



**FOCUS ON MATHEMATICS** is a unique partnership funded by the National Science Foundation to improve student achievement by providing mathematics teachers with the content knowledge and expertise most valuable in their profession.

In partnership with mathematicians and educators, **FOCUS ON MATHEMATICS** has created professional development programs in school districts and a new professional master's degree program at Boston University.

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# FOCUS ON MATHEMATICS

## MATHEMATICS EXPOSITION



**JUNE 11, 2005**

**THE SKYLINE ROOM  
BOSTON MUSEUM OF SCIENCE  
SCIENCE PARK  
BOSTON, MASSACHUSETTS**

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## Acknowledgements

*Focus on Mathematics* would like to extend its sincere thanks to many people who contributed to the success of the 2005 Math Expo. We greatly appreciate the support of our district superintendents and principals; the tireless effort of the *FoM* District Leaders to coordinate math fairs at the district level; the amazing, dedicated teachers who worked with and supported their students throughout the entire process; parents who undoubtedly made extra trips to and from school, supplied materials, and offered encouragement along the way; the mathematicians and mentors for their guidance and willingness to help in all sorts of ways; and most especially to the students for their many hours of hard work and for their commitment to their own learning and success. It has been a privilege to be involved with such bright, dedicated students.

A very special thanks goes to Ava Berinstein at Boston University, *FoM's* Math Fair and Expo Coordinator, for handling so many details and making it appear effortless; to Jill Vollmuth and Karina Dymina from EDC, Inc. for assisting in numerous ways; and to Edna Chiu and David Loi, students at BU, for assisting with registration. The Math Expo is indeed the result of a partnership effort. We may have inadvertently forgotten to thank someone due to the scope of such an undertaking and the efforts of so many people. We apologize for any such omissions.

*We look forward to seeing you at  
Math Expo 2006!*

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## Welcome!

...to the 2<sup>nd</sup> annual *Focus on Mathematics Math Expo*. We are pleased to present this year's exhibit as an example of the dedicated work undertaken by over 1000 middle and high school students in our five partner districts: *Arlington, Chelsea, Lawrence, Waltham, and Watertown*.

Students were mentored by their teachers, university mathematicians, college students, and in many cases, their parents, to develop over 600 research projects on various mathematical topics. The projects were then presented at district math fairs in 13 different schools. The ones here today were selected on the basis of mathematical content and depth, extent of research, creativity, effort, and presentation.

We would like to acknowledge all the students who participated in their local math fairs. These students demonstrated tremendous determination and effort to research and complete a challenging mathematical problem. In addition, it took a great deal of confidence and courage to present their projects to judges, their teachers, and their peers. We commend every one of these students and sincerely wish we could have included more of their projects in this exhibit.

Congratulations to the students exhibiting projects in today's Math Expo at the Museum of Science. We are very proud to present 63 projects in this exhibit, representing the work of 116 students. These students are eager to share their research experience, so we hope you will allow time for the students to discuss their work with you and answer questions you might have.

We would like to thank you for coming to today's event to celebrate the outstanding achievement of students in our partnership. We hope you enjoy the afternoon!

*Glenn Stevens*      *Wayne Harvey*      *Al Cuoco*  
Boston University      EDC, Inc.      EDC, Inc.

*Principal Investigators for Focus on Mathematics*

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# *Student Projects by District and School*

*Teachers listed with each school are those with students who participated in district Math Fairs and/or who assisted or judged at the fairs.*

## **ARLINGTON SCHOOL DISTRICT**

Superintendent – Kathleen Donovan  
Assistant Superintendent – Joanne Gurry  
FoM District Leader – Kathleen Bodie

## **ARLINGTON HIGH SCHOOL**

Principal – Charles Skidmore  
Teachers – Joanna Begin, Kathleen Bodie, Octavia Brauner, Al Flanders,  
Dennis Geller, Doreen Kilday, Nigel Kraus, Jane Martin, Chris Martino,  
Hugh Morgenbesser, Kambiz Vatan

### **APPROXIMATING SQUARE ROOTS**

Nathaniel Lim (Grade 10)

### **BENFORD'S LAW**

Marty Fahey (Grade 11)

### **PASCAL'S TRIANGLE**

Erin Bessette-Kirton, Bobby McWatters, and Melissa O'Connell (Grade 9)

### **PHYSICS OF FRISBEEES**

John Coglianese and Thomas Liu (Grade 10)

### **POLYGONAL NUMBERS**

Steve Carmody and Paul Jaffe (Grade 9)

### **PRIME ENCRYPTION**

Miranda Forman (Grade 9)

### **ROCKIN' ROUTES**

Hannah Harris and Ella Hartenian (Grade 10)

### **SPEECH SYNTHESIS**

Jonathan Hejzlar, Mike Maloney, and Scott Steinmetz (Grade 12)

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# *Special Honors and Awards*

In recognition of our students' Math Expo achievements, many state officials sent congratulatory awards and citations. We are grateful to the following list of distinguished representatives who issued these special awards:

## **ARLINGTON**

Senator Robert A. Havern  
Representative Jay R. Kaufman  
Representative J. James Marzilli Jr.  
Representative Anne M. Paulsen  
U. S. Congressman Edward J. Markey

## **CHELSEA**

Senator Jarret T. Barrios  
Representative Eugene L. O'Flaherty  
Representative Kathi-Anne Reinstein  
U. S. Congressman Michael E. Capuano

## **LAWRENCE**

Senator Susan C. Tucker  
Representative David M. Torrissi  
Representative William Lantigua  
Representative Barry R. Finegold

## **WALTHAM**

Senator Susan C. Fargo  
Representative Thomas M. Stanley  
Representative Peter J. Koutoujian  
U. S. Congressman Edward J. Markey

## **WATERTOWN**

Senator Steven A. Tolman  
Representative Rachel Kaprielian  
Representative Peter J. Koutoujian  
U. S. Congressman Edward J. Markey

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# Mathematicians

The Research Projects initiative puts students and teachers in the *Focus on Mathematics* partnership in direct contact with mathematicians. This has given many students the opportunity to experience mathematics as a scientific discipline and to be mentored on their mathematical projects by a team with a classroom teacher working alongside a university mathematician, and in some cases, university students. Many of the *FoM* mathematicians and mentors also served as judges at the district math fairs. A special thanks goes to two mathematicians who served as the Math Expo Advisors and played key roles in the organization of the research projects:

## Art Heinricher

Worcester Polytechnic University

## Dick Hall

Boston University

Many thanks to our other *Focus on Mathematics* mathematicians and mentors for their dedication and hard work, their commitment to the learning of mathematics for all students, and for the huge contributions they made to the success of the 2005 Math Expo:

### Boston University

Paul Blanchard  
Marvin Freedman  
Art Johnson  
Steve Rosenberg

Robert Devaney  
David Fried  
Emma Previato  
Glenn Stevens

### EDC, Inc.

Al Cuoco  
Steve Benson

### UMass Lowell

Al Doerr  
James Graham-Eagle  
Ken Levasseur  
Marvin Stick  
Andrew Larocque, mentor

### Worcester Polytechnic Institute

Suzanne Weekes  
Bogdan Vernescu

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## OTTOSON MIDDLE SCHOOL

Principal – Stavroula Bouris  
Teachers – Fenna Beverly, Jon Beverly, Larry Greco,  
Nella Larosa-Waters, Sue Nocella, Linda Tomilson

### BOAT GAME STRATEGY

Caroline Donovan, Maria Lobo, Katrina Rosenberg,  
and Jenny Ross-Callahan (Grade 6)

### MAGICAL MATH OF HARRY POTTER

Lindsay Culbert-Olds and Sonya Entova (Grade 8)

### ORIGAMI

Heather Kobayashi and Paul Sukijthamapan (Grade 8)

### “OUT-CALCULATING YOUR OPPONENT”

Jeffrey Lim (Grade 8)

### PYTHAGOREAN TRIPLETS

Ben Kuhn (Grade 6)

### SIMPLEX LOCK

Adam Formica, Vasiya Kochura, and Brian Lynch (Grade 8)



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## CHELSEA SCHOOL DISTRICT

Superintendent – Tom Kingston  
Assistant Superintendent – Mary Bourque  
FoM District Leaders – Andrea Pulver and Ben Sinwell

### CHELSEA HIGH SCHOOL

Principal – Mort Orlov  
Teachers – Susan Castella, Mel Conway, Mike Grubin, Ana Mateos,  
Deborah Miller, Pat Norton, Ross Phifer, Kevin Wynn,  
Emily Romano, Ben Sinwell, Strehon Treadway,

#### BIORHYTHMS

Joseph Campers (Grade 9) and Jessica Tejada (Grade 12)

#### BLACK HOLES

Kyle Roldan (Grade 10)

#### CONTINUITY AND INCOME TAX

Patel Nisarg and Maja Trokic (Grade 12)

#### EXPONENTIAL DECAY

Anosha Hassan and Maritza Rios (Grade 11)

#### FACE PROPORTION

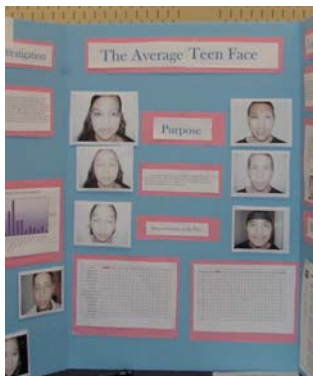
Emily Caulfield and Vanessa Lepe (Grade 9)

#### STRING ART

Monica Aragon (Grade 10) and Abby Pacheco (Grade 12)

#### TESSELLATIONS

Victoria D'Elia (Grade 9)



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## WATERTOWN SCHOOL DISTRICT

Superintendent – Steven Hiersche  
Assistant Superintendent – Stephen Gould  
FoM District Leader – Chuck Garabedian

### WATERTOWN HIGH SCHOOL

Headmaster – Paul Michael Noftsker  
Teachers – Keri Brookshire, Jonas Kalish, Mike Spillane,  
Karen Trenholm, and Dan Wulf

#### CHECKER PROBLEM

Pat Barry, Vivian Brown and Jason Cormier (Grade 10)

#### DON'T COMPLETE THE SQUARE

Deborah Chase and Immy Yu (Grade 10)  
and Tia Dudley (Grade 11)

#### ENGINE TEMPERATURE VS. PERFORMANCE

Faris Azar and Michael Hayek (Grade 12)

#### FIBONACCI SEQUENCE

Elise Conde (Grade 9)

#### GREATEST PLAYER - JOHNSON OR BIRD

Stephen Daley and Carlos Mendez (Grade 11)

#### JUMPING CHECKERS

Kristen Salerno, David Sianissian, and Stefanie Sugrue (Grade 10)

#### NEWS SOURCES

Alex Garbier (Grade 11)

#### PART-TIME JOBS

Fatma Barkus (Grade 12)

#### TESSELLATIONS

Ani Hakobyn (Grade 9)

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## **WALTHAM SCHOOL DISTRICT**

Superintendent – Susan Parrella  
Assistant Superintendent, Curriculum and Instruction – Alec Wyeth  
FoM District Leader – Eileen Herlihy

### **WALTHAM HIGH SCHOOL**

Principal – John Graceffa  
Teachers – Jessica Bella, Matthew Chedister, Brooks Deering,  
Thomas DeSisto, Larry Enos, Ami Fasulo, Linda Furbish,  
Marianne Genova, Paul Grady, Steven LaForest, Madeline Litopoulos,  
Michael Lucchetti, Jack McMahon, Michael Russo, Richard Sanzo,  
Jerry Slavet, Michael Sparkes, Anne Marie Varella,  
Patricia Walker, and Leah Walton

#### **BASEBALL STATS – PREDICTORS IN BASEBALL**

Mike Annino and Nick Cummings (Grade 10)

#### **BREAK!**

Candace Cobuzzi, (Grade 9)

#### **CAR INSURANCE IN MASSACHUSETTS**

Zach Grant (Grade 9)

#### **CARPENTRY STAIR DESIGN**

Merideth Langton and Emily Wiseheart (Grade 11)

#### **CLOCK ALGEBRA**

Josh Robinson (Grade 9)

#### **CROSS COUNTRY TRIP**

Krista Firkins and Nicole Hanley (Grade 9)

#### **GOING, GOING, GONE!**

Kasey Acosta (Grade 11)  
Kim Canty and Kristen Dooley (Grade 10)

#### **PATHS THROUGH DOWNTOWN**

Abby Auld (Grade 9)

#### **SAVING FOR COLLEGE**

Ayesha Ahmed, Carlene Lindahl, and Christine Vongsy (Grade 12)

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## **LAWRENCE SCHOOL DISTRICT**

Superintendent – Wilfredo T. Laboy  
Assistant Superintendent, Curriculum and Instruction – Gail Rosengard  
FoM District Leaders – Donna Chevaire and Nancy McLaughlin

### **ARLINGTON SCHOOL**

Principal – Beth Qualter  
Math Coach – Ellen Murray  
Teachers – Colleen Alonzo, Ian Gosselin, Norma Ormaza, Angel Pabon,  
Melissa Scott, Steve Skaff, and Lynne Yarrows

#### **GEOMETRY AND QUILTING**

Adrianny Mendez (Grade 8)

#### **GRADES OF SEVENTH GRADERS**

Adelaida Camilio (Grade 7)

#### **HOW DOES AN AIRPLANE FLY?**

Domby Toribio (Grade 8)

#### **TAKING DOWN AN NFL ROOKIE**

Luis Rosado (Grade 8)

#### **TILES AND TESSELLATIONS**

Rafael Torres and Miguel Vasquez (Grade 6)

### **ALEXANDER B. BRUCE SCHOOL**

Principal – William Sullivan  
Math Coach – Susan Skaff  
Teachers – Michelle Arevalo, Tracy Archambeault,  
Joshua Segaloff, and Maria Bevins

#### **RECYCLING?**

Wandaliz Fernandez (Grade 5)

#### **PYRAMIDS-MODEL**

Joshua Maldonado (Grade 7)

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## LAWRENCE SCHOOL DISTRICT, CONTINUED

### ROBERT L. FROST SCHOOL

Principal – Ellen Baranowski  
Math Coach – Mary Samperi Giordano  
Teachers – Jacqueline Angelari, Jane Batchelder, Kourtney Kane,  
Mike Guertin, Rebecca heggarty

#### ANALYZING BONES

Lanh Dang and Stephanie Perez (Grade 8)

#### MARSENNE PRIMES

Allison Turcotte and Crystal Wade (Grade 6)

#### TRIANGULAR NUMBERS

Lynette Colome and Leslie Rodriguez (Grade 6)

#### USING AN ABACUS

Marissa Ard and Michael Galloway (Grade 6)

### GERARD A. GUILMETTE SCHOOL

Principal – Daniel J. Hanneken  
Math Coach – Patrice Holt  
Teachers – Tom Crowe and Paula Sideri

#### BLUE PRINTS

Daniel Goncalves, Felix Guilamo and  
Ricky Rodriguez (Grade 6)

#### CARNIVAL DAY

Danny Burgos and Cedric Thomas (Grade 8)

#### HEADS UP

Makra Long and Anna Ottenwalder (Grade 6)

### EMILY WETHERBEE SCHOOL

Principal – Colleen Lennon  
Math Coach – Kent Werst  
Teacher – Ania Leavy

#### FRACTIONS

Matthew Chretien, Joseph Mejia, and Manny Tejada (Grade 7)

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### LAWRENCE HIGH SCHOOL

Principal – Thomas Sharkey  
Math Coach – Carol Rosen  
Teachers – Jen Dupras and Sue Gerber

#### MUSICAL MATH

Cheyenne Espinal and Manuel Lopez (Grade 10)

#### PASCAL'S TRIANGLE

Tomas Chanquet and Thien Huyen (Grade 10)

#### PHI PROJECT

Estephany Berroa, Van Le and Yashira Robles (Grade 10)

### HENRY K. OLIVER SCHOOL

Principal – Jennifer Roybal-Harris  
Math Coach – Pat Nastasi  
Teachers – Margaret Lynch, William Mahoney, and Nancy Santoro

#### FIBONACCI NUMBERS

Cassandra Abou-farah, Aeesha Escribano, Kiara Garcia,  
and Jennifer Mejia (Grade 8)

#### FRACTIONS FROM RECIPES

Joanel Estrella (Grade 5)

#### PROBABILITY

Paola Carpio and Jackie Vega (Grade 8)

#### SUNDIAL AND CLOCK

Abraham Tejada (Grade 5)

### SOUTH LAWRENCE EAST

Principal – Mary Toomey  
Math Coach – Anne Cook  
Teachers – Jeff Brown, Donna DiZoglio, and Leo Flanagan

#### YOU QUACK ME UP

Elizabeth Garcia and Danica Veita (Grade 8)

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