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## AT THE SEMESTER

We extend congratulations to our current TOP TEN students, determined as such from the average of their college Calculus and Physics grades for the first semester. They are listed below alphabetically according to school:

Duc Tran	(East)
Jason Stabenow	(Fort Osage)
Hien Tran	(Northeast)
Ryan Baker	(Truman)
Chris Nielson	(Truman)
Jeremy White	(Truman)
Reese Isbell	(Van Horn)
Michele Kliebert	(Van Horn)
Vanessa White	(Wm. Chrisman)
Nate Moore	(Wm. Chrisman)

(Note: Chris Nielson is taking only Physics.)

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## A BALANCING ACT

A recent problem-solving session in Physics was very much hands-on. Students in each section were divided into groups of four, and presented with the following problem: Given a bench, and two 8 foot planks of 2" X 10", and your team weights, what is the best arrangement of your team and planks so that when the planks are placed on the bench extending beyond one end, the maximum weight will be supported at a maximum distance from the point where the planks first extend past the bench? Furthermore, this was not simply a paper problem; once the calculations were complete each group was required to test its work in practice!

The exercise lead to everything from immediate failure to wobbly success, as our students laid their bodies on the line, dramatically driving home to them the fundamental notions that 1) calculations must be done carefully and correctly, and 2) in science a theoretical model ought to be tested for accuracy in the real world, to avoid the crashing consequences of trusting either a poor model, or the poor application of a good one.

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## OUR HIGH SCHOOL TEACHERS 1987-88

One of the unique features of the Institute is that six experienced high school teachers from six different high schools meet every morning to teach together, and to exchange ideas with colleagues that they might never have otherwise met. In the four years that most of our faculty have been together, they have unanimously agreed that for them this aspect of the MPI is perhaps more valuable than any other. In almost no other arena can they thrash out ideas and techniques with colleagues of the same level of talent and experience; one of our instructors even remarked that he had been considering retiring until the Institute and his new professional contacts here revived his interest. And, that same strength of comradery and crossfertilization of ideas that has evolved among these teachers over the course of four years in turn grows among each years' students.

As a part of this ongoing

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faculty enrichment, each year the MPI has sent either the physics teachers or the mathematics teachers as a group to a national professional meeting. Two years ago the two physics instructors attended the national meeting of the AAPT (American Association of Physics Teachers) in Atlanta, Ga.; last year the four mathematics instructors attended the national meeting of the NCTM (National Council of Teachers of Mathematics) in Anaheim, Ca. This year once again it was the turn of the physics pair and just this week they've returned from the national meeting of the AAPT in Washington, D.C. brimming (we suspect) with some new ideas, and certainly sharing a freshened outlook.

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#### ENRICHMENTS

The annual Panel Discussion held on Jan. 6, consisting of a panel of past MPI students, now in college, was its usual success, especially since Teddy Lambson graciously agreed to chair the panel once more.

On Jan. 20, Dr. Charles Wurrey of the UMKC Dept. of Chemistry addressed us on Dioxin, explaining the nature of the particular toxic chemicals subsumed under that broad category which have been troublesome here in Missouri, at places such as Times Beach.

#### UPCOMING ENRICHMENTS

On Feb. 3, Dr. Wai-Yim Ching of UMKC's Physics Dept. will talk about Superconductors, and his participation in the current fast and furious research to discover materials that are both less brittle than the current ceramics, and able to superconduct at higher temperatures.

No further dates have been confirmed, but:

Dr. Larry Campbell of the School of the Ozarks has consented to give a lecture on the History of Mathematics, with particular attention given to those curious and interesting mathematicians who made that history.

Dr. Richard Hetherington of UMKC's new and rapidly growing Computer Science Dept. has promised to provide a speaker for us, possibly even himself, to discuss the present state of the field.

We also hope to bring back Dr. Bruce Barker from the UMKC School of Dentistry for his stimulating discussion of AIDS, etc., which he first presented to the MPI last year.

Finally, we plan to visit the new GM plant in Fairfax sometime this semester.

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#### MORE QUOTES FROM OUR STUDENTS

"The teachers and students here at MPI make it both interesting as well as fun to be here. It is so nice that we have such talented teachers here to help us as we make the change from high school to college."

Vanessa White  
William Chrisman High School  
Independence District

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"Although the subject matter introduces me to college material, the most important discipline I've learned is staying awake during a pre-dawn Physics lecture."

Eric Butcher  
Raytown High School  
Raytown School District

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"MPI is one of the best programs I have attended. The teachers really care about you and the environment is nice."

Duc Tran  
East High School  
Kansas City, MO. District

"The Mathematics and Physics Institute has been a very good experience for me. The people here are very kind and helpful. I have learned a lot here and would recommend other people to try it."

Kim Wehmeyer  
Fort Osage High School  
Fort Osage District

a path from the topmost A to the bottommost A of the array. The number of such paths is given by the entry in Pascal's triangle corresponding to the bottommost A.

Recall that Pascal's triangle begins:

```

1
1 2 1
1 3 3 1
1 4 6 4 1
1 5 10 10 5 1

```

and each entry is the binomial coefficient:

$$\binom{N}{R}$$

where  $N$  = the row number, and counting from the left side,  $R$  = the entry in that row. The only convention to be kept in mind is that we begin both  $N$  and  $R$  with zero, so the rows and entries in those rows are numbered  $0, 1, 2, \dots$

In the present problem, we see that the bottommost A corresponds to the entry:

$$\binom{10}{5} = \frac{10!}{5! \cdot 5!} = 252.$$

So there are 252 different ways of reading ABRACADABRA in the above array. (Surprised?)

A SOLUTION TO  
MATHEMATICS CHALLENGE #3

Recall the problem statement:

In how many different ways can you read the word ABRACADABRA in the following array, beginning at the top and moving downward a letter at a time?

```

  A
 B B
R R R
A A A A
C C C C C
A A A A A A
D D D D D
  A A A A
    B B B
      R R
        A

```

SOLUTION:

Each reading of the word ABRACADABRA in the manner described above requires choosing

MATHEMATICS CHALLENGE #4

What is the largest positive integer  $N$  for which

$$N^3 + 100$$

is divisible by  $N + 10$ ?

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## HIGH SCHOOL VISITS

Once again the MPI staff will soon be visiting each of the 8 participating high schools to give a slide presentation describing what the Institute offers, and what the requirements are for entry. This year's MPI students from the school we visit will also be on hand at that time to share their thoughts about the program.

After our visits, students interested in applying to the Institute should contact their counselors, who will then schedule them to take the MAA Calculus Readiness Test, which we administer at each school near the end of the semester.

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