

# An Embedded Professional Development Model for Secondary Mathematics Teachers with an Alternative Approach to Dual Credit

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# Basic Program Premise

Secondary math teachers can successfully serve as teaching assistants for college algebra, precalculus, elementary calculus.

- They substantially have math degrees and could plausibly be math graduate students
- The 18-hour SACS rule does not apply if \*:
  - They have no control over the syllabus
  - They have no control over the text
  - They do not assign the homework
  - They do not make out the tests
  - They are under general faculty supervision and meet regularly (weekly) with supervisors.
- They are trained in instructional methods appropriate for sr. high school/early college students

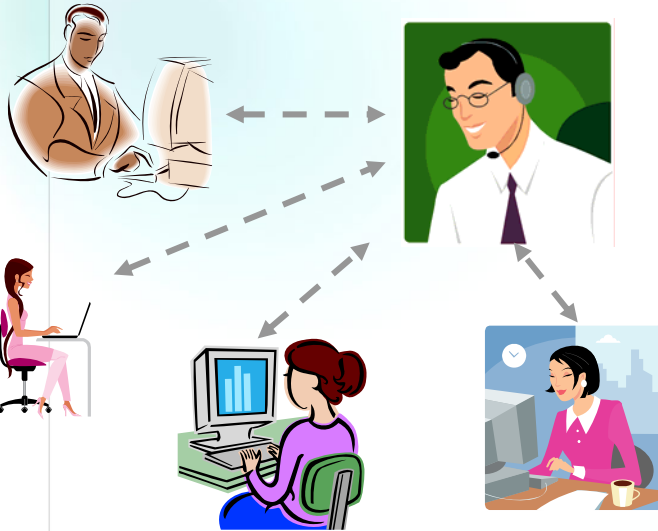
\* Checked with UK SACS compliance officer

# Program Features

- IHE develop courses and materials
  - Courses are offered on campus
  - Students get free texts and supplemental materials
- IHE faculty mentor High School teachers to offer the courses to advanced HS students
- High School teachers provide instruction
- IHE rigidly controls text, syllabus, homework, exams
- Successful students earn college credit for college course
  - High schools free to offer high school credit
- Program made possible through technology

# Basic Model Features

## Weekly Teacher Seminar/Graduate Course

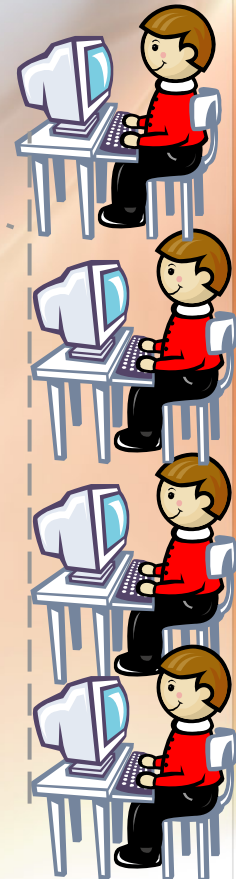


Central site  
for services

Students do common online  
homework and take common  
exams with on-campus students



Teachers employ appropriate  
Instructional model: formal class,  
personal instruction, mentoring,  
tutoring, etc. for their students.



# Students complete program:

- With credit in a principal “failout” course
- With a college transcript and an established relationship with the IHE
- Not having used any state scholarship (KEES) money
- Prepared for further credit-bearing math courses
- Experienced with distance learning mathematics instruction



# Economics

- Third party (NSF, Foundation, State) pays program operations:
  - Faculty: 1 FTE to develop, maintain a course
  - technology: approx \$100,000/yr for licenses, staff, operations
  - materials - approx \$25 per student
    - development
    - distribution,
  - exam scoring, approx \$20/student
  - teacher stipends, approx \$1500/yr
  - Overhead – 25%
- IHE grants credit (no tuition/no fees) to successful students - \$500-\$900/student
- Instruction is off-campus
- IHE is credited with instruction
  - Undergraduate. Graduate (for teachers)

# Nominal costs/yr for a model program

- 50 teachers = \$100,000/yr
- 1000 students = \$100,000/yr
- Evaluation/assessment = \$100,000
- Technology = \$100,000
- Faculty/grad students = \$400,000
- Overhead = \$200,000
- \$4000/teacher/year, \$200/student/yr

# Evaluation

- Content and technology evaluation is provided through direct feedback from teachers to developers.
  - Continuous improvement
- Program evaluation is provided by student homework and examination scores relative to those of the (on-campus) comparison groups
  - Maintenance of academic standards



# Program as Technology Transfer

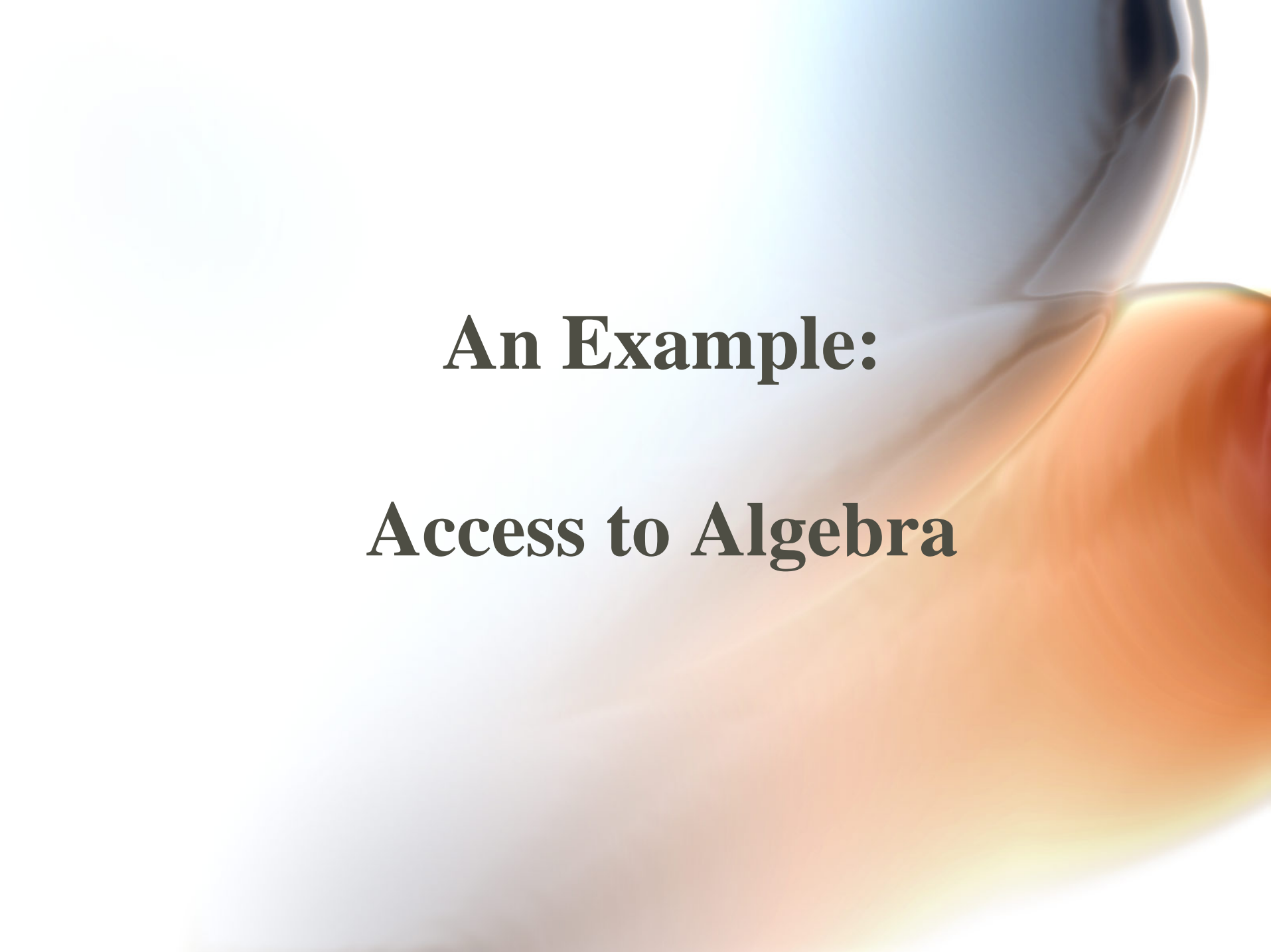
- Program is treated as systematic transfer of advanced technology from developers to professionals
- Employs year-long (weekly) seminar format:
  - moderated by expert user(s)
  - participants include recipients, developers and users
  - incremental transfer of content, philosophy, and implementation tools
  - Incremental implementation with discussion of evaluation issues
  - evaluation and improvement of the technology a major goal
- Program (objectively) assessed through measures of implementation success
- Program develops cadre of instructors familiar with IHE courses
- Provides formal process of curriculum alignment

# ‘Academic’ Technology Transfer

- Technology is a complete, “new” course of instruction
  - Has been successfully taught in one context
  - Objective is to transfer to participants the capacity to successfully offer (appropriate versions of) the course in their context
  - Free text, free online homework
- Academic year seminar
  - Includes participants and developers.
  - Moderated by expert user in “production” environment
  - Begins with overview and “walkthrough” followed by weekly discussion of instructional objectives, methods, and progress
  - Can be offered for graduate credit

# Technology

- (Centra) Asynchronous instruction (commercial system)
- Webclass (open source, developed with AMSP support at UK)
  - WHS (instructional support)
    - Online Homework
      - formatted math
      - Student/teacher interaction
    - Testing
      - Course
        - » Early (KEMTP)
        - » Placement
    - Materials Development tools
      - Posting System
      - Integrated web server
      - Problem Writing systems
      - Diagram development tools
  - Support for other disciplines
    - languages

The background features a soft, out-of-focus composition of two spheres. A large, white sphere occupies the upper right portion of the frame, while a smaller, vibrant orange sphere is positioned below and to the right of it. The lighting creates a gentle gradient across the scene, with the white sphere appearing brighter and more defined than the orange one.

# **An Example:**

## **Access to Algebra**

- College Algebra for high school students as corollary to professional development for teachers
- Alternative approach to dual credit
- Differential pay model for secondary math teachers
- Partnership among multiple independent organizations, programs
- Run by Lee Alan Roher as part of her doctoral research program
- Primarily supported by the AMSP



# AY (semester) Format

- Teachers select, invite average of 4 students for algebra program
- Students take UK Ma109 (college algebra)
  - Counselors must approve on behalf of school
  - Parents must approve
  - Same syllabus, (online) homework, schedule, tests as comparison groups of college students
  - Local Teacher is primary resource
  - Course parallel to defined on-campus comparison group
- Tests administered by teacher and sent\*\* to UK for common grading
  - Same tests as comparison group with same graders

- Course is UK Ma109 (College Algebra)
- Lee Roher is teacher of record.
  - Participating teachers are formally teaching assistants for recitation sections
  - Cleared by UK SACS officer
- Students are not registered until it is clear that they can succeed. Are granted the option of accepting credit with earned grade or not. All registration fees and tuition are waived by the university
- Teachers meet online weekly to discuss course, upcoming material, student progress, etc.

# Free\* Text Written by UK Math Professor

[https://www.msc.uky.edu/sohum/ma110/text/ma110\\_fa07.pdf](https://www.msc.uky.edu/sohum/ma110/text/ma110_fa07.pdf)

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  - 1.1.1 Working with Complex Numbers. . . . .
- 1.2 Indeterminates, variables, parameters . . . . .
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  - 1.3.1 Rational functions. . . . .
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- 1.5 Examples of polynomial operations. . . . .
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- Example 3. More Kuttaka problems. . . . .
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### 10 Looking closely at a function

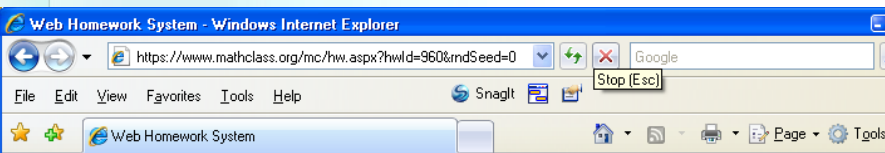
- 10.1 Introductory examples. . . . .
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  - Circle. Analysis near its points. . . . .
- 10.2 Analyzing a general curve  $y = f(x)$  near a point  $(x_0, y_0)$ . . . . .
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### 11 Root finding

- 11.1 Newton's Method . . . . .
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# Free Web Homework with Video Solution:

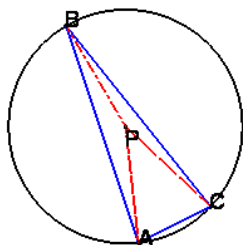
Videos Prepared by UK Faculty and Pre-service math teachers through support from AMSP



The circle in the diagram is centered at the origin and has radius = 1. Let  $A(-1, 0)$  be the chosen fixed point. If  $m = -\frac{1}{2}$  then the associated point B is (  ,  ).

## Question 8

[Click here for video solution to corresponding common version problem](#)



The equation of the circle which contains the points  $A = (0, -3)$ ,  $B = (-2, 3)$ , and  $C = (2, -2)$  is:

$$x^2 + y^2 + \boxed{\phantom{00}}x + \boxed{\phantom{00}}y + \frac{-72}{7} = 0.$$

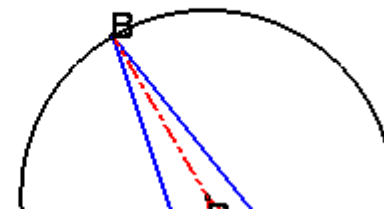
## Question 9

[Click here for video solution to corresponding common version problem](#)

Complete the table. In each blank enter the distance from the point at the top of the column to the line with the equation at the left end of the row.

line/point	(2,0)	(-2,-2)	(1,-3)
$2x + y + 2 = 0$	$\frac{6}{5}\sqrt{5}$	$\frac{4}{5}\sqrt{5}$	$\frac{1}{5}\sqrt{5}$
$3x - 3y + 1 = 0$	<input type="text"/>	<input type="text"/>	$\frac{13}{6}\sqrt{2}$

[Click here for video solution to corresponding common version problem](#)



Handwritten solution for Question 8:

$A = (1, -3)$   $B = (0, 1)$   $C = (1, 3)$

$$x^2 + y^2 + ux + vy = w \quad \leftarrow w = 1$$

$$x^2 + y^2 + ux + vy = 1$$

A:  $1 + (-3)^2 + u + (-3)v = 1$

$$9 + u - 3v = 0$$

B:  $1 + 9 + u + 3v - 1 = 0$

$$9 + u + 3v = 0$$

A+B:  $9 + u - 3v = 0$

$$9 + u + 3v = 0$$

$$18 + 2u = 0$$

$$2u = -18$$

$$\boxed{u = -9}$$

# Employs Open Source Homework System Developed with Support from AMSP

The fraction  $\frac{220772}{235516}$  is not in lowest

So  $\frac{220772}{235516}$  and  $\frac{110386}{117758}$  are fractions

Find the fraction in "lowest terms" w

where A and B are both positive and have

A =  B =

## Question 8

Fill in the missing entries in the following Aryabhata Algorithm

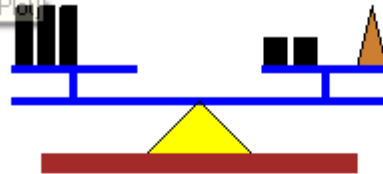
-Quotient	Answer 1	Answer 2	Remainder
	1	0	244
-3	0	1	68
<input type="text"/>	1	<input type="text"/>	<input type="text"/>
<input type="text"/>	-1	<input type="text"/>	<input type="text"/>
<input type="text"/>	2	<input type="text"/>	<input type="text"/>
<input type="text"/>	-5	<input type="text"/>	<input type="text"/>
<input type="text"/>	17	<input type="text"/>	<input type="text"/>

The greatest common divisor (GCD) of 244 and 68 is

From the table we can write GCD as a linear combina

=  \* 244 +  \* 68

Simple Plot



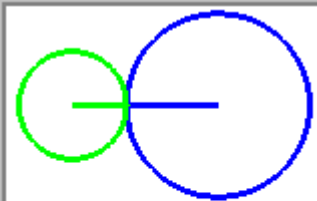
has a balance, a large collection of 37 gram weights and another weigh exactly 3 grams and he wants to check the weight and use

the other type on the opposite side so that the scale of the 37 gram weights in the left pan and

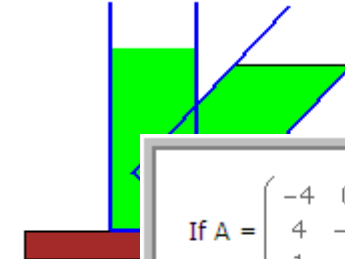
$$\begin{bmatrix} 0 & \frac{1}{4} & 1 & 0 & \frac{1}{4} & 0 & \frac{1}{4} \\ 1 & \frac{-3}{4} & 0 & 0 & \frac{-7}{4} & 0 & \frac{5}{4} \\ 0 & \frac{1}{4} & 0 & 1 & \frac{1}{4} & 0 & \frac{1}{4} \\ 0 & \frac{-1}{4} & 0 & 0 & \frac{19}{4} & 1 & \frac{59}{4} \end{bmatrix}$$

ate tableaux

for a m



eel of radius 1377 mm drives a

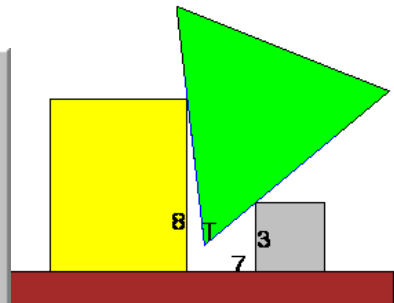


A container  
The contain  
container ar

If  $A = \begin{bmatrix} -4 & 0 & -2 \\ 4 & -2 & -2 \\ 1 & -1 & -5 \end{bmatrix}$  and  $B = \begin{bmatrix} -1 & 0 \\ -3 & 2 \\ 3 & 3 \end{bmatrix}$

then AB =

<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>
-13	<input type="text"/>



In the diagram (which is not to scale), if the angle T is too large then which the boxes rest. If T is much smaller then the triangle will rest largest angle T such that the triangle can touch the floor?

It is assumed that the triangle is sufficiently tall that its edges will

The problem is solvable  
The problem is unbounded  
Not enough information

Finish the solution process and give your decision.

Advice:



Formatted Math Feedback allows students to direct specific questions about homework problems to teacher and/or instructional assistants.

The image displays two screenshots of the WHS Feedback system, illustrating the process of providing formatted math feedback to students.

**Left Screenshot (Student Submission):**

The student's submission is titled "WHS Feedback" and shows the URL <https://www.mathclass.org/mc/whsFeedback.aspx?acctId=000000>. The submission includes the following text:

$q^2 = 5 + 6 + 2\sqrt{30}$

$q^2 - 11 = 2\sqrt{30}$  for convenience  $x = q^2 - 11$  then  $x^2 = 4 \cdot 30$ ,  $x^2 - 4 \cdot 30$  since this is irreducible then  $x^4 - 22x^2 + 1$  is irreducible.

**##WHAT THIS SHOWS IS THAT THERE IS NO LINEAR FACTOR. YOU STILL HAVE TO SHOW THAT THERE IS NO QUADRATIC FACTOR.**

{although after trying to work with it I'm still confused how this proves irreducibility and believe I am missing the tail end of this concept}

**##THE IDEA IS THAT IF  $\sqrt{4 \cdot 30} = x$  IS AN INTEGER THEN  $x^2 - 4 \cdot 30$  IS REDUCIBLE. SINCE IT IS IRREDUCIBLE THERE IS NO SUCH  $x$  SO  $x - \sqrt{s} - \sqrt{t}$  CANNOT BE A LINEAR FACTOR OF  $x^4 - 22x^2 + 1$ . <**

The submission also includes a rich text editor toolbar with options for Style, Font, Size, and various formatting tools.

**Right Screenshot (Teacher Response):**

The teacher's response is titled "WHS Feedback" and shows the same URL. The response includes the following text:

Mark the checkbox to open messages in a separate window.

Name	Accessed	Question	Message
Pizzuti, Michael		14:Q1-6	<p>Answered: <math>x^4 - 2(s+t)x^2 + (s-t)^2 = x^4 - 2(11)x^2 + (1)^2 = x^4 - 22x^2 + 1</math></p> <p>To prove this is irreducible we use <math>(x - \sqrt{s} - \sqrt{t})(x - \sqrt{s} + \sqrt{t})</math></p> <p><math>(x + \sqrt{s} - \sqrt{t})(x + \sqrt{s} + \sqrt{t}) = 0</math> so <math>q = \sqrt{s} + \sqrt{t}</math>, <math>q = \sqrt{6} + \sqrt{5}</math></p> <p>then <math>q^2 = 5 + 6 + 2\sqrt{30}</math></p> <p><math>q^2 - 11 = 2\sqrt{30}</math> for convenience <math>x = q^2 - 11</math> then <math>x^2 = 4 \cdot 30</math> making <math>x = \sqrt{4 \cdot 30}</math> as an integer and <math>x^2 - 4 \cdot 30</math> is irreducible. Because it is irreducible then <math>x - \sqrt{s} - \sqrt{t}</math> cannot be a linear factor.</p> <p>*The quadratic factors can be</p> <ol style="list-style-type: none"> <li>1. <math>x^2 - (\sqrt{6})(\sqrt{5}) - 11</math> or</li> <li>2. <math>x^2 - 2x\sqrt{6} + 1</math> or</li> <li>3. <math>x^2 - 2x\sqrt{5} - 1</math></li> </ol> <p>One of the above can only be a quadratic factor because since we are working in <math>\mathbb{Z}</math> the must be only whole integer coefficients to have a quadratic factor in <math>\mathbb{Z}_x</math></p> <p>for 1. <math>q \in \mathbb{Z}</math>, <math>q = \sqrt{6}\sqrt{5} = \sqrt{30}</math>, so <math>q^2 = 30</math> but since 6 and 5 have no prime factors in common this cannot be a whole integer.</p> <p>Number 2 <math>\sqrt{6}</math> cannot be a whole integer because <math>\sqrt{6} = \sqrt{2 \cdot 3}</math> since both 2 and 3 are prime numbers their square root would result in an irrational number in <math>\mathbb{Z}_p</math> not a whole integer which is what is needed. The same principle applies to number 3, the <math>\sqrt{5}</math> cannot be whole integers because five is a prime number.</p> <p>Since there can be no quadratic factor in <math>\mathbb{Z}[x]</math> and there is no linear factor the polynomial is irreducible in <math>\mathbb{Z}[x]</math>.</p> <p>The polynomial factors in mod 11 due to <math>x^4 - 22x^2 + 1 = x^4 + 1</math> using <math>t = 4^2</math></p> <p>The factors are <math>x^4 + 1 = (x^2 + 3x + 10)(x^2 - 3x - 1)</math></p> <p>Although the polynomial will factor in mod 13 and <math>x^4 + 9x^2 + 1 = (x^2 + 7)(x^2 + 2)</math></p> <p>Comment: Manual Grading (12/7 1:37) (Grading Requested)</p>

Done

[www.mathclass.org](https://www.mathclass.org)

# System supports secure, formatted open response

## math exams with intuitive, 'calculator syntax' expressions

### Question 1

Use Eisenstein's criterion to prove that

#### a. Problem statement

$f(x) =$

$1 + x + x^2 + x^3 + x^4 + x^5 + x^6 + x^7 + x^8 + x^9 + x^{10} + x^{11} + x^{12} + x^{13} + x^{14} + x^{15} + x^{16} + x^{17} + x^{18}$  is irreducible in  $\mathbb{Q}[x]$ .

One way to do this is to note that  $f(x) = \frac{x^{19}-1}{x-1}$ . This is just the geometric series. Replace  $x$  by  $x+1$  expand by the binomial theorem and simplify. Argue that Eisenstein's criterion applies to the resulting polynomial. Note there is no need to actually expand the expression, one is only interested in the form that the result takes.

$$(x^{19} - 1) \cdot (x - 1) = 1 + x + \dots + x^{18}$$

#### c. Formatted student response

Replace  $x$  by  $x+1$   $\frac{(x+1)^{19}-1}{x-1+1} = \frac{x^{19} + 19x^{18} + \binom{19}{2}x^{17} + \dots + 19x + 1 - 1}{x}$

$= x^{18} + 19x^{17} + \binom{19}{2}x^{16} + \dots + 19$  which is irreducible by Eisenstein

#### d. Teacher response in mathml editor

This is ok as far as it goes but you need to explain how you are applying Eisenstein's Criterion

This provides the capacity to economically and efficiently administer, "collect" and return open response math exams with fully formatted responses

Preview

[Style] [Font] [Size]

**B I U S x² x₃** [List Icons]

$(x^{19}-1) \cdot (x-1) = 1+x+\dots+x^{18}$

#### b. Student response in mathml editor

Replace  $x$  by  $x+1$   $((x+1)^{19}-1)/(x-1+1) = (x^{19} + 19x^{18} + ((19),(2))x^{17} + \dots + 19x + 1-1)/x$

$= x^{18} + 19x^{17} + ((19),(2))x^{16} + \dots + 19$  which is irreducible by Eisenstein

This is ok as far as it goes but you need to explain how you are applying Eisenstein's Criterion

#### d. Teacher response in mathml editor

# Synchronous Meetings currently employ a Centra commercial system

Centra 7 - KCTM 2007 Friday (PDK542218)

File Edit View Actions Tools Help



Participants

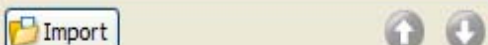


Lee



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Agenda



Agenda

## Meeting Tools

Application Sharing

White board

Recording capabilities

Share Files

Audio & Video Communication

# Meeting tools

Centra 7 - KCM Ongoing Test (QLQ573626)

File Edit View Actions Tools Help

Hand Yes No Laugh Applaud Step Out Text Chat Feedback Audio Full Screen

Participants

Lee

Betty

2

Agenda

Agenda

Hand Ask a question - or wait to be recognized to participate

Yes Confirm/Agree or Just say Yes

No Disagree or Just say No

Laugh Show Amusement

Applaud Applaud

Step Out Need to leave your computer for a moment

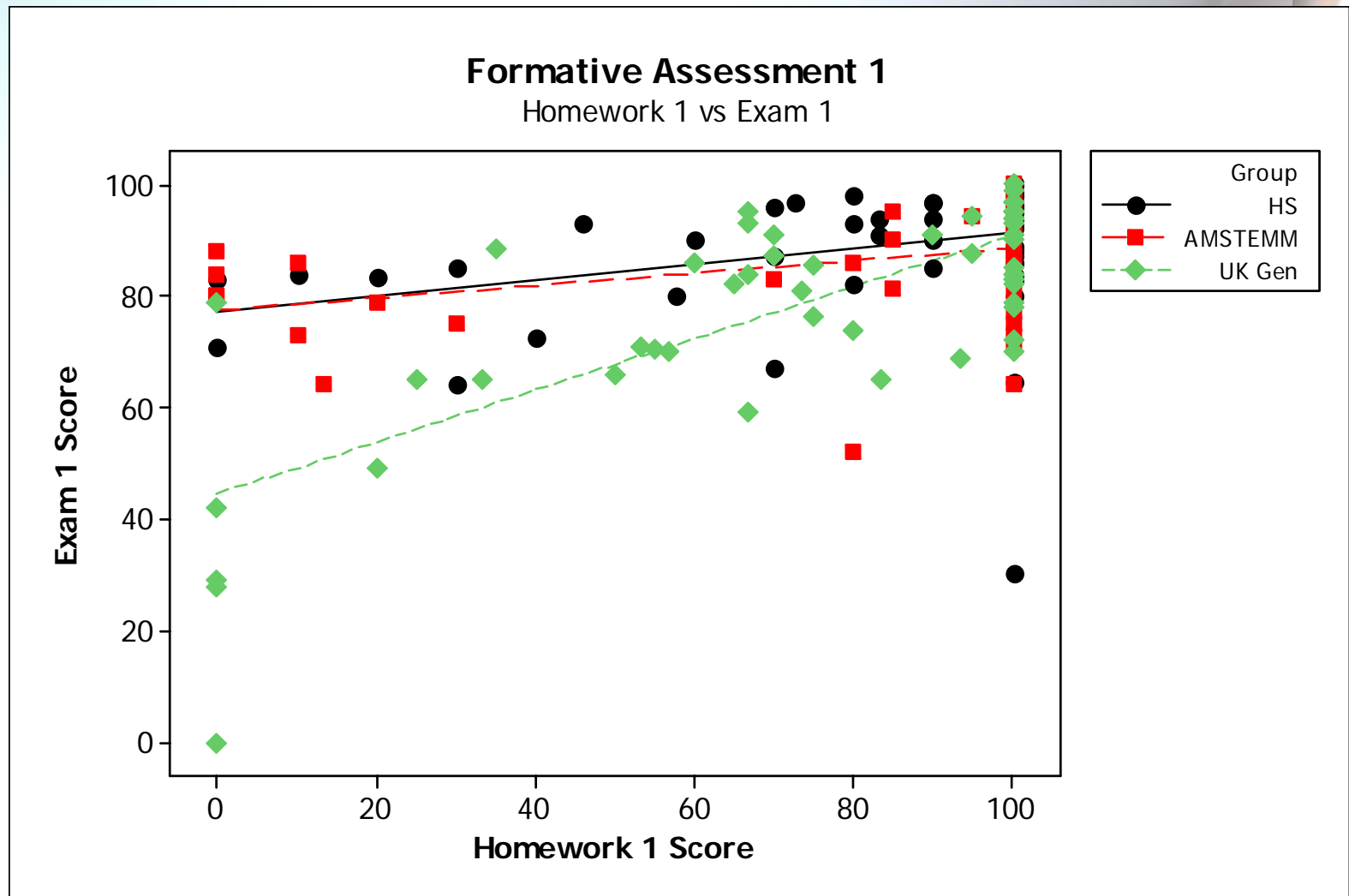
The background features a soft gradient from white on the left to a warm orange on the right. A metallic, reflective sphere is positioned in the upper right corner, partially cut off by the frame. The word "Outcomes" is centered in a dark, sans-serif font.

Outcomes

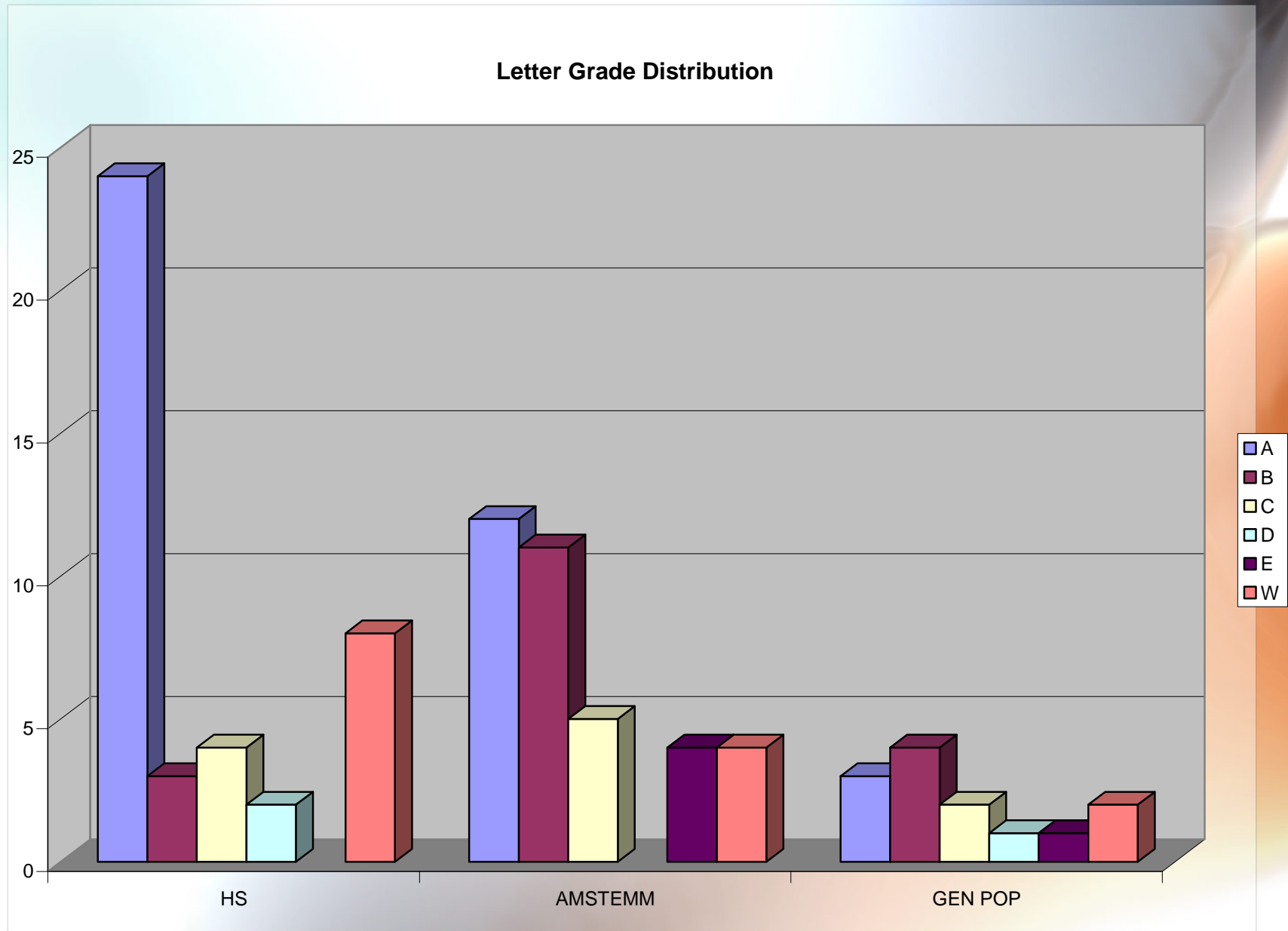


## Representative Formative Evaluation Data:

Student scores on exam 1 vs online homework participation  
Spring 2007



# Fall 2006 Results: Letter Grade Distribution



# Student Outcomes: Fall 2006

	<b>HS (41)</b>	<b>Comp Gp (45)</b>	<b>Random (13)</b>	<b>Gen. Course F05 (1686)</b>
<b>A</b>	<b>60 %</b>	<b>33 %</b>	<b>23 %</b>	<b>29 %</b>
<b>B</b>	<b>8 %</b>	<b>27 %</b>	<b>31 %</b>	<b>19 %</b>
<b>C</b>	<b>10 %</b>	<b>18 %</b>	<b>15 %</b>	<b>13 %</b>
<b>D</b>	<b>5 %</b>	<b>0 %</b>	<b>8 %</b>	<b>6 %</b>
<b>E</b>	<b>0 %</b>	<b>16 %</b>	<b>8 %</b>	<b>9 %</b>
<b>W</b>	<b>18 %</b>	<b>7 %</b>	<b>15 %</b>	<b>19 %</b>

**29 of 41 (70 %) of the HS students received a college transcript with credit for college algebra.  
( two C's declined the credit)**

# Student Outcomes: Spring 2007

Spring 2007: Final Grades for High School (HS), Comparison group CMP), General students (GEN), and General Course\* (CRS)

	HS (N= 24)	CMP (N= 10)	GEN (N= 50)	CRS* (N= 663 )
A	50%	60%	32%	17%
B	33%	10%	16%	21%
C	4%	20%	16%	18%
D	0%	0%	4%	14%
F	4%	10%	12%	17%
W	8%	0%	18%	14%

Percentages are rounded to the nearest integer so the columns may not total 100%.

\*The general course uses a conventional text and both large lecture and individual section formats. The “GEN” group was self-enrolled from the same pool as the general course.

# Assessment of the effectiveness of the PD program for participating teachers (Spring 2007 data)

<b>Teachers</b>	<b>Total</b>	<b>HS Students</b>	<b>HS Students Students receiving College Algebra credit</b>	<b>Success Rate</b>
<b>Systematic Participation</b>	<b>11</b>	<b>21</b>	<b>19</b>	<b>90%</b>
<b>Non-systematic Participation</b>	<b>3</b>	<b>9</b>	<b>3</b>	<b>33%*</b>



# Program Features:

- Articulation with other NSF programs (AMSP and AMSTEMM)
- Application of advanced distance learning and instructional support technology
- Integrated STEM and Education research programs
  - (open source) materials and technology developed for the program by research faculty
  - Program evaluation is leading to improvements in technology
- Operates through traditional university and school instructional structures and faculty assigned roles at costs that are modest and easily understood in these contexts.
- Integrated evaluation and assessment
- Program technology, materials, methods can be transferred to others employing the same basic tools



# Some Images From the Project

# Access to Algebra Startup (part B)









Algebra for Teachers - Summer 2005 - Microsoft Internet Explorer

MA501 Summer 2005

## Algebra for Teachers

### Logic Class Notes

These notes are on material in Chapter 5, section 1 of the *notes textbook*. The corresponding web exercises are 62 and 63.

Click on the items below to display the corresponding note.

- Notes Page 1
- Notes Page 2
- Notes Page 3
- Notes Page 4

**ORDER OF PRECEDENCE**

a)  $7 + (5 \times 3) = 22$   
 $+ (7 \div 5) = 36$

Order of operations:  
 →  $7 + 5 \times 3 = 22$  (PEMDAS)

b)  $7 + 5 \times 3 = 22$   
 $7 + 5 \times 3 = 22$

**MINUS AND VARIATION**

$-2^3 = 8(2)^3$  if  $-2$  is not  
 $-(2^3)$  otherwise

$-2^4 = 16$   
 $-(2^4) = -16$

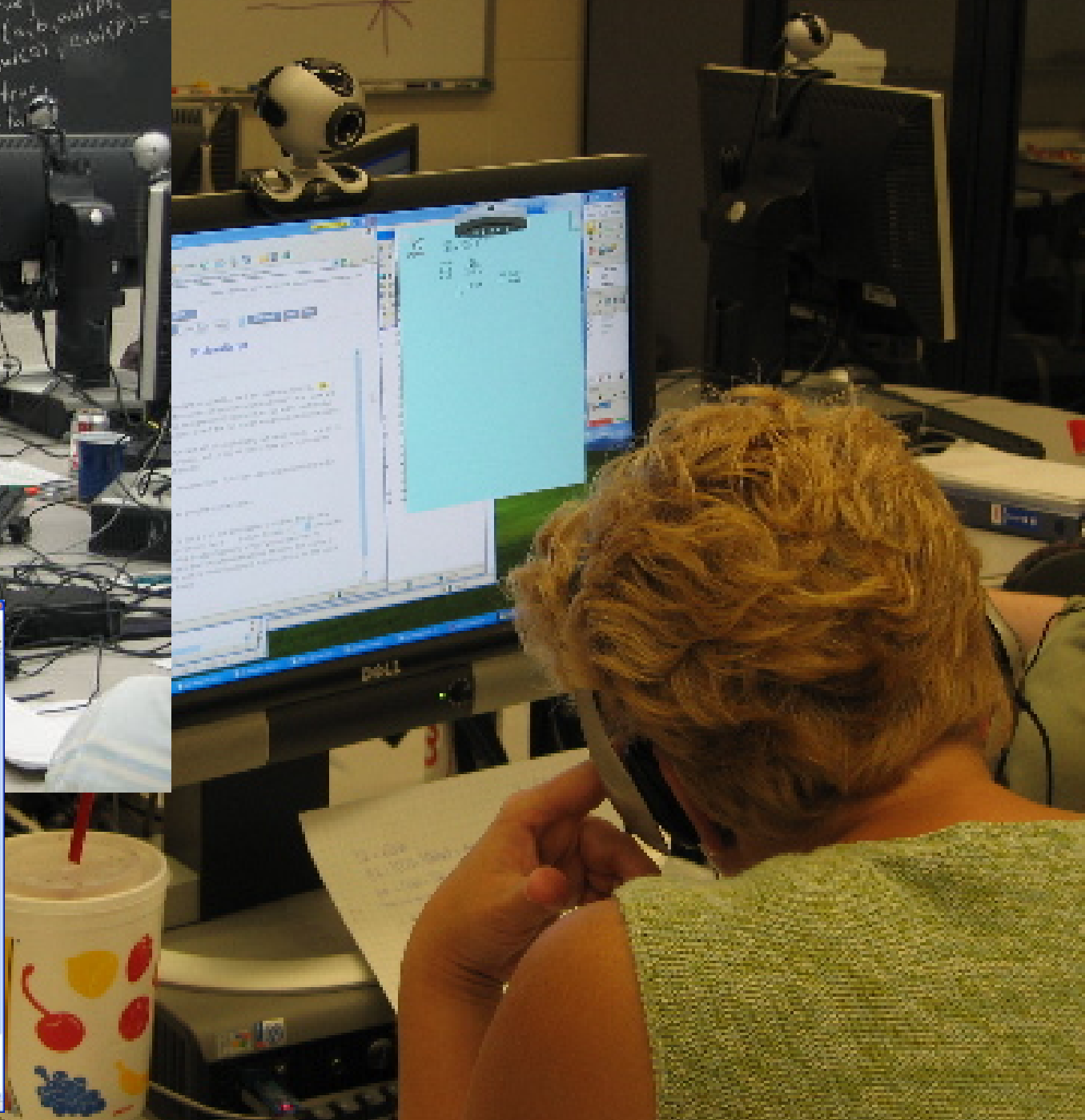
**ORDER OF ASSOCIATION**

Left Assoc.  $((a \times b) \times c)$   
 $(a \times b) \times c$

Right Assoc.  $(a \times (b \times c))$   
 $a \times (b \times c)$

Non Assoc.  $\Rightarrow 2^{2^2} \neq (2^2)^2$

"ADD PARENTHESES FOR CLARITY"





**Our  
favorite  
Image  
from  
the  
program**

Mark	A	[REDACTED]	Fall 06
Caitlin	A	[REDACTED]	Fall 06
Frederico	A	[REDACTED]	Fall 06
Tiffany	A	[REDACTED]	Fall 06
Holly	A	[REDACTED]	Fall 06
Jessica	A	[REDACTED]	Fall 06
Phil	B	[REDACTED]	Fall 06
Beth	A	[REDACTED]	Fall 06
Kelly	A	[REDACTED]	Fall 06
Laura	A	[REDACTED]	Fall 06
Alicia	B	[REDACTED]	Fall 06
Lindsay	A	[REDACTED]	Fall 06
Jarrold	A	[REDACTED]	Fall 06

**Spring 2007 High School Students who successfully completed College Algebra and Accepted Credit**

Student Name	Grade	School	Sponsor Teacher	Semester
Genevieve	B	[REDACTED]	[REDACTED]	Spring 07
Jennifer	A	[REDACTED]	[REDACTED]	Spring 07
Thomas	B	[REDACTED]	[REDACTED]	Spring 07
Byron	A	[REDACTED]	[REDACTED]	Spring 07
Elizabeth	B	[REDACTED]	[REDACTED]	Spring 07
Bennett	A	[REDACTED]	[REDACTED]	Spring 07
Coty	B	[REDACTED]	[REDACTED]	Spring 07
Ashley	A	[REDACTED]	[REDACTED]	Spring 07
Deanna	B	[REDACTED]	[REDACTED]	Spring 07
Chase		[REDACTED]	[REDACTED]	S

With the exception of the Centra conferencing system, the intellectual property employed in this program was developed in open source by the University of Kentucky Mathematical Sciences through grants and contracts funded by :

- The National Science Foundation
  - Primarily through the Appalachian Mathematics and Science Partnership (AMSP)
- The US Department of Education
- The Ky Department of Education
- The Ky Council on Postsecondary Education
- The University of Kentucky

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