

Presentation #404 Ernie, Hofacker, Serros Helping Our Students Look for and Make Use of Structure

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Standards of Mathematical Practice

1. Make sense of problems and persevere in solving them
2. Reason abstractly and quantitatively
3. Construct viable arguments and critique the reasoning of others
4. Model with mathematics
5. Use appropriate tools strategically
6. Attend to precision
7. Look for and make use of structure
8. Look for and express regularity in repeated reasoning

CCSSM Math Practice MP7 Look for and make use of structure

- **Mathematically proficient students look closely to discern a pattern or structure.**
- **They also can step back for an overview and shift perspective.**
- **They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects.**

From <http://www.corestandards.org/Math/Practice/>

A Sampling of Tasks Used in Professional Development and in Classrooms by Our Teachers

Working Slow to Fast

Evaluate Expressions Race Give half the class Set A and half Set B. Students do not use calculators and do not start until all students have their lists. Keep face down until the race begins. Which half of the class finished first? Why? How does MP7 tie into working slow to fast. What properties did you use?

Set A	Set B
$(4 \cdot 25) \cdot 74$	$(25 \cdot 74) \cdot 4$
$53(27 + 73)$	$53 \cdot 27 + 53 \cdot 73$
$(-93 + 93) + (38 + (-38))$	$-93 + 38 + 93 + (-38)$

Teacher Note: Interesting race to provide with materials or focused on only using mental math. How does the use of MP7 work in either scenario?

Sums of Numbers Show example 1 only first, after discussing it show example 2 and so on.

Find the results for each example, think about strategies you are using. For each ask yourself,

How did you look for and make use of structure?

Is there another way to look for and make use of structure?

Example 1) $4.32 + 4.32 + 8.64 + 6.8 + 4.32 + 4.32 + 4.32 + 4.32 + 8.64$

Example 2) $4.32 + 4.32 + 8.64 + 6.8 + 12.96 + 4.32 + 8.64$

Example 3) $4.32 - 8.64 + 12.96 + 4.32 + 4.32 + 4.32 - 8.64 + 4.32 + 4.32$

How did you make use of structure differently as you worked through these examples?

Teacher Note: Examples inspired by problem with whole numbers from NCTM

http://www.nctm.org/uploadedFiles/Classroom_Resources/Problems/Quick_Sum.pdf

The Four 4's Task Using exactly four 4's and your choice of number operations (+, -, x, /) along with symbols of grouping, form the values 1 through 9. Example: $1 = (4+4) / (4+4)$

Teacher Note: A good low floor, high ceiling task. Opens up discussion of multiple methods and potential confusion related to order of operations. Can we do the same process with Five 5's and likewise with Three 3's? Why? What similarities in structure do we see as in the Four 4's task.

Calculate the value of the 2nd expression, no calculator. What strategies did you use to calculate this?

$\begin{array}{r} 12345679 \\ \times \quad 27 \\ \hline 333,333,333 \end{array}$	$\begin{array}{r} 12345679 \\ \times \quad 36 \\ \hline \end{array}$
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Write the number for each visual, what do you see? See visual numbers task at youcubed.org