2007 PROM/SE SUMMER MATHEMATICS ACADEMY

Please join us for the PROM/SE Summer Mathematics Academy. Spend time delving deeply within one content area in courses taught by experts in K-12 mathematics education.

UNDERLYING PRINCIPLES: PROM/SE Academy courses are developed around topics of greatest need as identified by data collected from PROM/SE districts. Courses are grounded in research, provide opportunities for teachers to reflect on the research relevant to the course, and consider the cognitive demands of tasks. Each course is designed and facilitated to deepen teachers' knowledge of the mathematics students are expected to learn according to the state standards, expectations, benchmarks, and indicators.

WHO CAN PARTICIPATE? PROM/SE Mathematics Associates, as well as teachers from PROM/SE buildings.

REGISTRATION: **Registration deadline is April 5, 2007**.
Please register early. Space is limited. The registration form and course fee must be submitted at the same time. Please send a $100 check along with a completed registration form to your PROM/SE site coordinator. See details on registration form. **Refunds will not be given after the registration deadline unless the course is cancelled.** Extra brochures and registration forms can be downloaded at www.promse.msu.edu.

COST: There is a $100 course fee to attend.

STIPEND: A daily stipend of $75 will be paid to registered participants who attend the entire day and sign in/out.

CREDITS: CEUs are available at no charge. Two university graduate credits (pending approval) are available for an extra fee. To be eligible for CEUs or credit, participants must attend the entire institute. University credit requires completion of extra assignments.

ABOUT PROM/SE: Supported by the National Science Foundation, PROM/SE is a comprehensive research and development effort to improve mathematics and science teaching and learning in grades K-12, based on assessment of students and teachers, improvement of standards and frameworks, and capacity building with teachers and administrators. PROM/SE has six partners in Michigan and Ohio: Calhoun ISD, MI; High AIMS Consortium, OH; Ingham ISD, MI; Michigan State University; SMART Consortium, OH; and St. Clair County RESA, MI. For more information about PROM/SE and a full calendar of learning opportunities, visit www.promse.msu.edu.

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For more information about PROM/SE and project activities, visit www.promse.msu.edu or contact
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MICHIGAN STATE UNIVERSITY

PROMOTING Rigorous Outcomes in Mathematics and Science Education

2007 Summer Mathematics Academy

June 25-28
High AIMS
Princeton High School
11080 Chester Road
Cincinnati, Ohio

July 30–Aug 2
SMART
Corporate College East
4400 Richmond Road
Warrensville Hts, OH

Aug 13-16
Calhoun ISD
Ingham ISD
St. Clair Co RESA
East Lansing High School
509 Burcham Drive
East Lansing, Michigan

8:00 – 4:00 pm daily

Please join us for the PROM/SE Summer Math Academy, co-sponsored by Calhoun ISD, High AIMS Consortium, Ingham ISD, Michigan State University, SMART Consortium and St. Clair County RESA.

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ELEMENTARY COURSES

Geometry: Measuring Space in One, Two, and Three Dimensions *Teachers of Grades K-5*
Participants examine different attributes of size, develop facility in composing and decomposing shapes, and apply these skills to make sense of formulas for area and volume. They also explore conceptual issues of length, area, and volume, as well as their complex inter-relationships. The work consists of viewing and discussing videotapes of mathematics classrooms, analyzing lessons, and reading overviews of related research. Participants will read case studies between class sessions.

Number and Operations part 1: Building a System of Tens *Teachers of Grades K-5*
Participants explore the base-ten structure of the number system, consider how that structure is exploited in multi-digit computational procedures, and examine how basic concepts of whole numbers reappear when working with decimals. The work consists of viewing and discussing videotapes of mathematics classrooms, analyzing lessons, and reading overviews of related research. Participants will read case studies between class sessions.

Number and Operations part 2: Making Meaning of Operations *Teachers of Grades K-5*
Participants examine the actions and situations modeled by the four basic operations. The seminar begins with a view of young children's counting strategies as they encounter word problems, moves to an examination of the four basic operations on whole numbers, and revisits the operations in the context of rational numbers. The work consists of viewing and discussing videotapes of mathematics classrooms, analyzing lessons, and reading overviews of related research. Participants will read case studies between class sessions.

New **Number and Operations part 3: Reasoning Algebraically about Operations** *Teachers of Grades K-5*
Participants examine generalizations at the heart of the study of operations in the elementary grades. They express these generalizations in common language and in algebraic notation, develop arguments based on representations of the operations, study what it means to prove a generalization, and extend their generalizations and arguments when the domain under consideration expands from whole numbers to integers. The work consists of viewing and discussing videotapes of mathematics classrooms, analyzing lessons, and reading overviews of related research. Participants will read case studies between class sessions.

MIDDLE SCHOOL COURSES

Fraction and Decimal Operations *Teachers of Grades 5-7*
Fractions and decimals are central in upper elementary and middle grades mathematics. Participants in this course will consider strategies to help students understand how and why to operate with fractions and decimals. The course will emphasize making connections among the different representations in ways that enhance student learning. Suggestions from research provide the underlying framework for the activities.

Geometry and Measurement II *Teachers of Grades 5-8*
Elementary concepts of perimeter, area, and volume will be extended to apply to more complex shapes. Participants will explore relationships between measurements for two- and three-dimensional shapes and develop formulas through use of mathematical tasks of varying levels of cognitive demand. Applications include developing an understanding of the Pythagorean theorem (a key tool in working with some of the shapes).

MIDDLE SCHOOL COURSES (Continued)

New **Proportionality Across the Strands: Number, Algebra, and Geometry** *Teachers of Grades 5-8*
Proportional reasoning is important for students to learn, though studies indicate that utilizing proportional thinking is more difficult for students than additive thinking. Participants in this course will consider strategies to help students develop and apply proportional reasoning to concepts such as; ratio, proportions, rates, scale factors, congruence, and similarity. Applications of proportional reasoning will include problems in banking, science, and the arts.

Equations and Lines *Teachers of Grades 6-9*
The middle school mathematics curriculum has a strong emphasis on developing students' understanding of equations and their solutions. This course provides teachers with strategies to help students understand equations and their solutions, develop formal strategies for finding solutions, graph linear functions, and find and recognize equivalent expressions and equations. Participants will consider the role of tasks and levels of cognitive demands as key elements of lessons that lead to students' deeper understanding of the underlying mathematics.

HIGH SCHOOL COURSES

New **The Mathematics of Change from a New Perspective** *Teachers of Grades 8-12*
This course relates to and extends the ideas from the Change course from previous Summer Academies, but the first course is not a prerequisite. Change and how it behaves in different circumstances is a central element in many areas of mathematics. Situations such as loans and savings accounts (interest), the absorption of drugs into the bloodstream, Fibonacci numbers, and models of population growth can be described in terms of both discrete and continuous change equations that relate one term in a sequence to previous terms in a regular way. This course will develop several methods of description and prediction in these situations and will make connections to different mathematical approaches including matrices. In addition to providing mathematical background for middle and high school teachers, this course addresses pedagogical approaches and the use of technology that supports instruction.

Algebra II for All: A Data Driven Approach *Teachers of Grades 9-12*
Real-world contexts and applied problems can be effective tools for motivating fundamental ideas of algebra. Participants will explore the use of formulas from a variety of areas and relate them to the mathematics in the second year algebra curriculum, model relationships and discuss why these models are appropriate, and develop connections among different representations and areas of mathematics. One of the central themes will be helping students see that mathematics is a sense making discipline. The content is shaped by the second-year algebra curriculum. Technology will play a central role in the carrying out the activities.

New **Developing Mathematics: Some Applications of Geometric Thinking** *Teachers of Grades 9-12*
While geometry is a wonderful field in its own right, geometric ideas are also useful tools for studying and understanding all kinds of phenomena inside and outside of mathematics. Teachers in this course will look at some basic geometric habits of mind and apply these habits to a wide variety of situations. For example, what attributes of a figure stay the same when the figure is changed in some regular way; what does the fundamental theorem of algebra say, why is it fundamental, and why is it true?; if you pick a positive number, take its square root, take the square root of that, and keep up the good work, what happens and why? No background with any of these questions will be assumed. Participants will learn how to use The Geometer's Sketchpad® as a tool for the work. (This course was originally developed for the Institute for Advanced Study's Park City Mathematics Institute.)