Welcome Fall 2009

This welcome is brought to you
by Slide and Divide
Threat level orange
and Big Box Tutoring

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The talk is a slide show. The slides are framed in yellow rectangles. The quotation that follows, is what might have been said while the audience was looking at the slide. The blue comments like this one were added later and not part of the welcome. The title frame above was not the original.

Slide and Divide

$$8x^2 - 22x + 15$$
$$\Rightarrow x^2 - 22x + 15 \cdot 8 \qquad \textbf{SLIDE}$$
$$= x^2 - 22x + 120 \qquad \text{multiply}$$
$$= (x - 10)(x - 12) \qquad \text{factor}$$
$$\Rightarrow (x - \frac{10}{8})(x - \frac{12}{8}) \qquad \textbf{DIVIDE}$$
$$= (x - \frac{5}{4})(x - \frac{3}{2}) \qquad \text{simplify}$$
$$\Rightarrow (4x - 5)(2x - 3) \qquad \textbf{BOTTOMS UP}$$

A student brought me this handout from big box tutoring. I had never seen this trick before and it is not clear that it always works. Note that expanding $(4x - 5)(2x - 3)$ does give $8x^2 - 22x + 15$ so we did get a valid answer this time. More about big box later.

Years later one can find many utube videos on slide and divide or bottoms up. Bottoms up is last step, and it is iffy. It may be that all of them come after 2009.

This example shows that this method is not foolproof.

$$8x^2 - 24x + 16$$
$$\Rightarrow x^2 - 24x + 16 \cdot 8 \qquad \textbf{SLIDE}$$
$$= x^2 - 24x + 128 \qquad \text{multiply}$$
$$= (x - 8)(x - 16) \qquad \text{factor}$$
$$\Rightarrow (x - \frac{8}{8})(x - \frac{16}{8}) \qquad \textbf{DIVIDE}$$
$$= (x - \frac{1}{1})(x - \frac{2}{1}) \qquad \text{simplify}$$
$$\Rightarrow (1x - 1)(1x - 2) \qquad \textbf{WRONG}$$

Here the problem here is that 8 is a factor of all the terms. One needs to factor out the greatest common factor to use this method. The method reduces to a change of variable (see below), one likely to be over the head of an algebra student facing factorizing trinomials for the first time.

This technique for factoring quadratic equations has not been taught anywhere I have been at. It and another technique called the ac method do not meet the threshold of being useful enough to be included in any textbooks. And there are now aricles warning that it is a technique that does not explain its inner workings. `https://pballew.blogspot.com/2010/08/bottoms-up-factoring-question-of.html`

Here are justified steps that cover similar territory. We use the change of variable: let $x = t/8$

$$8x^2 - 22x + 15 =$$
$$= 8(t/8)^2 - 22(t/8) + 15 \qquad \text{change of variable } x = t/8$$
$$= t^2/8 - (22/8)t + 15 \qquad \text{expand}$$
$$= (1/8)(t^2 - 22t + 15 \cdot 8) \qquad \text{factor out } 1/8 \ \textbf{SLIDE}$$
$$= (1/8)(t^2 - 22t + 120) \qquad \text{multiply}$$
$$= (1/8)(t - 10)(t - 12) \qquad \text{factor}$$
$$= (1/8)(8x - 10)(8x - 12) \qquad \text{change back } t = 8x$$
$$= (1/8)[8(x - 10/8)][8(x - 12/8)] \qquad \text{factor out 8 from both}$$
$$= (1/8)(64)(x - 10/8)(x - 12/8) \qquad \textbf{DIVIDE}$$
$$= 8(x - 5/4)(x - 3/2) \qquad \text{simplify}$$
$$= 8[(1/4)(4x - 5)][(1/2)(2x - 3)] \text{ bottoms up}$$
$$= 8(1/4)(1/2)(4x - 5)(2x - 3) \qquad \text{rearrange and magically}$$
$$= (4x - 5)(2x - 3) \qquad \text{simplify}$$

`https://springfield.cambridgecollege.edu/news/math-matters-slide-and-divide`

A similar problem from my own experiences. I'm not a fan of determinates, but I often would give a largish 5×5 determinate that could be expanded by carefulling picking the row or column with exactly one non-zero term reducing it to a 2×2.

One student picked up tricks from the internet which basically did elementary row and column operations to get an upper triangular matrix. This is a valid method, except she forgot to change the sign when swapping rows. The problem needed an even number of swaps, so she got the correct answer, but did not receive full credit. She was sure she did it right and stormed away. She was a victim of memorizing a short cut incompletely. Of course making the problem so that an odd of swaps were needed would have improved the situation.

The Threat Level is Orange

Some of the computer classrooms got color coded alarms. The university got a more centralized alert system that send texts and emails for a number of threats, real or otherwise. A bigger better fire alarm.

Safety is a big selling point for colleges and universities.

FSU-ALERT

From: "fsu-alert@fsu.edu" ¡fsu-alert@fsu.edu¿
Date: Thu, 02 Jul 2009 17:40:41 -0400
Subject: 7/2/09 5:08PM - *FSU ALERT!* Severe Thunderstorm Warning

FSU ALERT! This is an official emergency notification, for distribution to all students currently taking classes, faculty and staff. 7/2/09 5:08PM - *FSU ALERT!* Severe Thunderstorm Warning for FSU Campus until 5:45PM: nickle-sized hail, 60mph winds, frequent lightning, heavy downpours.

http://alerts.fsu.edu/ for more details.

Some students have tried to use these emails as excused absences. They are not. Note the directions to go to http://alerts.fsu.edu, the place to go for campus closures information.

The university created email aliases for classes and provided no safeguards which would stop outside interests from using them. Needless to say, the math department was surprised.

The royal road quote has an Alexander and Menaechmus version as well as this one of Euclid and Ptolemy.

As a chair, I often got asked what is the best way to study? This is a question that is impossible. Different people need different ways to focus on the Mathematics. Many of the people asking don't want to understand the math, and only want to just do it. Some of them find tutors that are not in lock step with the lectures confusing.

One of these tutoring businesses guaranteed a grade of B, if you attended all of their meetings. You paid up front. If it didn't work the first time, would you continue to attend?

One of the worst outside tutor shortcut tricks predated bigbox. Another tutoring service service noticed that for a certain multiple choice problem, the longest answer was always correct. The problems were changed so this was no longer true. In those days, the practice tests were open to anyone. This changed to stop the copyright violations.

1   Why this topic?

A tutor can help a student by providing immediate feedback, but it is relatively exspensive. It doesn't scale. A tutoring study session given by outsiders with a money motive, is unlikely to survive. One needs to warn students that there is no royal road.

Second, new technology often introduces confusion. An alert that says you are going to get wet is far from a statement that all classes are cancelled.

Picture sources

threat level. picture is from
https://en.wikipedia.org/wiki/Homeland_Security_Advisory_System#/media/File:Hsas-chart_with_header.svg