

Contemplate then Calculate

An Instructional Routine to Foster Students'
Structural Thinking

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NATIONAL COUNCIL OF
TEACHERS OF MATHEMATICS

Do Now

Solve for x in the following equation:

$$5(x + 3) - 3(x + 3) + 1 = 17$$

Contemplate then Calculate

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Goals for Today's Session

Deepen understanding of structural thinking through the Instructional Routine, Contemplate then Calculate

You will know your learning is on track if you can

- Describe how you and/or a colleague is thinking structurally
- Articulate structural thinking that will be helpful in future problem solving

Goals for Today's Session

Learn how this instructional routine, designed to foster MP7, also embodies NCTM Teaching Principles

You will know your learning is on track if you can

- Identify when and how teachers ***Elicit and Use Evidence of Student Thinking***
- Describe how the routine ***Builds Procedural Fluency from Conceptual Understanding***
- Identify how the routine promotes ***Meaningful Mathematical Discourse***

Agenda

Opening, Framing, Goals

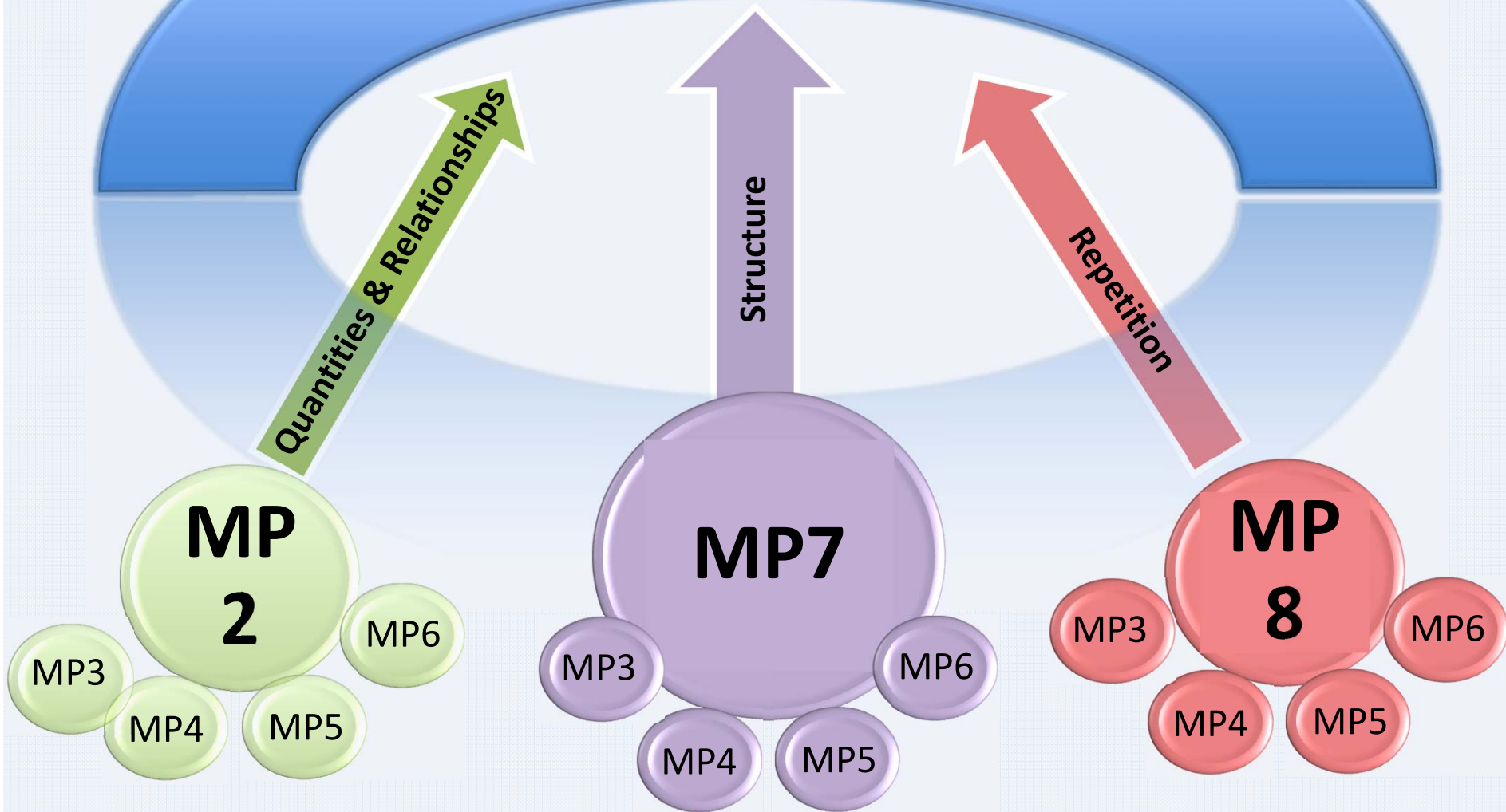
Do Math: Contemplate then Calculate

Reflection: Look for & Make Use of Structure

Do Math: Contemplate then Calculate

Reflection: NCTM Teaching Practices

MP1 Make Sense of Problems and Persevere in Solving Them



Do Now

Solve for x in the following equation:

$$5(x + 3) - 3(x + 3) + 1 = 17$$

Leveraging Instructional Activities

....To develop content and math practice understanding in teachers

....To develop MP prompting pedagogies in teachers

SO THAT all students can engage in the
MPs

What is an Instructional Activity

What routines do you use in your classroom or see in classrooms you observe?



Contemplate then Calculate



WHAT: Practice looking for *shortcuts* using what you know about the way numbers and operations work.

WHY: to “think like mathematicians”, to use mathematical *structure* to find shortcuts.



Contemplate then Calculate



Notice



Find Calculation Shortcut 

Share and Study Shortcuts

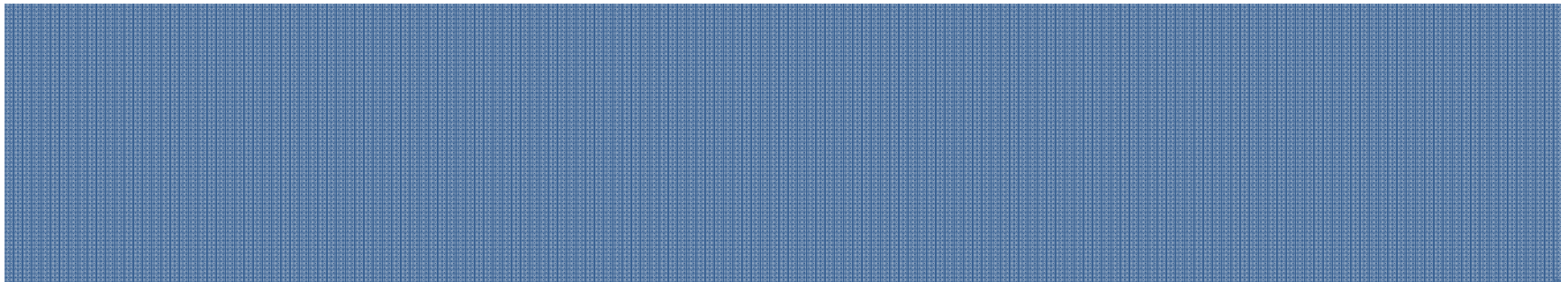


Reflect on Learning





What do you notice?

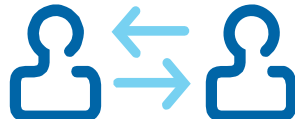




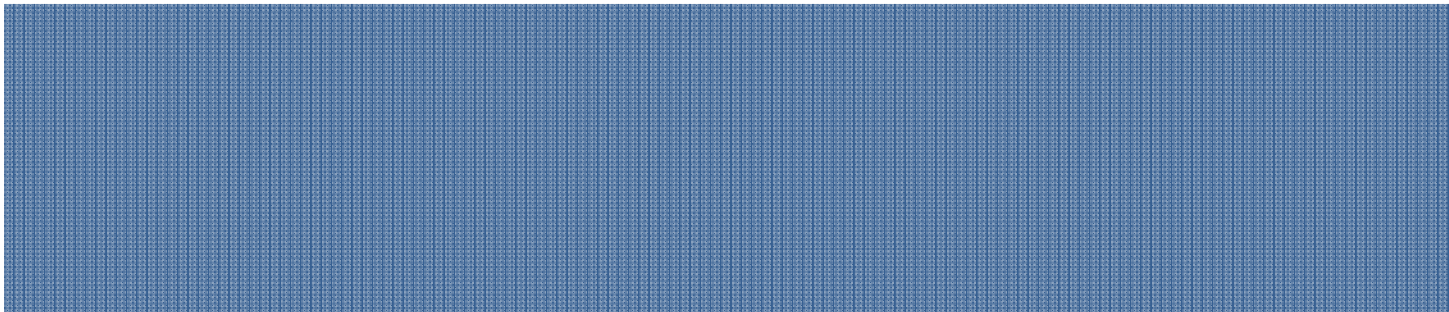
What do you notice?



$$81 - 72 + 63 - 54 + 45 - 36 + 27 - 18 + 9$$

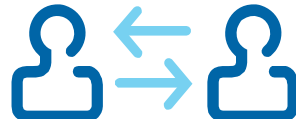


Share



I noticed...

What did you notice?



Find Calculation Shortcut



$$81 - 72 + 63 - 54 + 45 - 36 + 27 - 18 + 9$$

Find the value quickly
“in your head”
fewest calculations

Explain *why* your shortcut works.



Share and Study Shortcuts

$$81 - 72 + 63 - 54 + 45 - 36 + 27 - 18 + 9$$

Presenter

We noticed... so we...

We knew... so we...

Our shortcut works
because...

Audience

They noticed... so they...

They knew... so they...

Their shortcut works
because...

Reflect on Learning



- A. To find a calculation shortcut look for_____.
- B. Noticing _____ helped me find a shortcut because _____.
- C. A property that comes in handy when developing a shortcut is_____ because_____.

How were you *Looking for and Make Use of Structure?*

If I'm thinking structurally,
I'm paying attention to

If I'm thinking structurally,
I'm asking myself questions like....

If I'm thinking structurally,
I'm taking actions such as...



Contemplate then Calculate



WHAT: Practice looking for *shortcuts* using what you know about the way numbers and operations work.

WHY: to “think like mathematicians”, to use mathematical *structure* to find shortcuts.



Contemplate then Calculate



Notice



Find Calculation Shortcut 

Share and Study Shortcuts

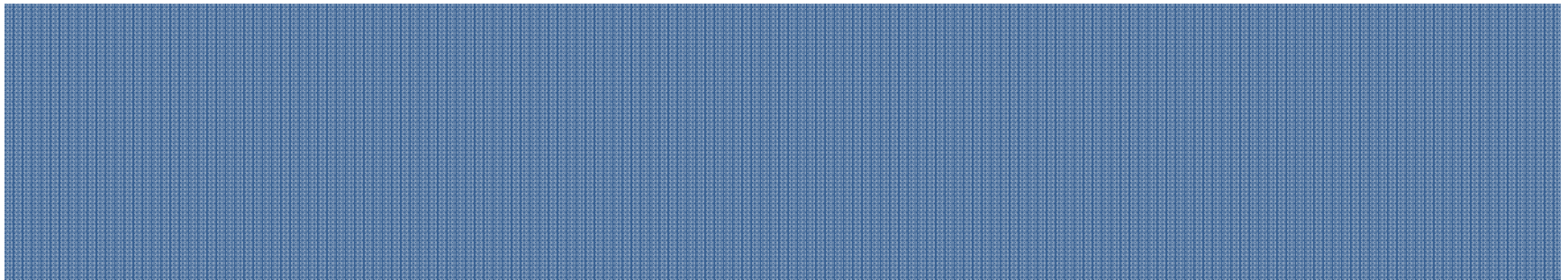


Reflect on Learning



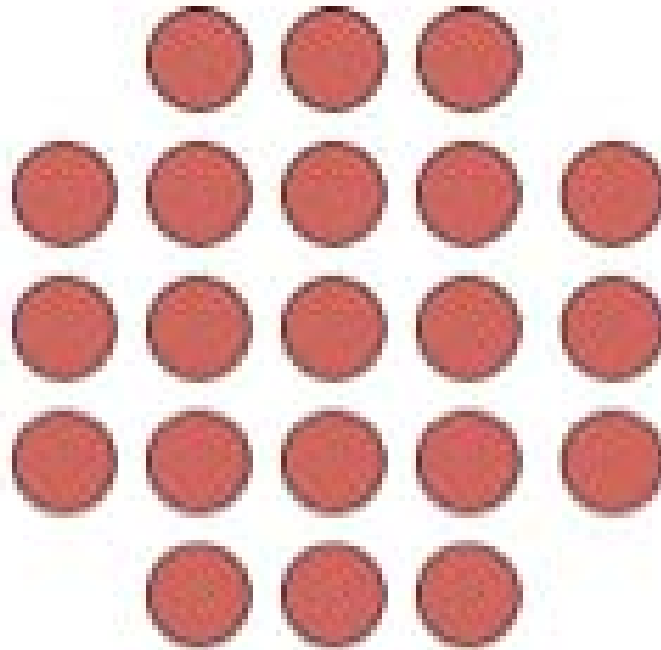


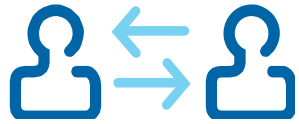
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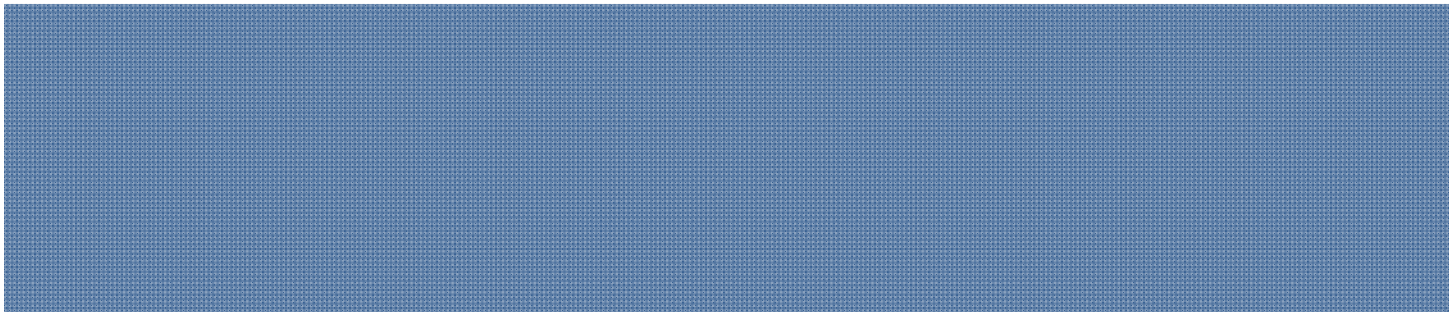


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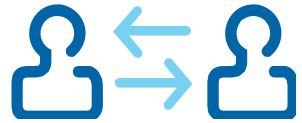


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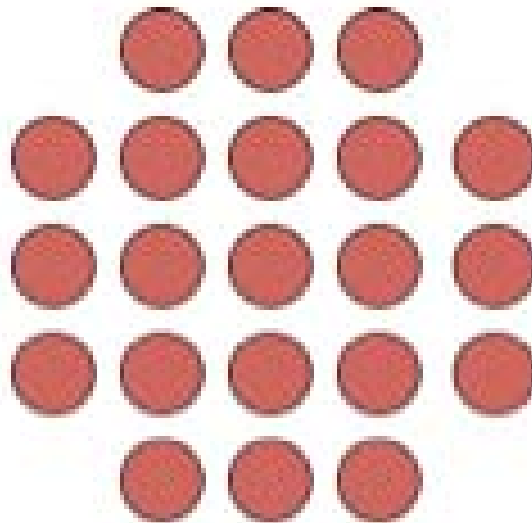


I noticed...

What did you notice?



Find Calculation Shortcut

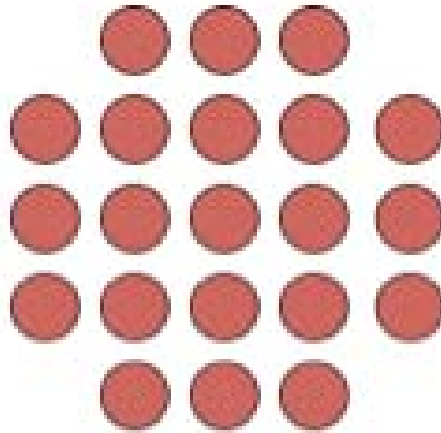


Find the total number of dots quickly, “in your head”
Explain *why* your shortcut works.



Share and Study Shortcuts

Presenter



Audience

We noticed... so we...

We knew... so we...

Our shortcut works
because...

They noticed... so they...

They knew... so they...

Their shortcut works
because...

Reflect on Learning



- A. To find a counting shortcut look for_____.
- B. Noticing _____ helped me find a shortcut because _____.
- C. A property that comes in handy when developing a shortcut is _____ because _____.

NCTM Teaching Practices

Identify how the routine promotes and makes use of ***Meaningful Mathematical Discourse***

Describe how the routine ***Builds Procedural Fluency from Conceptual Understanding***

Identify when and how teachers ***Elicit and Use Evidence of Student Thinking***

What Happens When...

Instructional Routines that embody the NCTM Teaching Practices and purposefully develop the Math Practices are implemented regularly?

Disclaimer

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