

The Math Forum PEMDAS and FOIL

John T. Baldwin

March 7, 2008

Outline

The Math
Forum
PEMDAS and
FOIL

John T.
Baldwin

An innovative
Course

Math Fo-
rum/Algebra
Symposium

Pemdas/Foil
session

- 1** An innovative Course
- 2** Math Forum/Algebra Symposium
- 3** Pemdas/Foil session

Teaching Algebra to Under-prepared Students

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In Fall 2007 Bonnie Saunders and Maria Mancini conducted a course in which high school teachers were ask to prepare lessons from Sybilla Beckmann's text:
Mathematics for Elementary Teachers.

Maria is here and will be glad to tell you about her experiences with this program.

Math Forum

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- 1 Monthly meetings
- 2 Mostly high school teachers; some middle school
- 3 2-5 faculty
- 4 20-40 teacher participants
- 5 stipends, food, parking, conversation
- 6 various topics

Sample Topics

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- 1 Calculators and Student Understanding
- 2 Mnemonics (PEMDAS, FOIL, etc.) and Their Impact on Student Success
- 3 Real Life Situations, Modeling, and the Fundamental Theorem of Algebra
- 4 Mathematics Success and Failure Among African American Youth
- 5 Interpreting Political Statistics -the GINI index
- 6 Expectations and Assessment
- 7 Teachers' Moves and Decisions and Students' Understanding

Mnemonics

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CPS-UIC Math Forum (formerly Algebra Symposium)

Thursday, February 2, 2006

4:30 - 7:30 PM

207 Taft Hall

UIC East Campus Chicago, IL 60607

1 Block West of Halsted-Taylor Parking Garage

Stipend: \$40 3 CPDU credits

Mnemonics (PEMDAS, FOIL,) and Their Impact on Student
Success

John Baldwin (jbaldwin@uic.edu) and John Masley
(jmmasley@uic.edu)

Agenda

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4:30 - 4:45 Introduction, Pre-Survey

4:45 - 5:30 PEMDAS session

5:30 - 5:45 Mentor Program and announcements

5:45 - 6:00 Debrief and summary 6:00 - 6:30 Dinner/Discussion

6:30 - 7:05 FOIL session

7:05 - 7:20 Debrief and summary

7:20 - 7:30 Post-Survey, Forms

Pre-registration is now closed. Please contact Janice Nekola (312-413-3750 or nekola@uic.edu) if there are any questions. Parking at the Halsted St. and Taylor St. parking structure. Bring your stub to the meeting for a payment sticker.

PEMDAS I: Order of Operations

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Parentheses, Exponents, Multiplication Division, Addition, Subtraction

I. A student asks how he is supposed to divide before he adds for the problem: $\frac{2+3}{4+1}$

How do you proceed?

What should "twenty divided by the sum of five and fifteen" be? Why?

II. Is $12/4 * 3 = 12/4(3)$? See if your calculator agrees. What should a student get for $12/4x$ when $x = 3$? How do you justify your answer?

PEMDAS II: Order of Operations

III. What is $-x^2$ when $x = -3$? What is $(-x)^2$ when $x = -3$?
What is $(^{-}x)^2$ when $x = -3$? How do you explain?

IV. Why do some teach students Order of Operations?
What problems have you encountered in algebra based on student understanding or misunderstanding of order of operations?

What answer do you expect for $6 \log(100) * 10^2$?
What if the asterisk is not there?

V. What's the difference between a convention and a law? Is PEMDAS (Please Excuse My Dear Aunt Sally) a set of laws? Is it complete?

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PEMDAS: Examples

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$$5 + 3 \cdot 4^2$$

$$(5 + 3) \cdot 4^2$$

$$3 \cdot 2 + 5 - 2^2$$

$$3 \div 2 + 5 - 2^2$$

$$3 \cdot y + 5 - x^2$$

$$3 \div y + 5 - 2^2$$

$$3 \div (2 + 5) - 2^2$$

FOIL I

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I. A student is asked to multiply $(x + 2)(x^2 + 3x + 4)$ and writes:

$$x^3 + 4x + 2x^2 + 8.$$

He explains his answer by saying, 'I foiled it.'
How do you proceed?

Ia) What are several explanations for the method of multiplying polynomials. Is there more than one method?

II. Why do we teach students to multiply binomials?

FOIL II

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III. Why do we teach students to factor trinomials?

IV. How should one explain the procedure for computing

$$(x + y)^3?$$

V. How do we prevent the error: $\sqrt[4]{x^4 + y^4} = x + y$?

Reaction I

Almost all said students had learned PEMDAS in elementary school. About half said FOIL had been learned.

presurvey: 17 taught PEMDAS, 11 didn't
9 taught FOIL; 12 didn't

Participants ranked PEMDAS and foil from 1 (essential) to 5 (counterproductive) before and after the session.

The average score moved
on PEMDAS from 2.85 to 3.17
and on FOIL from 3.38 to 3.81.

Both of these shifts were statistically significant at the 1% level.
3 of 6 no longer think Pemd as always give correct answer.

Reaction II

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Teacher Reactions to Session

Surveyed after each session.

Our overall average on all sessions: 4.7

This session 4.6.

The score of 4.3 on connections with state teaching standards was the lowest entry.

Is this a flaw in the standards?

Or do people not like to change their minds?

Geometry in Tunisia February 8, 2007

John Baldwin will lead a discussion of several problems from a daily math/physics column in 'La Presse de Tunisie'.

The height of a lighthouse

A lighthouse is visible from a distance of 32 km. At what height above sea-level is the lamp?

What are three interpretations of this problem. Why can you solve all three (with slightly different answers depending on your interpretation)?

We will discuss this and two other problems from the paper. If anyone has any background on why problems of this sort appear in the daily press, we'd like to know.

John went to Tunisia during his sabbatical in Spain. The Sahara is a truly fascinating place and you might enjoy the travelogue at <http://www2.math.uic.edu/~jbaldwin/tunisia.pdf>

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Geometry in Tunisia II

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If in a triangle, the angle bisector is also the bisector of the angle between the altitude and the median issuing from the same vertex, what can one say about this triangle.