Routines for Reasoning: Ensuring ALL Students are Mathematical Thinkers

DO NOW: Share with a partner:

One way CthenC is impacting your classroom and/or student thinking

Amy Lucenta

Elisabeth Ventimiglia

twitter

#FosteringMPs
@AmyLucenta

FOSTERING MATH PRACTICES

www.fosteringmathpractices.com

Opening

Quick name – share

Slides will be available after tonight.

Goal # 1

Deepen understanding of the Instructional Routine, *Contemplate then Calculate*, designed to develop structural thinking (MP7)

You will know your learning is on track if you can

- Describe how the designs of CthenC foster structural thinking

Goal # 2

Learn design features and teacher moves embedded in C then C that are designed to foster Structural Thinking (MP7) in ALL students

You will know your learning is on track if you can identify/describe how the routine:

- Provides access and support for a range of learners
- Focuses student attention on mathematical structure
- Develops students' language to describe structural thinking

Agenda

Do Now

Opening, Framing, Goals

Share Out Classroom Impact

Why CthenC?

Q & A based on experiences

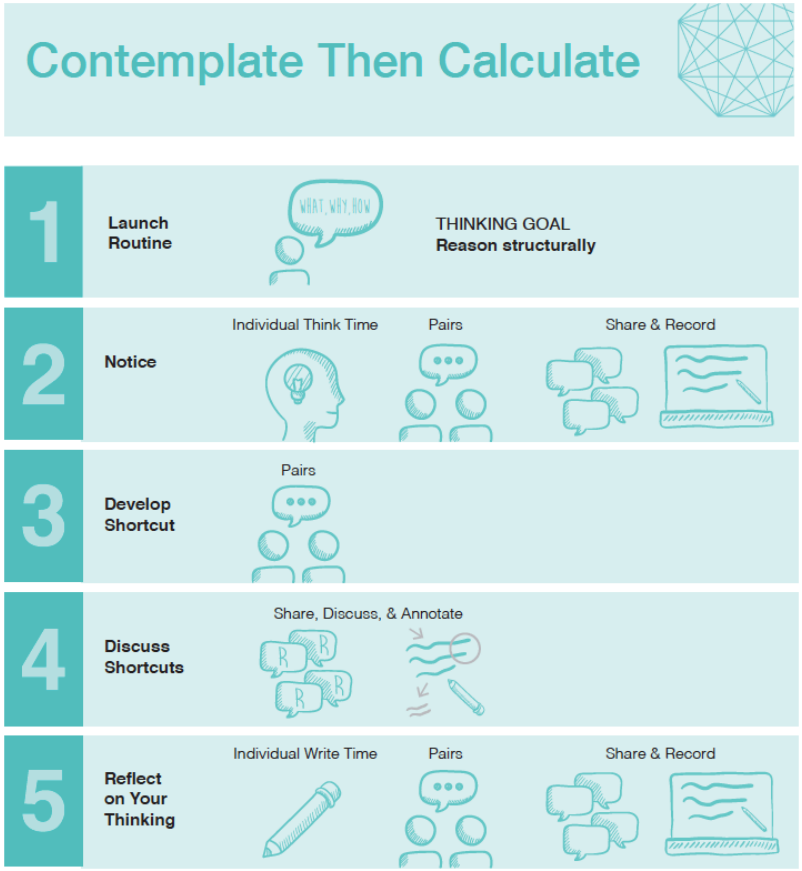
Focused Rehearsal of Contemplate then Calculate

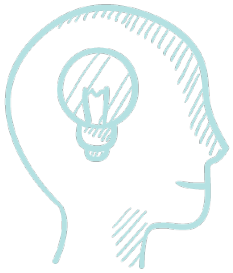
Characteristics of #CthenC tasks

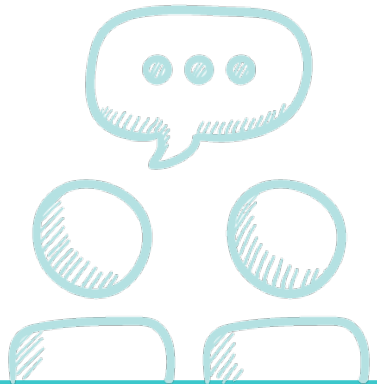
One way CthenC is impacting my classroom….

One way CthenC is impacting student thinking…

Annotate the info graphic with questions







Shift Students' view of Mathematics as…

A collection of unrelated results and procedures to know

A set of interconnected ideas that build on each other and make sense

Structural Thinking Supports Students Who…

- Get lost in details or tedious calculations
- Benefit from visual representations
- Benefit from connections between and among math ideas & representations
- Interpret the ‘big picture’ or shift perspective

Middle School Examples

Chunk

CCSS.MATH.CONTENT.6.EE.A.2.B
Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient); view one or more parts of an expression as a single entity. For example, describe the expression 2 (8 + 7) as a product of two factors; view (8 + 7) as both a single entity and a sum of two terms

Change

CCSS.MATH.CONTENT.7.EE.A.2
Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related. For example, a + 0.05a = 1.05a means that "increase by 5%" is the same as "multiply by 1.05."

High School Examples

Interpret the structure of expressions.

CCSS.MATH.CONTENT.HSA.SSE.A.1

- Interpret expressions that represent a quantity in terms of its context.*
- Interpret parts of an expression, such as terms, factors, and coefficients.
- Interpret complicated expressions by viewing one or more of their parts as a single entity. For example, interpret P(1+r)n as the product of P and a factor not depending on P.

CCSS.MATH.CONTENT.HSA.SSE.A.2

Use the structure of an expression to identify ways to rewrite it.

Write expressions in equivalent forms to solve problems.

CCSS.MATH.CONTENT.HSA.SSE.B.3

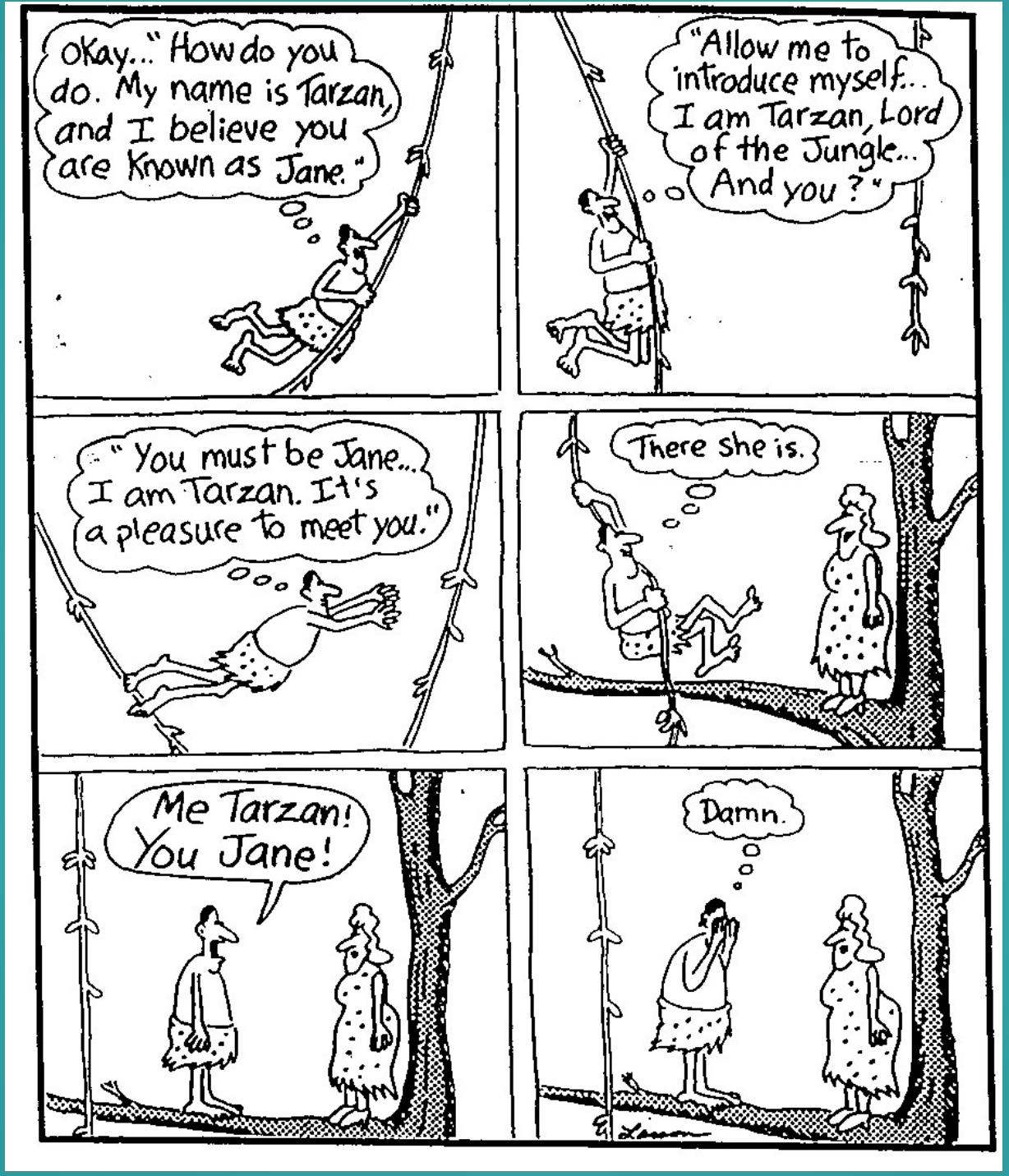
Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.*

Contemplate then Calculate Rehearsals

Why Rehearse?

FOSTERING MATH PRACTICES

https://www.youtube.com/watch?v=cLPXCVYoM-s&feature=youtu.be


Okay..." How do you do. My name is Tarzan, and I believe you are known as Jane."
"Allow me to introduce myself... I am Tarzan, Lord of the Jungle... And you?"
"You must be Jane... I am Tarzan. It's a pleasure to meet you."
There she is.
Me Tarzan! You Jane!
Damn.
Gary Larson 1991

Rationale for Rehearsing thru Routines

https://americanroosters.files.wordpress.com/2012/03/istock_000002150297-girl-sprayed-with-hose.jpg

Rehearsal Roles

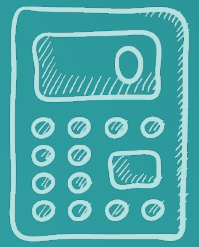
Contemplate then Calculate

An Instructional Routine to Develop
ALL Students' Structural Thinking

FOSTERING MATH PRACTICES

www.fosteringmathpractices.com

Contemplate then Calculate

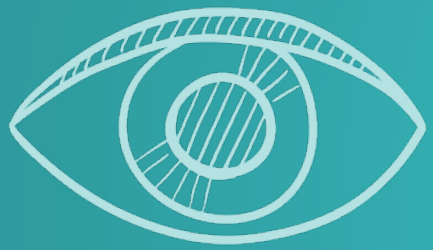


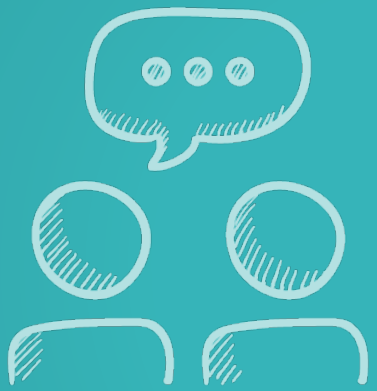
- **WHAT:** Quick count by chunking, changing the form and connecting to math you know.

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

FOSTERING MATH PRACTICES

Contemplate then Calculate





Notice

Find calculation shortcut

Share & study shortcut

Reflect on learning

FOSTERING MATH PRACTICES

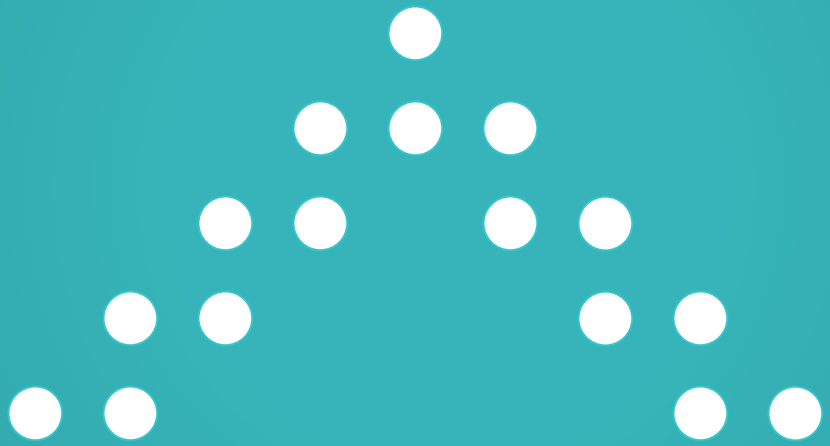
What do you notice?

ASK YOURSELF:

What might be mathematically important?

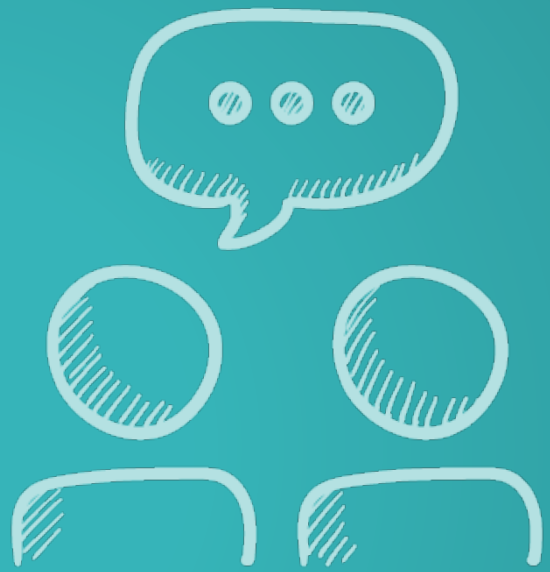
FOSTERING MATH PRACTICES

What do you notice?



FOSTERING MATH PRACTICES

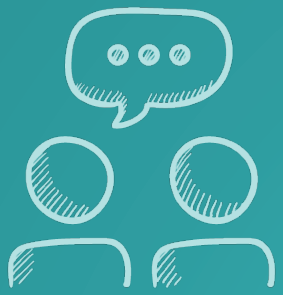
Share



I noticed…

What did you notice?

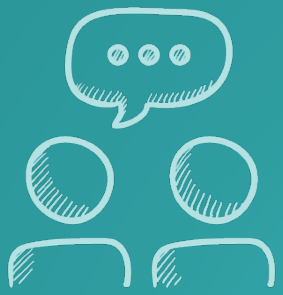
FOSTERING MATH PRACTICES



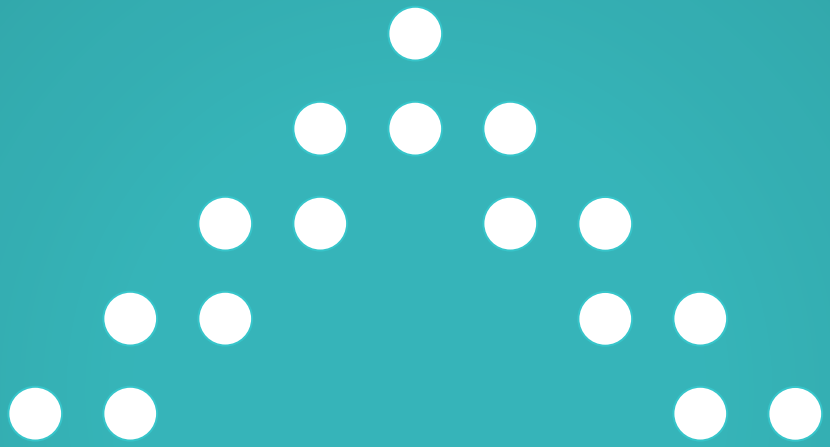
Find counting shortcut

- Find the total number of circles quickly **in your head**
- Prepare to explain your shortcut using **chunk, change, and connect**.

FOSTERING MATH PRACTICES



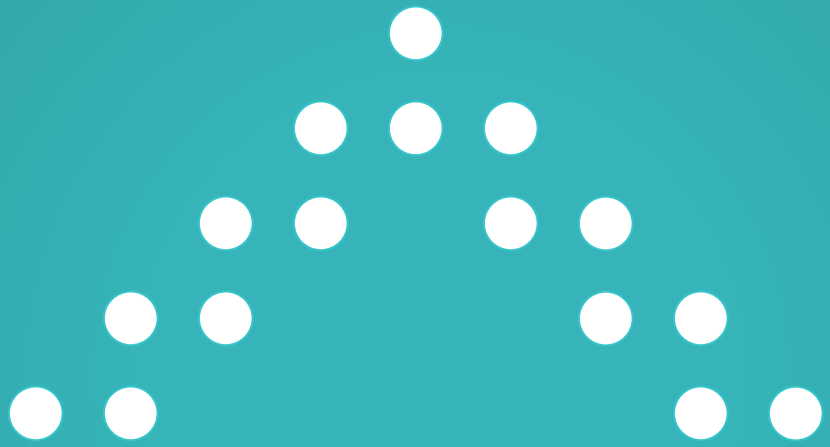
Find counting shortcut



- Find the total number of circles quickly in your head
- Prepare to explain your shortcut using chunk, change, and connect.

FOSTERING MATH PRACTICES

Share and study shortcuts



PRESENTER
- We noticed…so we…
- We knew...so we…

AUDIENCE
- They noticed…so they…
- They knew...so they…

FOSTERING MATH PRACTICES

Reflect on learning

a) To find a shortcut look for _____.

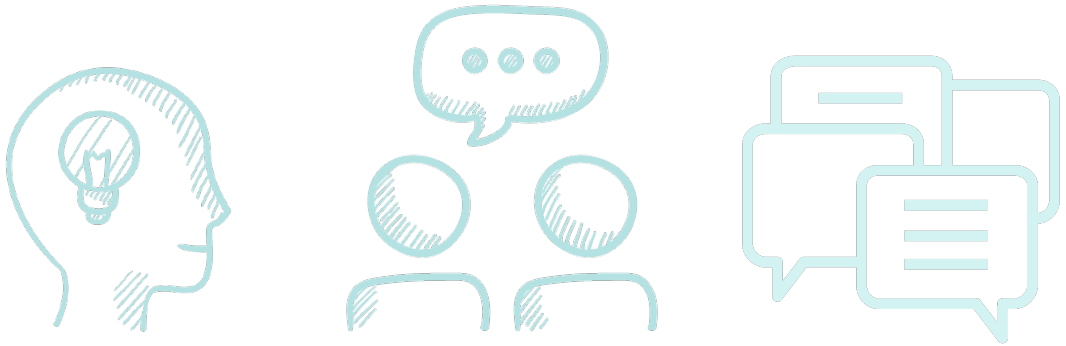
b) Noticing _____ helped me count quickly because_____.

c) Knowing _____ comes in handy when counting quickly because_____.

FOSTERING MATH PRACTICES

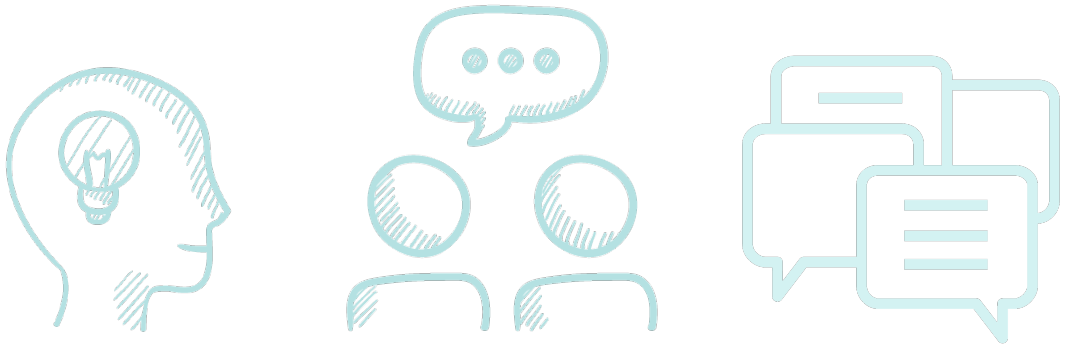
Stop and Jot
The rehearsal has me thinking about…

Think-Pair-Share



What design elements of Contemplate then Calculate support ALL learners?

Think-Pair-Share



4 Essential Instructional Strategies

Keeping the focus on the mathematical thinking while providing access for a wide range of learners

- Ask-yourself questions
- Annotation
- Sentence frames and starters
- The Four Rs – repeat, rephrase, reword, record

The Power of Routines

Instructional routines…

- support students
- are collaborative.
- free up brain space for the hard work.
- serve as vehicles for the Five Practices.
- save time.
- develop math practices over time.
- Wash, rinse, repeat.

….AND….

- Develop equitable practice in a classroom, school, district.

Contemplate Then Calculate

1 **Launch Routine**

THINKING GOAL
Reason structurally

2 **Notice**

Individual Think Time

Pairs

Share & Record

3 **Develop Shortcut**

Pairs

4 **Discuss Shortcuts**

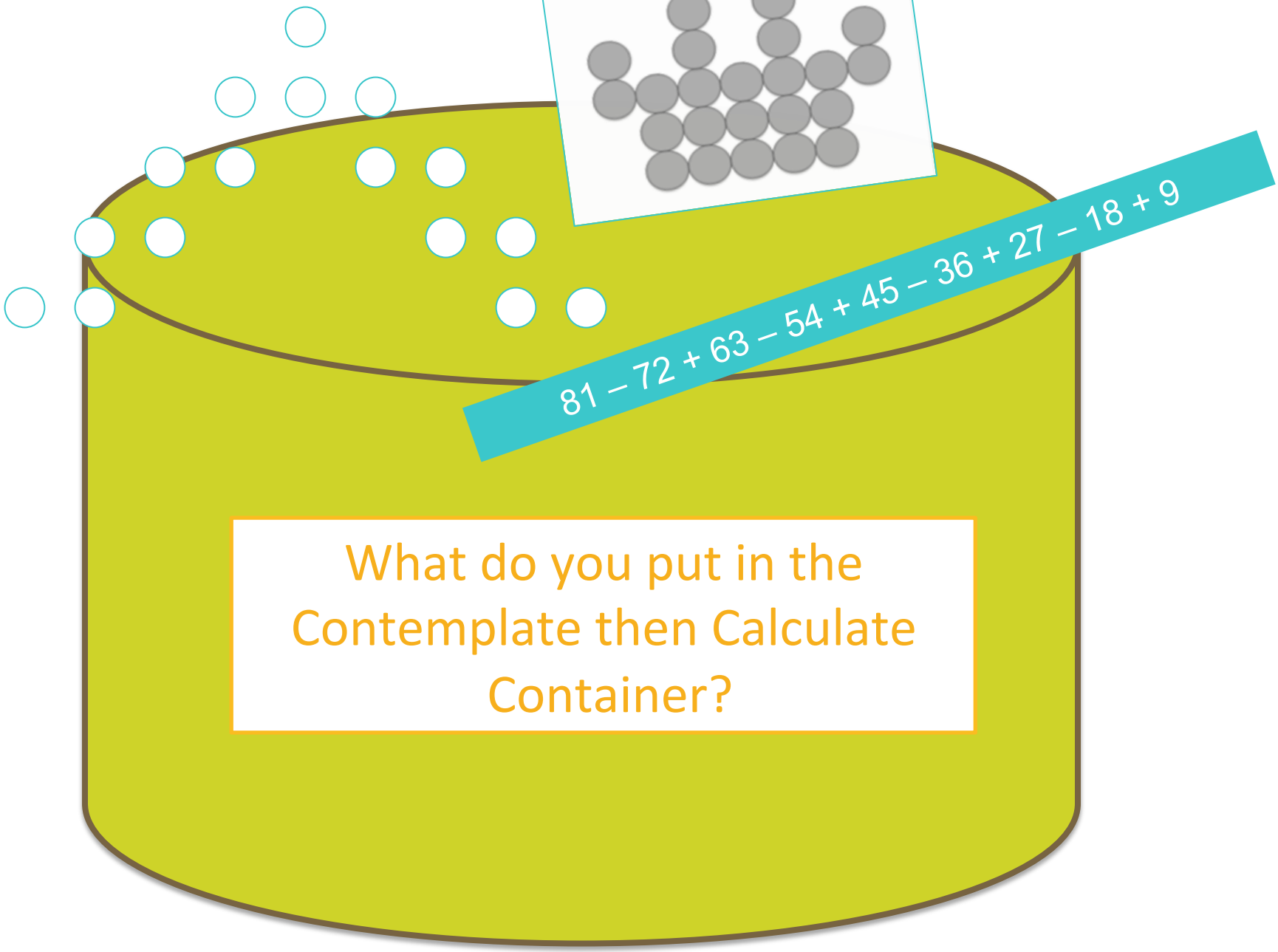
Share, Discuss, & Annotate

5 **Reflect on Your Thinking**

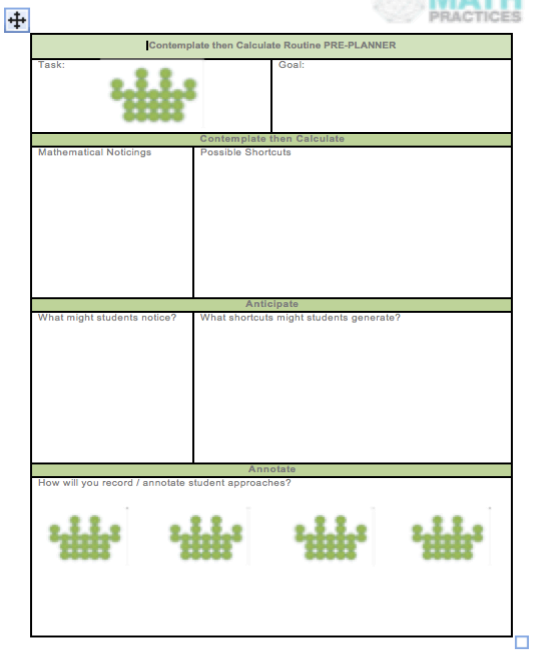
Individual Write Time

Pairs

Share & Record


81 – 72 + 63 – 54 + 45 – 36 + 27 – 18 + 9
What do you put in the Contemplate then Calculate Container?

Contemplate then Calculate Planning


Contemplate then Calculate Routine PRE-PLANNER

Task:

Goal:

Contemplate then Calculate

Mathematical Noticings

Possible Shortcuts

Anticipate

What might students notice?

What shortcuts might students generate?

Annotate

How will you record / annotate student approaches?

Contemplate then Calculate Routine PLANNER

Launch

What will you say to students about *what* they will be doing and *why*?

Notice

How long will you project the task? What noticings would be important to share in the full group and record?

Develop Shortcuts

Which shortcuts will you share? In what order?

Discuss Shortcuts

How will you record and annotate shortcuts?

Reflect on Thinking

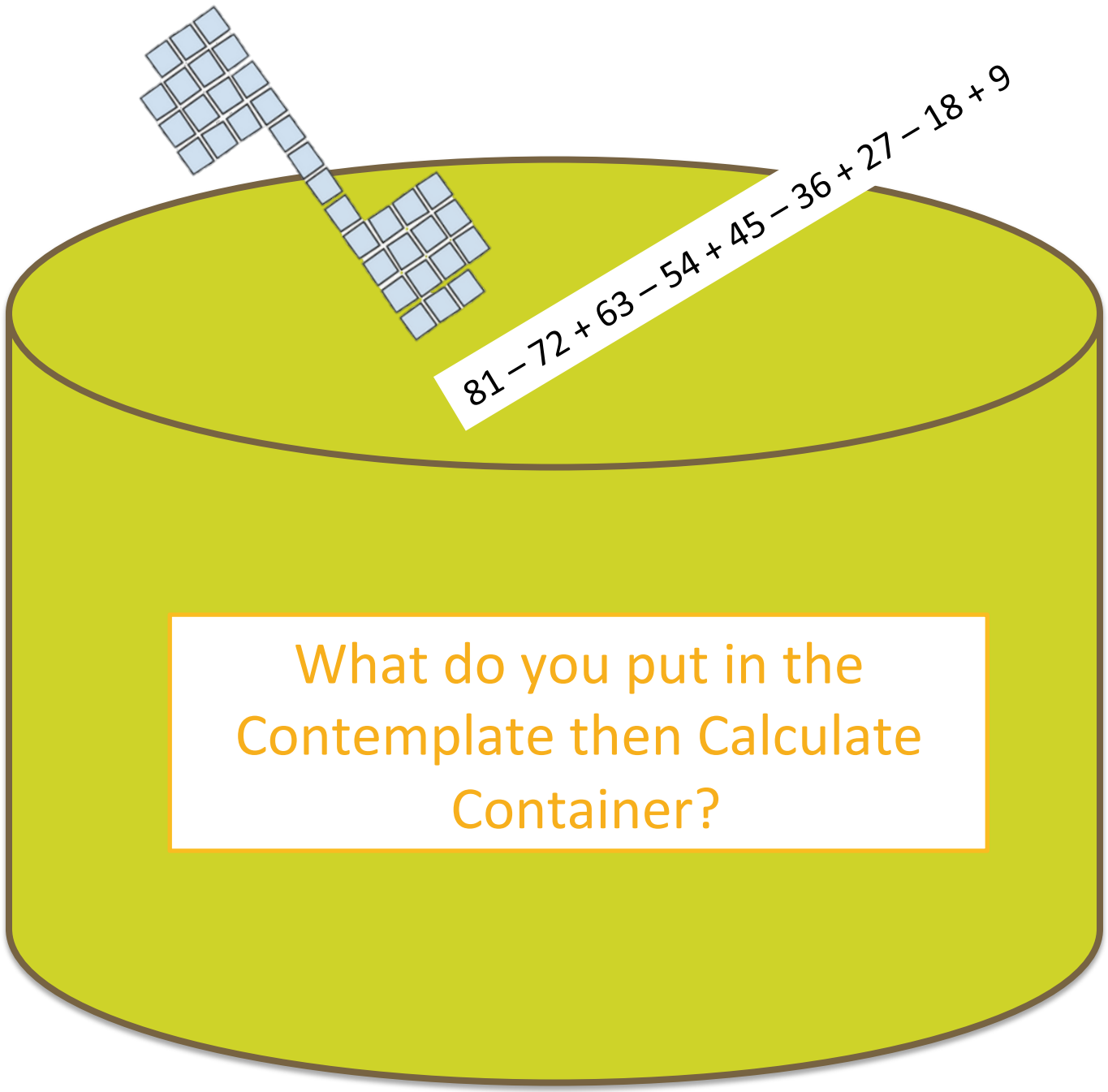
What reflection prompts will you provide?

PART 1

- Do the Math
- Anticipate Noticings
- Anticipate Strategies
- Anticipate Annotations
- Anticipate Reflections

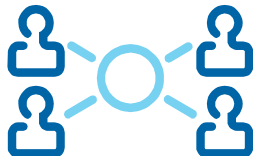
PART 2

- Work through the Planner
- Prepare the Slides


81 – 72 + 63 – 54 + 45 – 36 + 27 – 18 + 9
What do you put in the Contemplate then Calculate Container?

What are characteristics of a productive C then C task?

At your table, articulate 2-3 characteristics of a productive C then C task



Consider these Tasks

$-12\left(\frac{1}{5} + X\right) = 0$

$5(X + 3) = 6(5)$

$X^2 + 2x - 5 = 0$

29×5

Would they be good for C then C?

Refer to the characteristics.

Advice for learning C then C

- Collaborate around tasks, strategies, annotation
- Rehearse
- Get feedback
- Reflect on opportunities to refine flow
- Reflect on opportunities to highlight structural thinking

Advice for implementing C then C

- Make it routine….for you, for teachers, for students
- Don’t judge success on the first enactment
- Place an increased focus on the the structural thinking behind the shortcuts
- Infuse the Contemplate then Calculate thinking into non-instructional routine lessons and tasks

CthenC in classrooms

- C then C has supported me in my **planning** by giving me a ready-to-use framework for facilitating quality math discussions.
- Repeatedly using the same discussion routine has helped **my students dive right into the mathematical thinking** because they are so familiar with the steps.
- Outside of C then C, I've observed my students internalize the **habits of mind** that C then C reinforces: For example, my students often tell me what they noticed in a problem when explaining how they solved it.

Julia Stoller, Boston Public Schools

CthenC in classrooms

Today's Slides

Log On

www.fosteringmathpractices.com

FOSTERING MATH PRACTICES

FOSTERING MATH PRACTICES

Avenues of Thinking | Special Populations | Routines for Reasoning | Related Resources | What We Offer

"Teaching students to think and reason is perhaps the greatest challenge we face math educators, and these routines pro clear pathways to do so."

For More on C then C and Other Instructional Routines

Reach Out

AmyLucenta@gmail.com

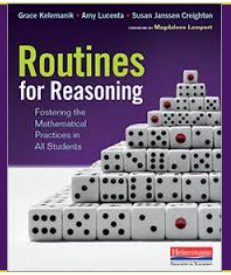
Log On

www.fosteringmathpractices.com

FOSTERING MATH PRACTICES

Join the Conversation

#CthenC #fosteringmps

Get the Book

www.heinemann.com