**What Are You Asking?**
**6 Questions to Transform Math Teaching**

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"We want students to know *how* to solve problems (procedures), know *why* procedures work (conceptual understanding), and know *when* to use mathematics (problem solving and application) while building a positive mathematics identity and sense of agency. How? Why? And when? These questions are the very essence of rigor in the Common Core."

Matt Larson, NCTM President
*The Elusive Search for Balance*, 2017

**The Big 6**

1. How? (solving, computing, doing procedures)
2. What do you notice? (observing, investigating)
3. Can you prove it? (justifying)
4. How is this like…? (comparing, connecting)
5. What is the big idea? (generalizing)
6. What did you learn? (summarizing, reflecting)

**Question 1: How?**

- Can you help me understand what you did?
- How did you solve it?
- How did you get that answer?

Focus: procedures

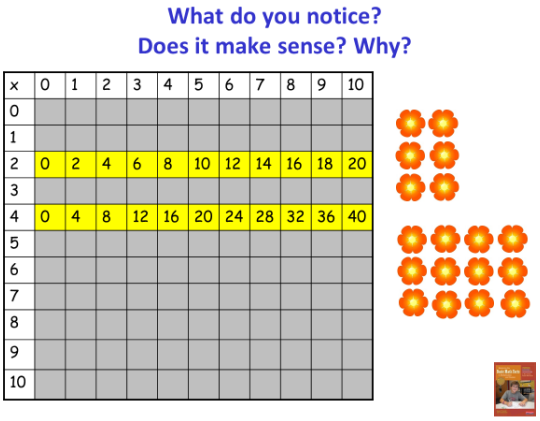
**Cookie Sales**

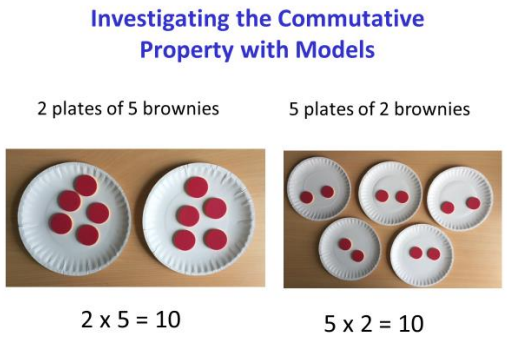
Boxes of cookies sold by Girl Scout Troop #328:
95 boxes of Thin Mints
76 boxes of Tagalongs
68 boxes of Samoas
The Troop made $3.00 profit for every box of cookies sold. How much money did they make?

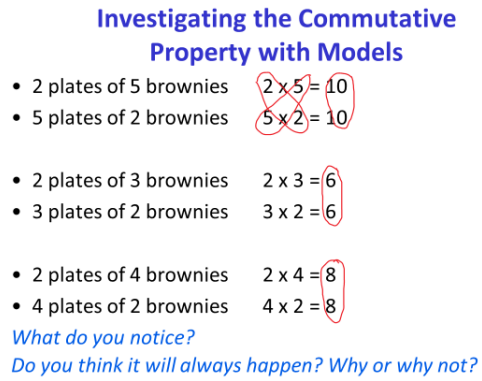
$\$3.00 \times (95 + 76 + 68) = n$
$(\$3.00 \times 95) + (\$3.00 \times 76) + (\$3.00 \times 68) = n$
*Tell me about what you did.*
*Talk about "first" and "next" (order they used)*
*Explain the operations chosen and equations built.*
Expect precision.

**Question 2: What do you notice?**

Discuss math images. http://ntimages.weebly.com/




**Question 3: Why?**

- How could you prove that?
- Can you give me an example to support your thinking/prove your point?
- What can you tell me to help me understand why you chose that strategy?

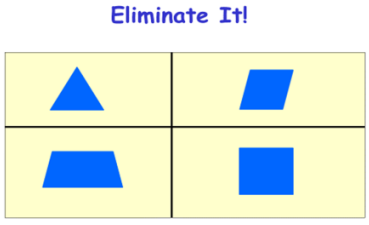
Focus: conceptual understanding, justification

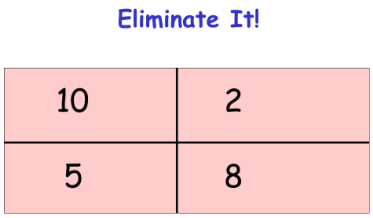
**Agree or Disagree?**

5 tens and 3 ones is the same as 4 tens and 13 ones.

Think about:

- models
- reasoning
- computations



**Make a New Group of Ten or Not?**

Tell me about your thinking.

34 + 3 = __

34 + 7 = __

34 + 6 = __

**Valentine Cards**

Molly got 18 valentine cards. Some of the cards were red, some were pink, and some were white.
There were more pink than red or white.
How many of each color did she get?
Be ready to prove your answers.

**Interpreting Remainders**

a)CDs are on sale for $4.00. Peter has $30.00 in his wallet. How many CDs can he buy? Why?

b)Dad divided 30 large cookies onto 4 plates. How many cookies were on each plate? Why?

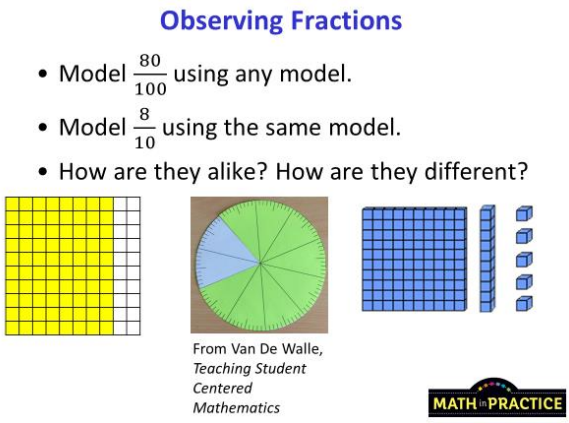
c) Mr. Smith gave his 4 children $30.00 to share equally. How much money did each child get? Why?

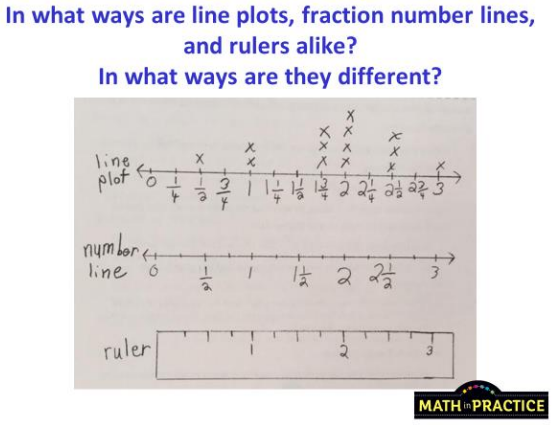
d) There are 30 children in a 4th grade class. Each table seats 4 children. How many tables will be needed? Why?

**Question 4: How does this compare to…?**

- How is this like…?
- How is this different from…?
- When have you seen this before? Explain.

Focus: observation, connections




**Sticky Note Arrays**

Grade 2

- Make giant arrays with square sticky notes.
- *How many squares (sticky notes) are there?*
- *What is the equation?* (4 + 4 + 4 = 12)
- Have students build more sticky-note arrays and label with repeated addition equations.

Grade 3

- Do the same activity.
- Build multiplication equations. (3 × 4 = 12)
- What do these remind you of?
- How are the equations alike and different?

**Question 5: What's the big idea?**

- What is the rule?
- Can you give an example to show it works?
- Will it always work? Explain your thinking.

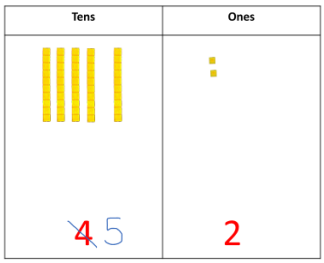
Focus: generalizing

**Solve it with a model.**

Colin had 42 Pokemon cards.

How many will he have if he buys 10 more?

How will you show 10 more?
Where do you place the ten rod? Why?
How many cards does Colin have now?




**Figuring Out the Rule**

Repeat with other problem data.

| | | | | |
|---|---|---|---|---|
| 42 | 21 | 81 | 54 | 78 |
| 52 | 31 | 91 | 64 | 88 |

*What do you notice?*
*What digit changes? Why?*
*Predict: What is 46 + 10?*
*Check your prediction with a model.*
*How could you add 10 without using a model?*

MATH in PRACTICE

**Jack found $\frac{2}{3}$ of a pizza in the refrigerator. He ate ¼ of it. How much of the whole pizza did he eat?**

$\frac{1}{4} \times \frac{2}{3} = \frac{2}{12}$

**Model, solve, and record.**

$\frac{1}{4} \times \frac{1}{6} = \frac{1}{24}$
$\frac{1}{4} \times \frac{2}{3} = \frac{2}{12}$
$\frac{1}{3} \times \frac{1}{2} = \frac{1}{6}$

What do you notice?

Predict the product of $\frac{1}{2} \times \frac{1}{4}$.

Model it to find the product. Were you right?

Is there a way to find the product without using the model? What is the rule?

**Question 6: What did you learn?**

- What did you learn today?
- What surprised you today?
- What questions do you have about the lesson?
- Where did you get stuck today? How did you get unstruck?

Focus: summarizing, reflecting, closure

**Two-Column Notes**

I Know This/I Still Have These Questions
I Discovered/I Still Wonder About
Today I Learned/Tomorrow I'd Like to Talk About
This Was Easy for Me/This Was Hard for Me

**Considerations: The "How" of Teacher Questioning**

- Give students time to think.
- Use "turn and talk".
- Anticipate student thinking/responses.
- Take time to consider responses.
- Don't interpret their answers. Ask them to clarify/interpret them for you.
- Expect and probe for precision.
- Ask others to respond to answers.
- Show interest whether they are right or wrong.

**For more on Teacher Questioning, see the following resources:**

***Math in Practice*** **(Heinemann, 2016)**
This series is filled with lesson ideas, instructional strategies, sample teacher questions, practice tasks, and many online printable resources to make teaching K-5 math more meaningful and more fun. There is a book for each grade level K-5 that contains a wealth of grade-specific activities, as well as a *Guide for Teachers* filled with instructional strategies and an *Administrator's Guide* for math coaches and district math leaders. Visit the website at **www.mathinpractice.com** to view the materials. *Math in Practice* is PD in a book - like having a math coach for every teacher!

***Putting the Practices into Action - Implementing the Common Core Standards for Mathematical Practice K-8*** with John SanGiovanni (Heinemann)
The Standards for Math Practice are the heart and soul of the Common Core State Standards. This book explains each standard in teacher-friendly terms and highlights practical activities to make the standards come alive in classrooms. It contains PLC study group questions and online resources.

***Mastering the Basic Math Facts for Addition and Subtraction***
***Mastering the Basic Math Facts for Multiplication and Division***
with John SanGiovanni (Heinemann)
Through investigations, teacher questioning, student discussions, visual models, children's literature, and hands-on explorations, students explore math operations, and through engaging, interactive practice achieve fluency with basic facts. Online resources contain customizable activities, templates, recording sheets, and teacher tools to simplify your planning and preparation. Reproducibles are in English and Spanish translation.

**Introduction to Communication (Heinemann, part of the Math Process Standards Series)**
This is a practical guide for helping students refine their skills at communicating about math. It includes tips and strategies for teacher questioning, generating student talk, and improving students' writing about math. Includes a CD filled with teacher tools and customizable student activities. This book is available for Grades PK-2, Grades 3-5, and Grades 6-8.

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For information on resources or workshops by Sue O'Connell, visit her website at www.qualityteacherdevelopment.com.

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