to be the first real challenge of my life. Not only will it prepare me for college but it will also prove that being the oldest of 7 in a motherless family is a piece of cake."

Teeyana Kent
Van Horn High School
Kansas City, MO School District

A SOLUTION TO MATHEMATICS CHALLENGE #59

Recall the problem statement:

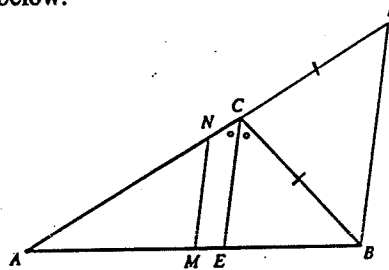
In triangle ABC, as sketched below, let M be the midpoint of side AB. Through M draw a line parallel to the angle bisector of angle ACB, as shown, intersecting triangle ABC again at N. Show that the line segment MN bisects the perimeter of triangle ABC.



[From: Which Way Did the Bicycle Go?, by Konhauser, et al., 1996, p. 8, #24.]

SOLUTION:

First we extend side AC upward to a point D such that $CD = CB$, and then draw the segment BD, as shown below:



Now, by construction, triangle BCD is isosceles. So, since base angles of an isosceles triangle are congruent, within triangle BCD we have:

$$\text{angle CDB} = (1/2)(180 - \text{angle DCB}).$$

Since by hypothesis CE is an angle bisector, we reinterpret the right hand side, getting:

$\text{angle CDB} = (1/2)\text{angle ACB} = \text{angle ACE}$.
Therefore, BD is parallel to CE, as well as to MN, meaning triangle AMN is similar to triangle ABD. Since M is the midpoint of AB, we have that $AB = 2AM$, and $AD = 2AN$.

Thus the perimeter of the original triangle ABC is $AB + AC + CB = AB + AC + CD = AB + AD = 2(AM + AN)$, as required.

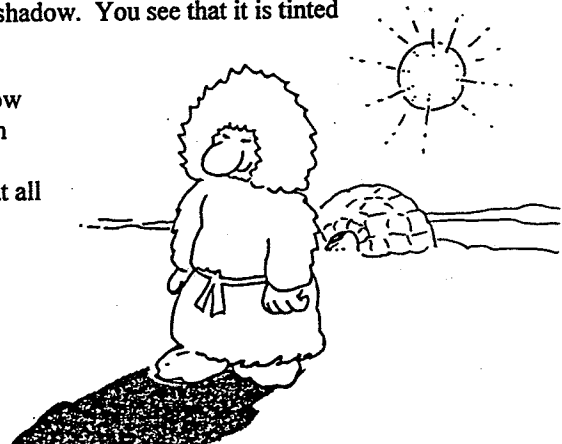
A SOLUTION TO PHYSICS CHALLENGE #50

Recall the problem statement:

WHAT COLOR IS YOUR SHADOW?

On a clear and sunny day, you are on snow and look at your shadow. You see that it is tinted

- red
- yellow
- green
- blue
- not at all



[From: Thinking Physics, Practical Lessons in Critical Thinking by Lewis Carroll Epstein, p. 307.]

SOLUTION:

The answer is: d. The part of the snow in direct sun shows the color of the sun: yellow white. The snow in your shadow gets no direct sunlight, but is illuminated by light from the blue sky. Perhaps it is the blue color of shadows that makes people associate blue with cold.

MATHEMATICS CHALLENGE #60

Suppose $P(x)$ is a polynomial of degree 8 with Real coefficients, and we also know that $P(k) = 1/k$, for $k = 1, 2, \dots, 9$. [Meaning $P(1) = 1/1$, $P(2) = 1/2$, and so on, up to $P(9) = 1/9$.]

What is the numerical value of $P(10)$?

[From: Which Way Did the Bicycle Go?, by Konhauser, et. al., 1996, p.33, #114.]

PHYSICS CHALLENGE #51

At the same time that a high speed bullet is fired horizontally from a rifle, another bullet is simply dropped from the same height. Which bullet strikes the ground first?

- a) The dropped bullet
- b) The fired bullet
- c) Both strike at the same time

[From: Thinking Physics, Practical Lessons in Critical Thinking by Lewis Carroll Epstein, p. 130.]

Editor/Writer:

Richard Delaware

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