

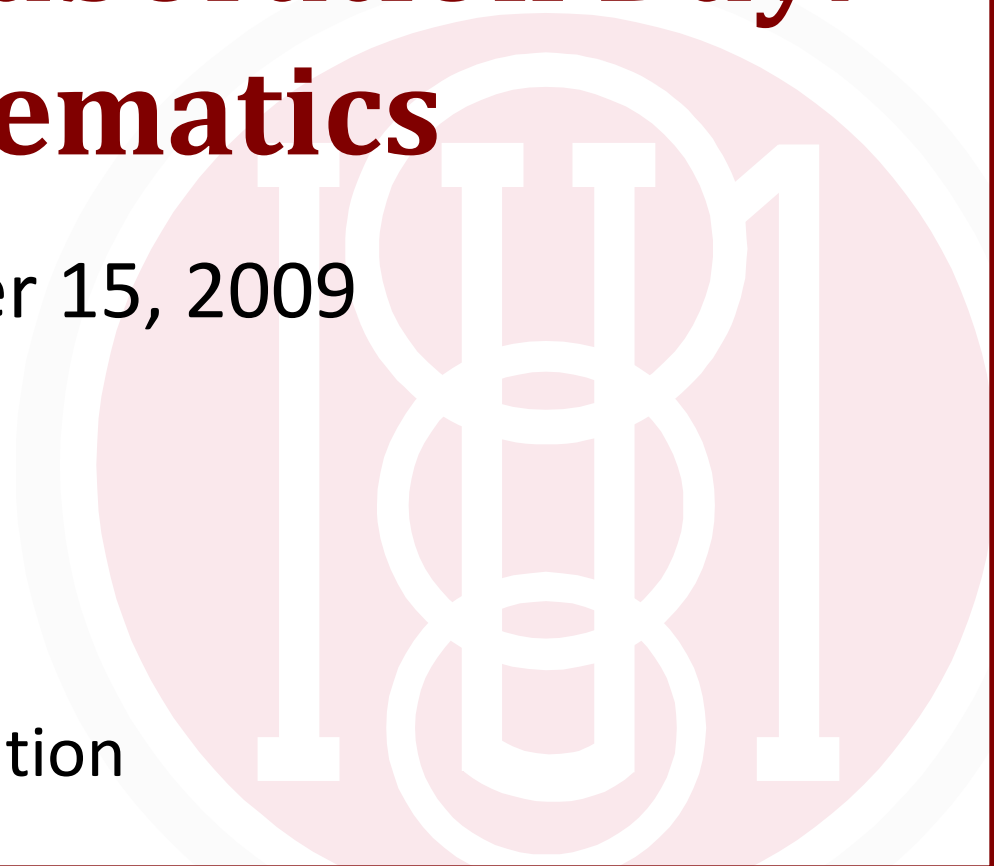
Content Collaboration Day: Mathematics

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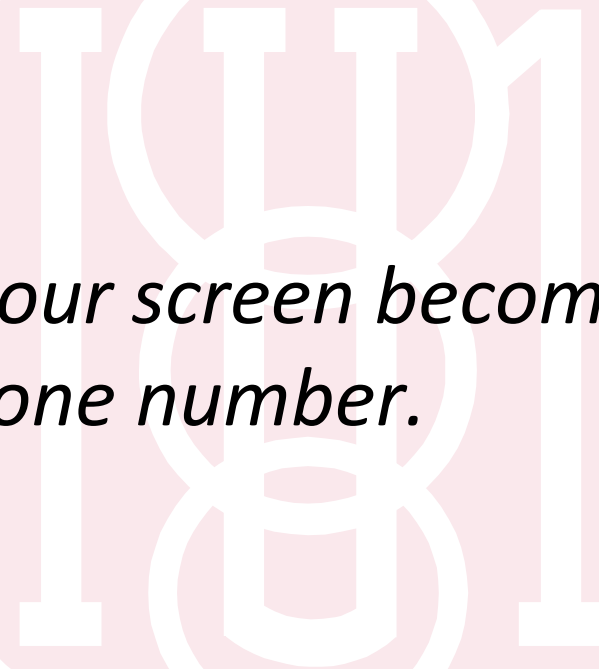
Using Calculators in the Middle School Classroom

- Agenda
 - Examples
 - Wipe Out
 - Evaluating Expressions
 - What's My Rule?
 - Solving Equations
 - Rationale for using calculators at this level
 - Resources
 - Q & A



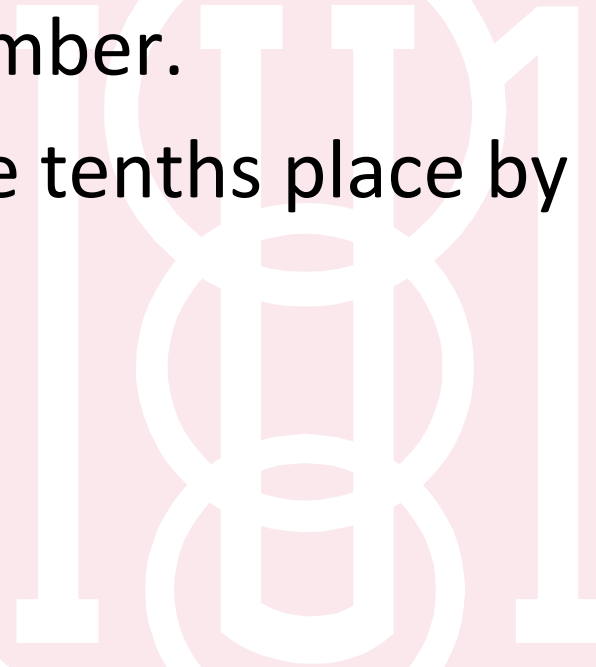
Wipe Out

- Enter the number 45673.189 into your calculator.
- What is this number?
- *Your challenge is to make your screen become 40673.189 by taking away one number.*



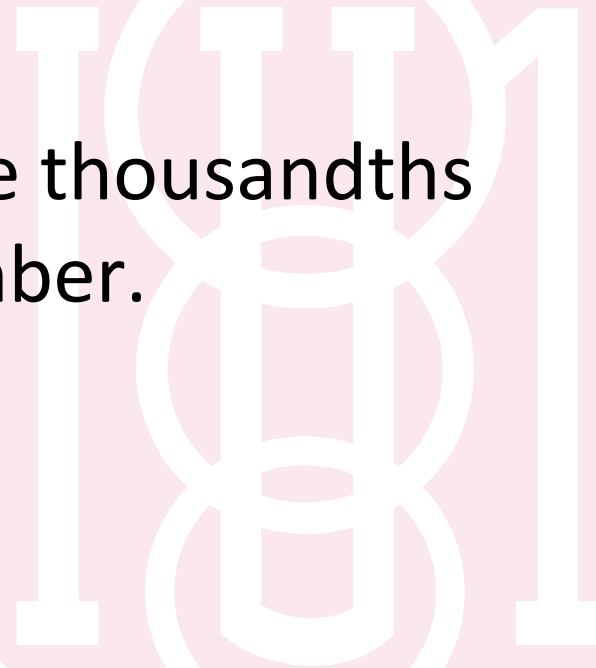
Wipe Out

- Wipe out the number in the tens place by taking away a number.
- Change the number in the ten-thousands place to a 6 by adding a number.
- Wipe out the number in the tenths place by taking away a number.



Wipe Out

- Wipe out the number in the hundreds place by taking away a number.
- Change the hundredths digit to a 7 by subtracting a number.
- Wipe out the number in the thousandths place by taking away a number.



Wipe Out

- Wipe out the number in the ten thousands place.
- Wipe out the ones.
- Wipe out the hundredths place.
- Are you wiped out?



Wipe Out

- What big ideas of the base-ten system did you use in Wipe Out?
- What is the value of this task?
- When should it be used?
- What are possible extensions for this task?

What's in an Expression?

- You have received a set of expressions.
- Please calculate the results using your four-function calculator.

If you experience difficulty, write equivalent expressions without exponents and include parentheses to indicate explicit groupings.

For example:

$$\begin{aligned}(7 \times 2^3 - 5)^3 &= (7 \times (2 \times 2 \times 2) - 5) \times (7 \times (2 \times 2 \times 2) - 5) \times (7 \times (2 \times 2 \times 2) - 5) \\ &= (7 \times 8 - 5) \times (7 \times 8 - 5) \times (7 \times 8 - 5) \\ &= (56 - 5) \times (56 - 5) \times (56 - 5) \\ &= 51 \times 51 \times 51\end{aligned}$$

What's in an Expression?

$$3 + 4 \times 8$$

$$4 \times 8 + 3$$

$$3^6 + 2^6$$

$$(3 + 2)^6$$

$$3^4 \times 7 - 5^2$$

$$(3 \times 7)^4 - 5 \times 2$$

$$3^2 \times 5^2$$

$$(3 \times 5)^6$$

$$\frac{5^3 \times 5^2}{5^6}$$

$$5^6$$

$$4 \times 3 - 2^3 \times 5 + 2^3 \times 9$$

$$\frac{4 \times 3^5}{2}$$

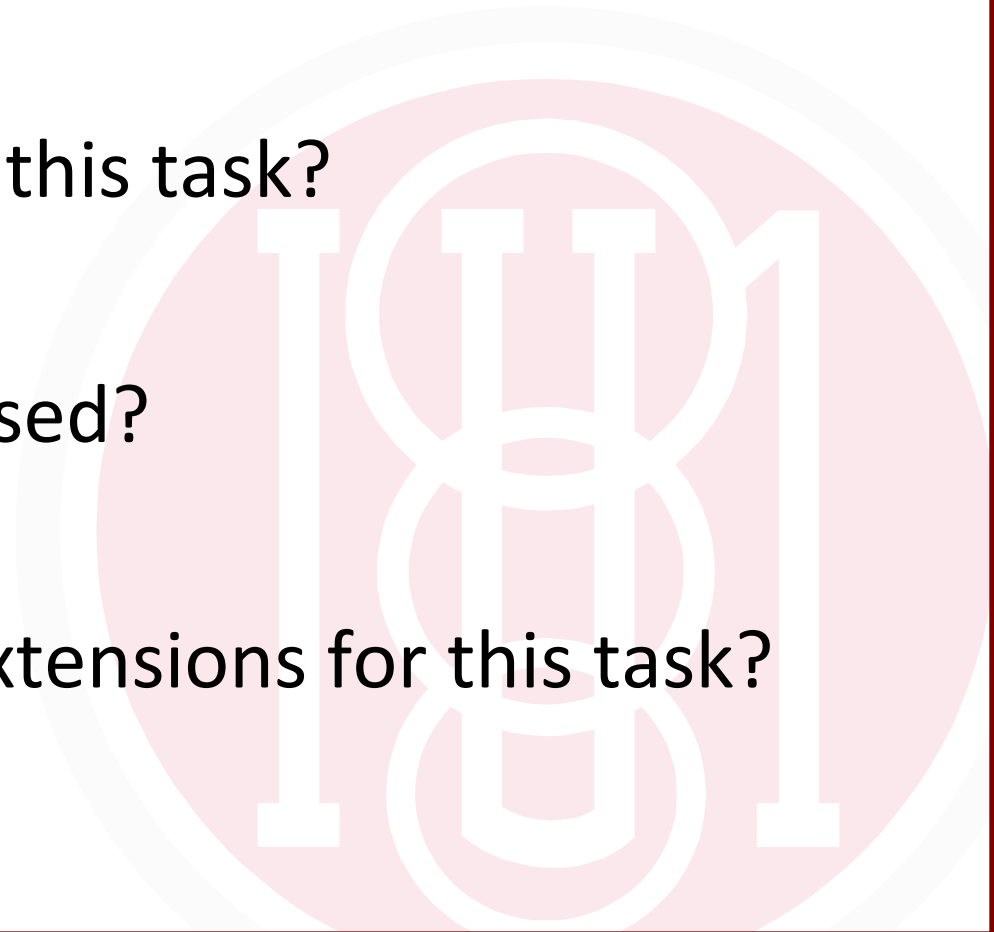
$$2$$

$$4 + \frac{3^5}{2}$$

$$2$$

What's in an Expression?

- What mathematics is involved in this task?
- What is the value of this task?
- When should it be used?
- What are possible extensions for this task?



What's My Rule? (v1)

- Let's play the chalkboard version!
- Now, let's use the calculator:

```
PRGM : GUESS
:Lbl 1
:Disp "Enter X"
:Input X
:2x + 5 -> A
:Disp A
:Goto 1
```



What's My Rule? (v1)

- Change the function and play “What's My Rule?” with your elbow partner.



What's My Rule? (v2)

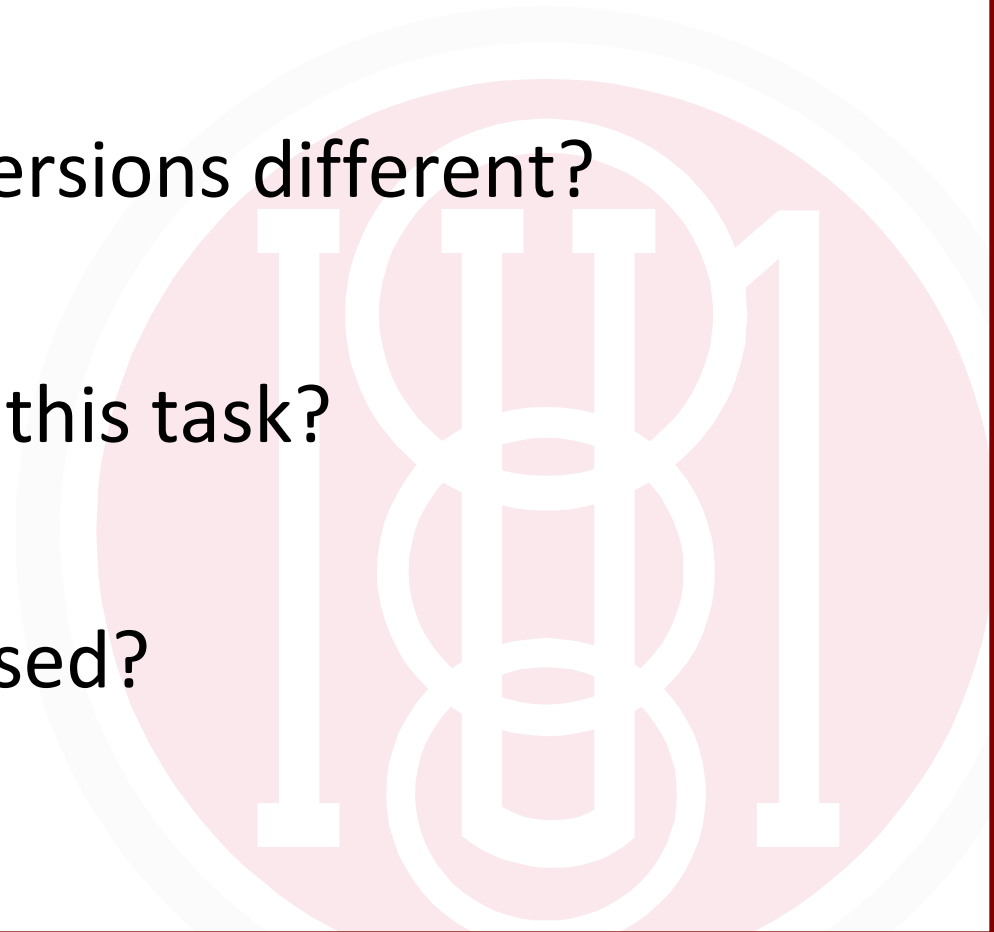
- Input a rule in your $Y=$ menu.
- Hit 2^{nd} GRAPH to display a table of values.
 - You may need to adjust the settings in [TBLSET] .
- Show the table to your elbow partner.
- What's the rule?

What's My Rule? (v3)

- Input a rule in your $Y=$ menu.
- Hit **GRAPH** to display a table of values.
 - Be sure that your **WINDOW** is appropriate.
- Show the graph to your elbow partner.
- What's the rule?

What's My Rule?

- What mathematics is involved in this task?
- How are the three versions different?
- What is the value of this task?
- When should it be used?



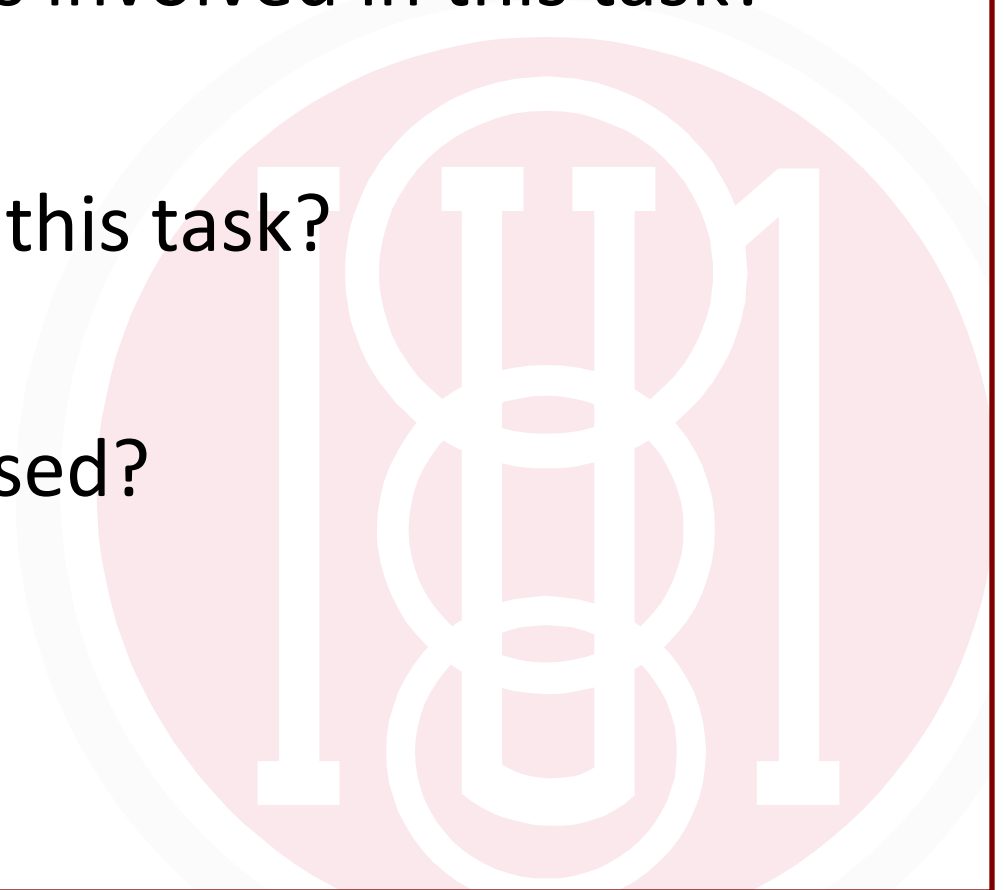
Using the “ENTRY” Button

- Given the equation $y=5x+9$.
- We want to complete this table of values.
- How can we use the calculator to deepen our understanding of this expression and resulting values?

x	$5x + 9$
3	
7	
11	
15	

Using the “ENTRY” Button

- What mathematics is involved in this task?
- What is the value of this task?
- When should it be used?



Solving Equations

- How can we use our calculator to solve the following equations?

$$4(x + 6) = 42$$

$$3x - 9 = 7 + -12x$$

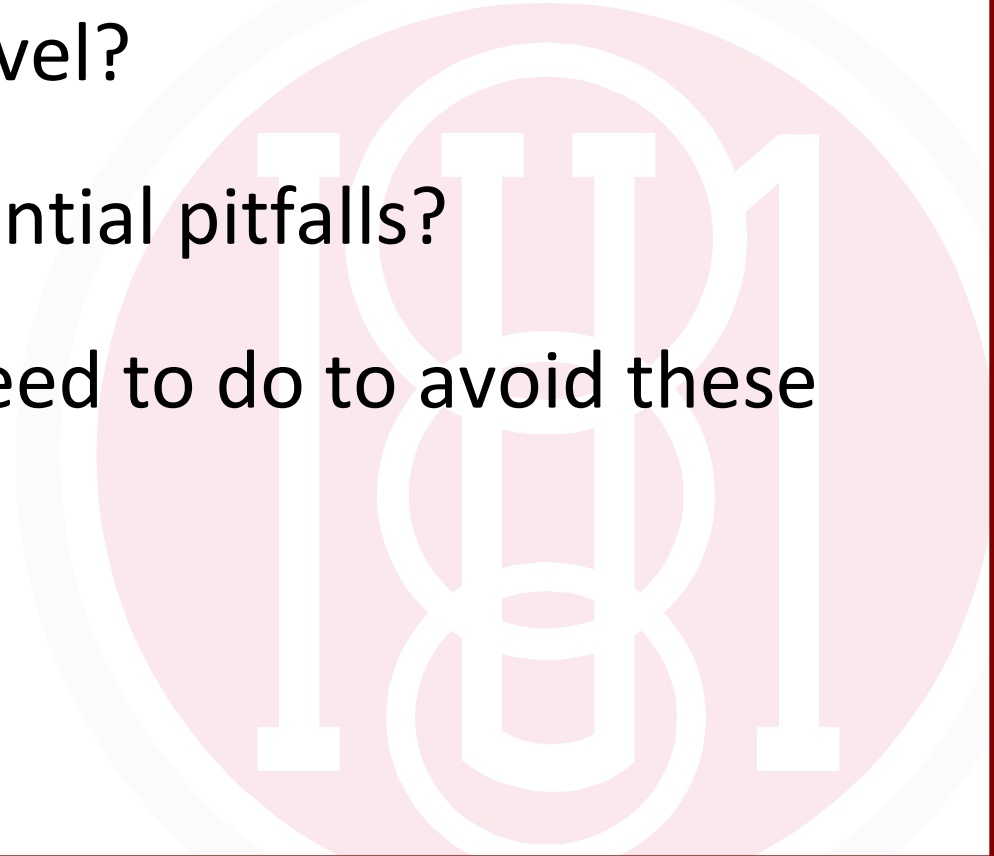
$$\frac{2}{3}x^2 + \frac{10}{71}x = \frac{3}{2}x + 14\frac{2}{7}$$

Using the “ENTRY” Button

- What mathematics is involved in this task?
- What is the value of this task?
- When should it be used?
- How can does understanding this task impact a student’s ability to understand later mathematics?

“They’ll never learn their facts!”

- How can the use of calculators *assist* students in thinking more deeply about mathematics at the middle school level?
- What are some potential pitfalls?
- What do teachers need to do to avoid these pitfalls?



Resources

- Texas Instruments: Classroom Activities

<http://education.ti.com/educationportal/sites/US/sectionHome/classroomactivities.html>

- *Teaching Student-Centered Mathematics* Series, John A. Van de Walle

<http://www.allynbaconmerrill.com/authors/bio.aspx?a=496bc376-e400-40f2-8d90-fa1b61237aa4>

- National Library of Virtual Manipulatives

<http://nlvm.usu.edu/en/nav/vLibrary.html>

Q & A



Thanks!

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Materials can be found at

<http://makingsenseofmath.iu1.wikispaces.net>