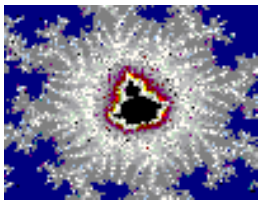

Sinclair Mathnet

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Expectation of Quality

By the time our students finish a math course, we want them to have, among other things, a basic understanding of the language of mathematics, of the use of symbols and notation appropriate to the level of that course. We also hope that their work will attain a certain level of quality in its appearance. This article will take a look at some of the issues of notation and quality that might arise in an Intermediate Algebra class.

THE EQUAL SYMBOL

At the Department's retreat last year we held a discussion on the expectations we have about the quality of our students' work. The most common concern voiced centered on students' use of the equal symbol.

The equal sign has two proper uses:

1. Within an equation, such as:

$$\begin{aligned} 4x &= x + 15 \\ 3x &= 15 \\ x &= 5. \end{aligned}$$

2. Between expressions of equal value, such as:

$$\sqrt{24} = \sqrt{4 \cdot 6} = \sqrt{4} \cdot \sqrt{6} = 2\sqrt{6}$$

or

$$\begin{aligned} 4(x + 1)^2 + 3(x + 2) \\ &= 4(x^2 + 2x + 1) + 3x + 6 \\ &= 4x^2 + 8x + 4 + 3x + 6 \\ &= 4x^2 + 11x + 10. \end{aligned}$$

An equal sign is not meant to direct the reader's attention from one statement to another. For instance, the following is incorrect:

$$15 + 5x = 20 \;=\; 5x = 5 \;=\; x = 1,$$

as is

$$\begin{aligned} & 4(x^2 - 1) = 8 \\ = \;& 4x^2 - 4 = 8 \\ = \;& 4x^2 = 12 \\ = \;& x^2 = 3 \\ = \;& x = \pm\sqrt{3}. \end{aligned}$$

The implies symbol, $\Rightarrow$, is appropriate to use when we want to show that one statement leads to another:

$$3x < 27 \quad \Rightarrow \quad x < 9.$$

We, as instructors, need to continue to stress the difference between *solving an equation* and *reducing an expression*. Introducing the implies symbol early on may help students to differentiate between the two.

PARENTHESES

Suppose we wish to clear the fractions from the following equation:

$$\frac{1}{5} - \frac{2}{3}x = \frac{1}{3} + x.$$

A student intends to show that both sides of the equation are to be multiplied by 15, but writes:

$$15 \quad \frac{1}{5} - \frac{2}{3}x = \frac{1}{3} + x \;.$$

(Continued on Page 2)

(Continued from page 1)

An equal sign should not be placed inside a set of parentheses. This error frequently occurs when a student overwrites a finished line instead of beginning a new step and incorporating correct notation into the new step.

Another instance of overwriting a statement and incorrectly using parentheses can happen when a student is using factoring by grouping. Suppose the original problem is to factor

$$x^3 - 4x^2 - 8x + 32.$$

The student writes down the problem, but then overlays a set of parentheses (shown in red) in order to mark the terms that are to be grouped:

$$(x^3 - 4x^2) - (8x + 32).$$

But, of course, the new expression is now equivalent to $x^3 - 4x^2 - 8x - 32$, which is prime! This mistake can be avoided if the student waits until the next step (when the factoring process begins) to insert parentheses. If desired, terms can be underlined or similarly indicated to show how they will be grouped:

$$\underbrace{x^3 - 4x^2}\ -\ \underbrace{8x + 32}$$

$x^2(x - 4) - 8(x - 4)$, etc.

MULTIPLIERS THAT LOOK LIKE EXPONENTS

Solving the equation $\frac{1}{2}m + 5 = -2$ for m, a student wishes to multiply both sides by 2, but instead puts the right side multiplier in a superscript position:

$$2\left(\frac{1}{2}m+5\right) = (-2)^2$$

$$m + 10 = -4.$$

Unfortunately, the superscript appears to be an exponent.

This error occurs because the student has finished a step in an equation, but then overwrites it, and either lacks the space to put the multipliers in correctly, or else simply doesn't know how to use the notation properly. Rather than overwriting a finished step, it might be better to encourage students to begin a new line where there will be enough space to use proper notation:

$$\frac{1}{2}m+5 = -2$$

$$2\left(\frac{1}{2}m+5\right) = 2(-2)$$

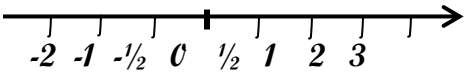
$$m + 10 = -4.$$

DRAWING A SET OF AXES

Measurement is a fundamental aspect of mathematics, and our students' skill set should at least include the correct use of a ruler and the ability to draw and label a set of axes.

The following should both be considered unacceptable:

and



At the college level, students should be expected to draw axes and other straight lines using a ruler, to measure scales using a ruler, to label axes appropriately, and to show the coordinates of points that have been plotted.

Do you have issues of notation and quality that you would like to discuss? Please send comments to ellen.keeler@sinclair.edu.

Kudos

Prof. Kay Cornelius will be the new Director for WiSTEM Summer Institute-2010. She takes over from Prof. Larraine Kapka, chairperson after serving a two year term. *WiSTEM, Women in Science, Technology, Engineering and Mathematics* is a two-week summer institute for junior and senior girls in high schools. There is a special theme to introduce students to various fields related to STEM. This has been running successfully for the past 15 years (earlier as WIET). Visit www.sinclair.edu/organizations/wiet/ for more information and annual reports.

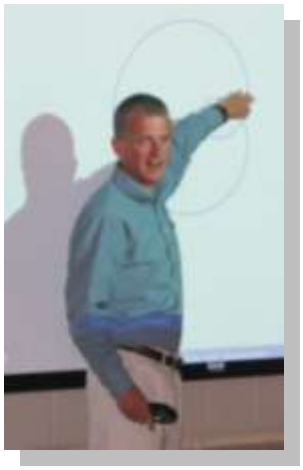
Les Steinlage, longtime part-time Math Department faculty member, was inducted into the Oakwood City Schools Sam Andrews Educational Hall of Honor on September 17, 2009, an honor reserved for those who have made significant contributions to the school system and who have had an outstanding effect on the lives of the students at Oakwood Schools. Les taught math at Oakwood High School from 1972-1995.

Professor **Bob Chaney** traveled to Las Vegas this month to accept the **2009 AMATYC Teaching Excellence Award**. We'll hear more about Bob's achievement in the next issue of *Mathnet*.

And, we wish **Marie Stroh** well as she takes over as coordinator for the MAT 191 sequence from **Richard Uchida**. Thank you, Richard, for all of your hard work.

Photo GALLERY

At the Math Department's Fall Colloquium, **Dr. Len Ruth** (left) spoke about "Quasidisks and Quasicircles," and **Moez Ben-Azzouz** (center) gave us "An Introduction to Webgraphs." Last winter's first place finisher (tie) in the AMATYC Student Mathematics League Competition Round II, **Austin Maloney**, is shown receiving his certificate from David Stott.



CIRCLE

There were two points, happy and gay
One day as usual, they wanted to play
One point to the other, so did say
"I shall keep still and you move in such a way
Neither you come near me nor you go away
And the distance between us fixed shall stay
Then you gallop, trot or canter
I am fixed I am the center"
With this condition bound
As the other went round and round
To their surprise a circle was found!

- M. Sharma

Contributed by: Harmit Kaur

Reminders

- Course grades are due by 12 noon on Tuesday, December 1.
- Please continue to turn in copies of each exam as well as the grade distribution using the Adjunct Faculty Support form available in the Math Community Group in Angel.
- Please do not cancel class without notifying the Math Department. Additionally, if you utilize a substitute, please make sure the department is kept in the "loop."
- Please utilize the entire class time; the content of our classes is such that students should not be dismissed more than a few minutes early.

TEST YOUR SKILLS

During summer break I spent some time reading (rereading actually – it's so good it warrants being read multiple times) Douglas Hofstadter's *Godel, Escher, Bach: an Eternal Golden Braid*. In it he presents the following MU puzzle:

> There are four rules governing strings of the three letters M, I, and U. These rules explain how to form new strings:
>
> 1. Given a string whose last letter is I, a U may be added to the right end of the string.
> 2. Given a string of the form Mx, a new string of the form Mxx may be created.
> 3. If the pattern III occurs as a substring within a string, then it may be replaced by U.
> 4. If the pattern UU occurs as a substring within a string, then it may be removed.
>
> Given these conditions, and the starting string MI, can you produce the string MU?

If you find a solution, please include all of the steps; if you believe none exists, explain why not. You may submit solutions to Lyn Keeler, care of the Math Department.

Harvey's Joke Corner

I took my Trig class on a field trip to the Triangle Gallery.

My mistake in calculating mass times distance was due to a "senior moment."

Two certainties for educators: "Death and Taxonomies."

After a 12 minute break during an evening class at WPAFB, a student said: "I haven't thought about math since 1958."

From Len Ruth:
Q: What can be right but never wrong?
A: An angle.

New definition of "relative extremum": In-laws who came for the holidays and stay for six months.