Mπ The Mathematics and Physics Institute NEWSLETTER

Director: Richard Waring
Mathematics Coordinator: Richard Delaware

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FIRST SEMESTER -- TOP TEN

By taking the mean of their college Calculus and Physics grades for the first semester, we have determined our current Top Ten MPI students. We congratulate them all. Alphabetically by schools, they are:

Misty Piatt	(Center Pl. Restoration)
Sarah Thompson	(Fort Osage)
Rachel Cianciolo	(Truman)
Eric Fryatt	(Truman)
Whitney Meagher	(Truman)
Robert Monnig	(Truman)
Beth Olson	(Truman)
Jessica Ostrom	(Truman)
Shelley Record	(Truman)
Brian Johnson	(Wm Chrisman)

RECRUITMENT DAY -- FEB 11

On Tuesday Feb. 11, we are inviting for a visit interested juniors and their teachers from the high schools involved in the MPI program. (Last year we hosted about 165 students.) They will arrive between 8 and 8:10 am and, with MPI student tour guides, take a short tour of the MPI classrooms. There will be MPI students at work on Calculus in our computer lab, a Physics lab set-up for viewing, and lectures or problem-solving sessions in action. Following the tour, everyone will be led to Rm. 207, to receive an MPI brochure, this issue of the Newsletter, a sheet containing information about the Calculus Readiness Test and MPI Mathematics Technology, a donut (!), and be seated for our slide show, which includes computer, calculator, and physics demonstrations. Afterward, several MPI students may be asked to share their thoughts about being in the program, and we'll all take questions from the audience.

TO ALL MPI ALUMNI:

HAVE YOU GRADUATED FROM COLLEGE?
IF SO:
PLEASE CONSIDER BEING AN **ENRICHMENT SPEAKER**

CALL (816) 235-1272

ODDS AND ENDS

1. Update: SHARP will be announcing at the NCTM Annual Meeting in Minneapolis, April 17-20, that new model (after 3 years!) mentioned in the last Mπ issue, of the EL-9300C graphics calculator which the MPI currently requires all students to use. We will not decide whether or not to switch to the HP 38G until we've seen this model.

2. So far, this year is tied for the worst winter for cancellation of MPI classes due to bad weather:

NUMBER OF MPI "SNOW DAYS"

3	Year 1	(84-85)
2	Year 2	(85-86)
0	Year 3	(86-87)
2	Year 4	(87-88)
0	Year 5	(88-89)
0	Year 6	(89-90)
0	Year 7	(90-91)
0	Year 8	(91-92)
5	Year 9	(92-93)
1	Year 10	(93-94)
0	Year 11	(94-95)
4	Year 12	(95-96)
(so far) 5	Year 13	(96-97)

ENRICHMENTS

FOLLOW UP

On **Dec. 6**, our last enrichment date before Christmas break, Frank Booth, a forensic chemist from the Kansas City Regional Crime Lab, spoke about **SCIENCE IN THE CRIME LAB.**

Some student comments were:

■ He described to us the different marks left on each individual bullet at discharge and the way that gunpowder can be tested on clothing, with special photography to determine how close up a person was shot. Mr. Booth also told us about the differences in hair strands, and how race, hair color, and hair condition can be determined w/just one strand! This was definitely the most interesting speaker we have had so far. I learned a lot of new and fascinating things!

■ I really loved this lecture, it was so neat to see how criminals have a tougher chance to get away with breaking the law because of the advancements we've made in our technology since the early 1900's.

■ He began with bullets and guns. I always knew that bullets could be traced back to their gun, but I never knew that it was because of the way the gun's barrel was drilled. He also talked about evidence analysis, such as footprints, blood splatters and ultraviolet photography of speedometers. He also showed us *luminal*, which will detect the presence of blood by glowing in the dark when in contact w/blood residue.

■ This was my favorite enrichment so far. The speaker and the subject matter was really interesting. He really kept my attention.

■ Some of the best young minds in Kansas City were educated about the tricks police use to catch criminals. We may have thereby bred some highly complex criminal masterminds, especially when the Internet makes crime look like mind games. We learned that UV photography can identify shoe and fingerprints in places you wouldn't normally expect. This kind of photography can also identify wording on labels ripped off of clothing. Something as small as a tiny piece of shoe leather off the trim on your shoes can link someone to the crime scene.

■ A substance called *luminal* can be sprayed on objects to find blood. The lights are turned off and the luminal has a reaction with blood that makes it a glowing blue color. Overall he did a good job. It always helps us as listeners when we can see what the speaker is saying.

■ He showed us the many ways chemistry and physics are used in his career field. Using chemistry seemingly invisible blood traces can be easily identified. With physics, the ballistics of a fired bullet can be found. I felt Mr. Booth did an excellent job. I found the subject to be very interesting. I never knew how so many little pieces of evidence, such as matching a trash bag to the manufacturer, could lead to a conviction.

■ He told us that at a crime scene you always leave something, and often take something with you. An example of this is footprints: everyone leaves footprints everywhere – even on carpet. He spoke about tires and how each tire mark is distinct. He told us that powder from a gun and bullets are left behind at a crime scene and that every gun barrel has a distinct grooving. The demonstration of the fluorescent spray was excellent.

■ Mr. Booth was by far the most interesting speaker we have had all year. It was very interesting finding out how criminals are brought to justice through their own trail of misdeeds. The visual presentation was very effective. It's good to know that there are people out there in the world doing all they can to bring the "correct" individual to the law.

Our 12th annual **PANEL DISCUSSION AND REUNION** on Jan. 3 was again held in Rm. 207, and moderated by Sheri Adams and Al Morse. As usual, each of the panelists discussed their college experience, their major, and/or work experience.

The alumni panelists this year were:

Kristi Bass **(92-93)**
Rockhurst College
Biology & Physical Therapy Major

Todd Johann (92-93)
Dartmouth College
Economics Major

Jill Dawson (93-94)
Univ. of MO-Kansas City
6 Year Medical Program

Derek Olson (94-95)
Univ. of MO-Rolla
Civil Engineering Major

Joe Ziolkowski (95-96)
Worcester Poly. Tech.
Aerospace Engineering Major

Their presentations were clear and perceptive. In all, 16 former MPI students attended. Some specific current MPI student comments were:

■ They talked about their majors and what good MPI did in preparing them for college. They all noticed a huge difference between high school and college, but said it is possible to be successful w/good time-management. They also said that MPI enabled them to skip one or several college physics and calculus classes.

■ I am glad we had the chance to meet past students and learn from their experiences in college and how MPI helped them.

■ Substitute teaching seemed to be a favorite part-time job of the students. Two of the students are across the country and the separation from the normal seemed large. The different colleges seemed to have different amounts of degree requirements, though most leaned toward the 5 year degree. Very good idea to bring back former students and let us know what towering inferno awaits for us with hugh pointy teeth. The discussion by the students put me at ease actually, and I enjoyed it.

■ They talked about their lives in college and we could see all the different paths one can take. When asked how beneficial MPI was, the guy from Dartmouth pointed out that while his major didn't have a daily use for calculus and physics, there were still basic concepts he learned here that he needed.

■ The guests said that the MPI classes really prepared them for their college experiences. One of the guests said that going to college is like starting a new life by yourself. The guests advised not to get a job until you are comfortable with your classes and study habits. They agreed that you should study by yourself and then if you still don't understand, you should ask someone else. They advised that study groups are time consuming. This enrichment was very informative. The people on the panel were very insightful.

■ They discussed how different college was from high school. For example, they have about 12 hours of class a week in college compared to 8 hours of class a day in high school. Adults often talk about college and how it should be approached. It is beneficial to hear from college students how to approach college and be successful.

■ The two guys that left home discussed the homesickness that they felt. I found out that all the panelists have to go 4 to 6 years of college. I also found out that a job search after college can be hard; it sounds like applying for college.

■ Going far away seemed to be easier on the student making the break from home than staying close by.

■ Most majors and degrees will probably take an average 5 years. Internships are a great way to earn some good money, and after a couple of years, it also helps to getting a job. It was a good idea. I was able to talk to some people about what I'm doing and where I'm going.

■ It was very helpful though most of the things they said (more studying, totally different from high school), I have heard numerous times, it never hurts to hear it again because it is then just reinforced. It was nice to hear how the MPI classes had helped them, even when they didn't receive credit.

■ This enrichment was real cool. Because of the questions that were asked, I know what to expect in college. And I am glad I got to know that even if you don't need physics and calculus in some of the majors, you can use the credit as an alternative class. I'm also glad that I got to know that colleges have tutors to help with their classes.

■ I learned more about college life than expected from the former MPI students. I learned the benefits of being enrolled in MPI. Also, I

learned more about what I need to expect from myself to survive the college life. Overall, I enjoyed meeting the former students and discussing how college life is for each of them. One day I hope I can be on the panel!

■ Kristi liked the advantages of a small school, whereas Jill enjoyed the benefits of a larger college. Basically, their desires and career interests lead them to schools that reflected their interests. Listening to them assures me that college is what you make of it. I want to thank all the former MPI'ers for coming back and sharing their experiences with us.

Our **Jan. 10** enrichment was cancelled due to a snow day.

Ray Coveney, Professor of Geosciences at UMKC, joined us on **Jan. 24** to speak on **WHAT GEOLOGISTS DO.**

Students responded:

■ Dr. Coveney first started collecting rocks in the fourth grade...(he) talked about how the Grand Tetons were formed and about what people in Tibet use for fuel (cow pies). Most of the energy resources come from areas west of the Mississippi River. Dr. Coveney studies rocks mainly like shales which are found in Kansas City. He talked about earthquakes and how they still cannot be predicted. It was pretty interesting. I really liked the pictures that he brought, like of the landslides and sinkholes.

■ The speaker explained the many fields that a geologist might deal with. One field of study was earthquake prediction. He also explained that not all geologists work with rocks. An example of one geologist was General Colin Powell. The enrichment was very insightful. I was unaware that the U.S. Secretary of Interior Bruce Babbitt and former presidential science advisor Frank Press have college degrees in geology. I learned a lot of interesting facts from this enrichment.

■ Dr. Coveney told us a little about field geology and the kind of trouble-shooting they do, like flooding, sink holes, mud slides, and consultation on building sites.

■ The most interesting part to me was about the house which collapsed by the sink hole. That's really weird. He talked about mines and the importance of gold. I really understand more about geology from this enrichment.

■ The most interesting part of the discussion was when Dr. Coveney discussed air pollution and natural geological occurrences. He told us that twenty-five years ago, people thought that air pollution including CO^2 should be dispersed into higher parts of the atmosphere. He also showed us slides of natural wonders. His subject material was excellent.

UPCOMING

Our **Feb. 7** speaker is Sam Gill who is an instructor at Johnson County Community College where he teaches Critical Thinking, and has written for The Skeptical Inquirer magazine. He will discuss **UNSOLVED MYSTERIES.**

Friday, **Feb. 21,** UMKC Mechanical and Aerospace Engineering Professor Craig Kluever will speak about **THE SPACE SHUTTLE & NEW SPACE MISSIONS.**

Then on Friday **Mar. 7**, we will take our third annual trip to the **UMKC PHYSICS DEPARTMENT.** Last year we toured laboratories in: **Surface Physics** (Dave Wieliczka), **High Pressure Physics with Diamond Anvil Cells** (Michael Kruger), **Atomic Force Microscopy and Scanning-Tunnelling Electron Microscopy** (Da-Ming Dhu), **Photo-Luminescence** (Jerzy Wrobel), and **Computer Simulations & Chaos** (Jim Phillips).

Finally, on **Mar. 21,** Ed Kiker, a Harvard graduate who majored in Lunar Geology, a member of the National Space Society, and the CEO of Outer Space Industrial Resources Investigations Systems, will return to speak on **FUTURE STUDIES.**

MPI E-MAIL ADDRESS:

rdelaware@cctr.umkc.edu

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

NEW (OR CHANGED) MPI ALUMNI E-MAIL ADDRESSES

[A list of known MPI Alumni e-mail addresses is available on request.]

**** NEW ****

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CENTRAL MO STATE UNIV

WE HEAR FROM PAST STUDENTS

GREG WRIGHT (85-86)
(BS, Mechanical Engineering)

E-mail received 1-14-97:

"I am currently working as a mechanical engineer for the US Army Corps of Engineers at Truman Power Plant (a hydropower facility). If you are in need of a field trip to see an interesting place, call us. I hope everyone is doing OK at the MPI. Say hello to Mr. Waring for me.

Please send me a copy of alumni e-mail addresses. My address is gregory.d.wright@mrk01.usace.army.mil."

KIMBERLY (GALLAGHER) BROX (86-87)
(BS, History)

"It's so hard to believe that ten years have gone by since leaving MPI! I would dearly love to have been able to attend our tenth reunion in the hope of getting to see fellow classmates and our teachers, but I must settle for a letter instead.

Current MPI students--enjoy the reunion day, as it's one of the few you'll have off before graduation!

My husband, Michael, is an Air Force officer... In September of 1995 we had our first child, Thomas Michael. He keeps us both very busy and entertained. In October of this year I returned to work part time and am teaching math and reading at Sylvan. The setup works great for getting to stay current in my field and have enough time for Tommy. We get to play Santa this year for the first time and are having a blast. We are able to travel a lot with Michael's job and we enjoy the military lifestyle so far. My family left Independence in 1988 and moved to Des Moines with my mother's job. They came out of "Iowa exile" this year and are happily relocated in Tulsa. My father is still living and the Tulsa climate agrees with both of them. We'll spend Christmas with Michael's family in Atchison and New Year's with my family in Tulsa, thus I'll miss the reunion.

I frequently and fondly think back on the time spent at MPI. I hope your lives have been abundantly blessed with happiness and success. Please drop me a line at brox@ix.netcom.com. At least that is one address which stays constant. We escape from L.A. in approximately 18 months."

LESLIE (FARROW) BAY (91-92)
(Accounting Major)

"I can't believe it has been five years since I was in MPI. Time has flown by and I do feel a lot older and I don't know about wiser. I do know that when I attended MPI I was very ambitious wanting the top score on every exam. I still do, but I've had to juggle a full-time job, and a full-time husband along with a full-time school schedule. It is not always possible to ace every exam and I'm finding myself fighting to keep caught up. I believe MPI helped me to learn quickly and to retain the information studied. My study habits are not as good as they were in high school, but I had a lot more time then. I do <u>not</u> regret getting up at 6 am to be at class at 7 am, because MPI was very beneficial to me as a student and a very good learning experience.

I'm going to try to be at the reunion on the 3rd. I just hope you all remember me!"

PATRICK HAYDEN (91-92)
(AA, General)

"Just recently I was hired on at Ernst & Young as a major part of their ISAAS – information systems advisory and assistance services group. My primary role will be in information security analysis and systems security analysis. Prior to working at E & Y, I was (and still am) an instructor at US Connect in Novell Netware, Microsoft & Windows NT, some Lotus Notes, and other computer related fields/technologies (TCP/IP, SQL, Mail, security, Internet, etc.)

Although I do not have a degree (esp. since the midwest universities can't keep up with the technology), I have a very good background working with computer technologies.

I am still married; my son is nearly 5 and my daughter nearly 3. My wife is working on her history/english/education degrees (she will have enough for both of us!) and will graduate from UMKC in '99.

I would enjoy an opportunity to come to MPI one morning to speak a little on systems security, Internet security, computer crime, or something of the sort.

You can feel free to email me at patrick.hayden@ey.com."

KRISTI BASS (92-93)
(Biology/Physical Therapy Major)

"MPI taught me how to study for a college course which has been beneficial for the past four years.

MPI is a good eye-opener for students planning to go on to college. It gives you a chance to realize your strengths & weaknesses & your likes & dislikes. MPI was beneficial in many different aspects besides just an academic one, and for that it was definitely worthwhile."

JESSIE NOLLE (92-93)
(Civil Engineering Major)

"I was in honors calc and physics at MU, but MPI matched up fine because there wasn't anyone in either of the classes that wasn't smart enough to hack it (not like college).

Keep the challenge up! Too often I did not reach my full potential in H.S. solely because teachers did not teach in my level. MPI was tough but I felt like I came closer to my full potential. If no one pushes the top students to push themselves we will have a country of mediocre minds. Being a substitute (teacher) I have seen that when nothing is expected of students, rarely is anything delivered or accomplished. The more you expect, the more you get."

ANDREA SLUSSER (92-93)
(Architectural Engineering Major)

"Please keep up the good work and hold to your high standards. Despite how current students feel about MPI, yes we all groaned many times and the early mornings left us somewhat less than eager, upon reflection now we appreciate everything MPI gives to us, and now that I have finally completed the calc series and physics series, I want to thank you for offering the opportunity to us. I feel I did better due to my MPI experience. ☺

Now seeking an internship in Kansas City for summer 1997 — BEWARE! I may use some of you as references. ☺"

MATT BARROWS (93-94)
(Civil Engineering Major)

"MPI did give me a solid background, but by no means did it teach me all I needed to know. The classes down here (at UM-Rolla) are much harder, especially physics. Don't get me wrong, that is what I expected.

I feel that MPI did an excellent job of filling the gap between high school and college, which is what it is designed to do!!

Just a bit of an aside note: I know I never listened when anyone told me this but, tell the students if you are going into a math, science, or engineering degree, it only gets harder. I get the newsletter and people say they are up all night studying and just spending hours at it; just wait till college. I never had to study much at MPI (well I'm sure that's why I got a college B), but it gets real rough down at Rolla.

Just keep up the good work and I look forward to seeing you all at the reunion...maybe!!"

JOSHUA SMALL (93-94)
(Chemical Engineering Major)

"The instruction that I received at MPI was exceptional. The quality of the classes offered at MPI is as good or better than that of my classes here. The quality of my calculus class at MPI was better than my calculus class here at Rolla. At MPI, the teachers were more involved with students and spent more time on a personal level helping them learn the material. Through the use of the demonstrations and labs, the concepts of physics were better understood than if we had just had lecture. Overall, the teachers made the difference.

While attending MPI I learned essential study skills that I wouldn't have learned in my regular classes. Through my classes I became accustomed to the type of schedule that I would be encountering in college, and the types of demands set upon me. Through MPI, I learned how to work efficiently with study groups."

JENNIFER BROWN (94-95)
(French Major)

"My courses I took at MPI were at a higher level of difficulty and comprehension than those I have taken since then. I really enjoyed the one on one with the professors not something easily found in college."

PHUOC HUU DANG (94-95)
(Biology Major)

"I learned at MPI that I have a low aptitude for physics and mathematics. I am thankful that MPI

exposed this weakness to me before I went off to college. Now I know my strengths and can focus better on them. More importantly, to me, MPI gave me a taste of college life. Without it, I would surely have floundered my freshman year. Instead, I was prepared, at least in the sense that my expectations were not too different from what I really observed. It provided a base for me and has allowed me to build on it. I know that is not the main purpose for having MPI, but all the same, I am grateful."

RACHAEL GARD (94-95)
(Physical Therapy Major)

"MPI was sort of a preparation for the difficult courses I encounter in college now. The transition from high school-type classes to college-type classes is so huge; I really think MPI helped to bridge the gap. It showed me the time and effort involved in succeeding in upper-level courses.

I think it is a wonderful program. The teachers express a sincere concern for the students understanding, and are very encouraging. Students looking for a challenge are very lucky to have a program like the MPI."

DEREK OLSON (94-95)
(Civil Engineering Major)

"I got used to studying hard for college level tests at MPI. This carried on to college, and the workload at UMR was not quite an unexpected, dramatic change. I have done well in my college classes, and I attribute some of this success to MPI preparing the way. High school calc and physics classes don't adequately prepare students pursuing technical degrees. I am truly amazed at how math and science affect our world.

I definitely recommend MPI. The calc and physics at MPI are true college level classes. It is good to get a jump on these classes in high school. The study skills developed will aid one for the rest of his/her college career. Even non-technical majors can benefit from MPI. The competition at MPI is fierce, because the best students of the area attend. The competition sparks better performances from everyone involved. Mathematics and science are very important in this world. And math truly is the language of science."

REBECCA SCHWIETZ (94-95)
(Economics Major)

"There was greater teacher contact and student-teacher interaction at the MPI. The material was always presented clearly and with a structure. Also, the labs were helpful in seeing what all of the computational fuss was about. Overall - a good intro to college math, tho not necessarily a replacement for Calc I or II at the college itself.

If any of your students in the next couple of years are interested in coming to the East, or even in just going away (non-midwest) and would like to chat with someone, please give them my e-mail address. (schwietz@fas.harvard.edu) If no e-mail, my parents (home address/phone) would be happy to give them my current phone number...

Enjoy the rest of your year..."

BRIAN STUCK (94-95)
(Piano Performance Major)

"Although the field I have chosen to major in does not directly use the skills I learned at MPI, I feel as though MPI was a wise choice for me in high school. One reason was my indecision in high school on what would be my major. MPI showed me accurately what was ahead in math/science and although I excelled there, I preferred music. I believe now that the problem solving techniques and thought processes I learned at MPI have greatly enhanced my abilities in the theory or analysis part of music. As a result I have also excelled in the technical analyis of music. Besides calculus and physics looks impressive on a music major's transcript.

MPI is a good experience for anybody no matter what their plans are for college, I would recommend it to anybody. It teaches discipline and wakes one up to the reality of education. But by being a half-pace class, with lots of individual time with the teacher, makes it accessible

to just about anybody who is willing to work. You don't realize how nice MPI is until you get into college pace classes."

MARLENE TOOLE (94-95)
(Biology Major)

"MPI helped me prepare for the "This isn't high school anymore" shock. Emotionally, MPI helped me learn that the world doesn't end at a B+, and that I'm smarter than I give myself credit for. **If** I apply myself, I am capable of understanding calculus and physics. MPI was a wonderful experience. The teachers are very knowledgeable, and will help anyone whenever they need it. MPI also gave me a look at what study really meant. It is an excellent transition into college, and should be continued at all costs!!

MPI was a great experience. My only wish is that I had been more aware at the time, of how useful it was. I let myself get by with college B's, thinking I wouldn't need to take anymore of it. That was a huge mistake, which I will regret for the rest of my life!!! The instruction is wonderful, and the material is important. My only suggestion is early in the year encourage students to find out exactly how much calculus and physics they need at their school(s) of choice. Perhaps that will discourage fools like me from not taking full advantage of this wonderful opportunity and learning all they can."

JENNIFER WOOLSEY (94-95)
(Accounting Major)

"The instruction in the MPI courses was a lot better than the mathematics class I have taken since then. The MPI teachers try to explain things in more than just one day. The teachers really care about the students and the students' grades.

MPI gave me a great experience of college classes. The coursework at MPI helped me to learn how to study for later classes. Knowing how to study in college is a major part of your grades, and MPI helped me to study as a college student (not just cram before a test).

You guys are doing great!"

AMANDA BENAVIDEZ (95-96)
(Journalism/Interdisciplinary Major)

"I think that MPI was worth it. I didn't do as well as I could have, but it was my fault. I saw that if I worked hard, I could do it, and I think it's good that the MPI staff tries to work with the kids and let them know how college really is. If anything, despite my average grade I got in calc, MPI showed me how to learn. The KCMO School district isn't the best, and MPI gives some students from the KCMO district (a chance) to really learn higher math and science, things that are needed in today's society. MPI really had an effect on me, and I thank each and every one of you."

RAGAN BUCKLEY (95-96)
(Government Major)

E-mail received 12-11-96:

"I've been really busy this week, what with my job (filing papers in the admissions office), two papers due before break, a chemistry test Monday, a big computer science assignment also due Monday, and extra time in the chemistry lab, finishing up a big project. Government is still my major; this semester has only confirmed that. My government class is my favorite, definitely. The professor worked at the White House during three separate administrations, and so he has a lot of experience to draw on (since the topic of the course is the American Presidency). I haven't seen Rebecca (Schwietz, MPI 94-95) since the first week I was here, but I was thinking about dropping her a line.

Actually, I leave Independence on January 2. I have a class that meets during the reading period, and that means a chemistry lecture on January 3. Sorry ... I did want to take part in the Panel Discussion this year... well, maybe next time."

MORE 1996-97 STUDENT FIRST IMPRESSIONS

"Halfway into the year, the MPI seems much less bleak than it did at

the beginning of the year. By now I have developed some good study skills and I have learned how to better manage my time (first study, then take a nap). Overall I believe my MPI experience will prove to be very beneficial for college."

Rob Monnig
Truman High School
Independence School District

"When I first started at MPI, I was so confused. Even though I've taken a lot of college classes at Penn Valley, I've never seen any hard classes like MPI. It drives me "crazy"!!! Due to the support and encouragement from the teachers here, I have improved a lot. Anyway, I'm very glad to be at MPI because it gives me an opportunity to get ready for "real" college."

Khoi Nguyen
Northeast High School
Kansas City, MO School District

"When I first visited MPI I thought it would be tedious, and I had no idea how laborious it would be with all the homework, labs, and studying. MPI is not only challenging, but it becomes your life if you want to succeed. Weekend study groups are essential. First semester is over and I am proud of my accomplishments, but there is always room for improvement here. No matter what, stick with this program because it is better to take these classes now than to wait until your stressful freshman year in college."

Crystal Gearke
Wm. Chrisman High School
Independence School District

"My study habits, math skills, and standardized test scores have all improved since being in the MPI. I have matured immensely from this program."

Jacqueline Fairley
Van Horn High School
Kansas City, MO School District

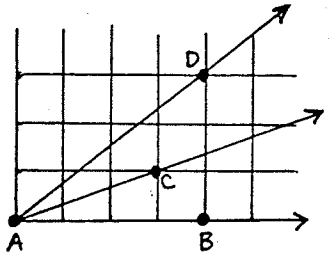
"Have you ever stepped out of a hot, steamy, and relaxing shower only to realize that the bathroom is cold and shocking? That's my first impression of MPI. High school teachers shower you with praise because you're one of the best, but at MPI you learn a shocking truth: GASP! Other people <u>can</u> and <u>are</u> better than you at math and physics! My second realization is the support from the MPI staff. I like to think of them as the towels that wrap you with relief assuring you that the worst shock is over. The MPI "towels" absorb all my shocking fears and welcome me into a different realm of education that is both challenging and fascinating."

Teresa Schleuter
Paseo High School
Kansas City, MO School District

A SOLUTION TO MATHEMATICS CHALLENGE #46

Recall the problem statement:

Three rays AB, AC, and AD are drawn from point A on graph paper as shown below.

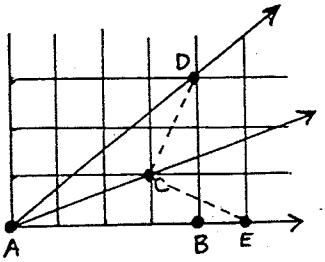


Using the square grid, prove that the angles BAC and CAD are equal.

[From: M. Koman, Quantum/Brain Teasers, March/April 1995, p. 9.]

SOLUTION:

In the extended sketch below, assuming that the side of each square on the grid has length 1, by applying the Pythagorean Theorem to right triangle ΔABD, we see that $AD = \sqrt{(4^2 + 3^2)} = \sqrt{(25)} = 5$.



So, AD = AE. Then, since they are identical diagonals of tiny two-square rectangles, we also see that CD = CE. Therefore, having identical sides, triangle ΔAEC is congruent to triangle ΔADC, meaning in particular, angles BAC and CAD are congruent, as desired.

A SOLUTION TO PHYSICS CHALLENGE #37

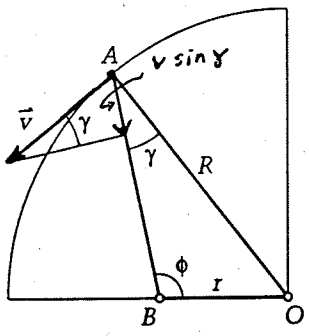
Recall the problem statement:

A horse runs with a constant speed v in a circle of radius R. A person stands at a distance r from the circle's center. What is the maximum speed at which the horse approaches the person?

[From: A. Bytsko, Quantum Magazine, March/April 1995, P 136, p. 29.]

SOLUTION:

Let the horse be at point A, and the person be at point B, as seen below:



Write OA = R, OB = r, $\angle OBA = \phi$, and $\angle BAO = \gamma$. The speed at which the horse approaches the person is the component of the velocity vector $\vec{v}$ along the direction AB:

$$v_{appr} = v \sin \gamma,$$

where v is the magnitude (speed) of the velocity vector $\vec{v}$. Since v is constant, to maximize v_{appr} we must find the position of point A where angle γ (hence, $\sin\gamma$) is the greatest. By the Law of Sines applied to triangle ΔOBA, we have

$$\frac{\sin\gamma}{r} = \frac{\sin\phi}{R}, \quad \text{so}$$

$$\sin\gamma = \frac{r}{R}\sin\phi \le \frac{r}{R}, \text{ because } \sin\phi \le 1.$$

Thus, $v_{appr} = v \sin\gamma \le v\frac{r}{R}$.

When $\phi = 90°$, $\sin\phi = 1$, and v_{appr} attains its maximum:

$$v_{appr\ max} = v\frac{r}{R}.$$

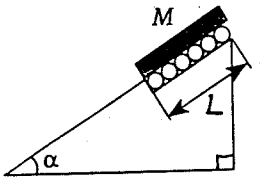
MATHEMATICS CHALLENGE #47

Suppose you have 6 points in the plane, and each point is joined by either a blue string or a red string to each of the other five points.

Prove that there must exist at least one completely blue triangle, or one completely red triangle.

PHYSICS CHALLENGE #38

A homogeneous bar of mass M and length L begins to move downward along an inclined plane that makes an angle α with the horizontal.



The initial portion of the inclined plane of length L is occupied by closely packed rollers made of tubes of mass m and radius r << L, which rotate on ball bearings without friction. The rest of the inclined plane is frictionless.

Find the dependence of the bar's acceleration on its position as it moves.

[From: A. Stasenko, Quantum Challenges in Physics & Math, March/April 1996, p. 16]

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