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# Balanced Numeracy / Math Workshop

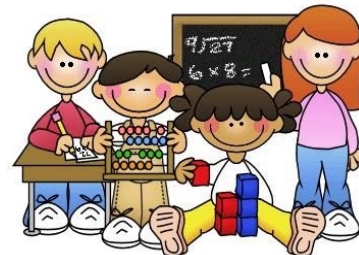
## Presented by Jen Barker

Rosemary Heights Elementary - September 24th, 2018  
Surrey, B.C. 8:30 a.m. - 11:30 a.m.

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## WHOLE CLASS:

### Teach for Conceptual Understanding

**Concretely** - using hands-on real materials (e.g., beans, buttons) or manipulatives (e.g., counters or blocks)

**Representational** - pictorial, using models such as ten frame cards, five and ten frame templates, number charts, and number lines, part-part whole mats

**Abstract/Symbolic** - using the numbers and symbols Using Number Routines

### Open Questions

Questions that not only have different strategies but also could have different answers.

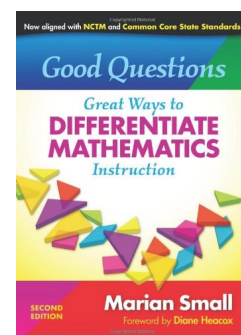
- [www.onetwainfinity.ca/presentations/AMElemNov.pdf](http://www.onetwainfinity.ca/presentations/AMElemNov.pdf)
- Marian Small's Open Questions [http://www.rubiconpublishing.com/shop/?pa\\_focus=numeracy](http://www.rubiconpublishing.com/shop/?pa_focus=numeracy)



The Open Questions for the Number Strand are correlated to the WCNP (BC Curriculum). The other strands are available but they are aligned to the Ontario curriculum, not BC. Number Strand K - 3 LRS #173627 and Grades 4 - 6 LRS #173628 and Grades 7 - 9 LRS #173629

### Parallel Tasks

Parallel tasks are a set of two or three tasks that are designed to meet the needs of students at different developmental levels, but that get at the same big idea and are close enough in context that they can be discussed simultaneously.



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## Open Middle Problems

These questions have a ‘closed’ beginning and a ‘closed’ end. How children approach the question can vary in different ways - thus it has an “open” middle.

- Open Middle Blogpost Collection of Lessons <https://docs.google.com/document/d/1h-FX4tTm1GCz931MTDORKQIKU6btorKcDuNZ5RvrVXA/edit>
- Open Middle Website <http://www.openmiddle.com/>



## Rich Tasks

- Margie Pierce List of Rich Tasks [https://docs.google.com/spreadsheets/d/1yGaZy9g8X0HHFuWMBQkF14pVStu\\_SIBnbZSkxo9nWPI/edit#gid=0](https://docs.google.com/spreadsheets/d/1yGaZy9g8X0HHFuWMBQkF14pVStu_SIBnbZSkxo9nWPI/edit#gid=0)
- Rich Tasks list created by the BC Provincial Numeracy Project Team [https://www.dropbox.com/s/sc6h24ii69hacoz/Rich%20Tasks\\_Problems%20copy.docx?dl=0](https://www.dropbox.com/s/sc6h24ii69hacoz/Rich%20Tasks_Problems%20copy.docx?dl=0)

## Literature Based Lessons

Mathematizing a read-aloud provides students with opportunities to learn mathematical concepts in meaningful contexts. Using literature to connect concepts with students’ experiences helps foster understanding and motivates students to learn.

- Intermediate: <https://portal.sd71.bc.ca/group/l7lwzs1/intermediatemath/Documents/Math%20Bibliography%20Intermediate%202017.pdf> from Campbell River/Comox
- <https://mathbookmagic.com/>



## Three Act Tasks

This activity is made up of three parts or “acts;” 1) The Question, 2) Gathering Information, and 3) The Reveal. The entire activity typically takes a full math period or the acts can be split up and worked on across multiple days. The goal of the activity is to engage children in asking mathematical questions, identifying information that will allow them to answer the question, developing a mathematical model of the situation, and revising their models to more closely reflect the real world.



- Graham Fletcher’s Three Act Tasks <https://docs.google.com/spreadsheets/d/1hc1RelbdJJzEA3fO6DE457wu4AKOfi6BFxWLRBXO-bA/edit#gid=0>
- [tedd.org](http://tedd.org) NOTE - You need to register but it is FREE and a wealth of information.

## Quick Image Number Talks:

Quick Image number talks involve pictures of quantities, usually organized in a particular way to encourage students to subtilize and/or use spatial sense of quantities. The teacher shows the image for a few seconds and then asks “How many \_\_\_\_\_?” It is important not to show the images for more than few seconds, as doing so provides opportunity for

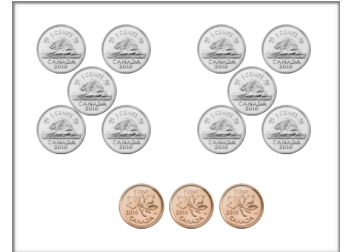
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students to count by ones. Students must mentally structure the amounts in efficient ways.

Next the teacher facilitates the discussion about the quantity. Teachers can help students to link the pictorial and symbolic representation of the quantities by recording how the student saw the quantities and using descriptions including numerals and equations.

**CONTENT** that can be explored includes:

- Perceptual and Conceptual Subtilizing
- Estimation
- Counting - one-to-one correspondence, cardinality, counting sequence, skip counting
- Place Value
- Numbers - quantity, number language (the words we use to say how many things there are), numeration (how we write how many things there are)
- Decomposing and Recomposing
- Additive and Multiplicative thinking



**Items you can use:**

- |                   |                                  |
|-------------------|----------------------------------|
| - fingers         | - tally marks                    |
| - dots            | - base ten blocks                |
| - 5 and 10 frames | - rekenreks                      |
| - money           | - shapes partitioned (fractions) |

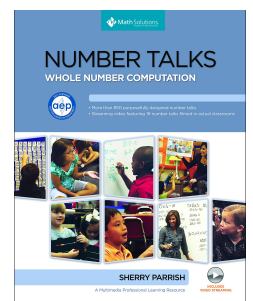
**For Virtual Apps that you can Screenshot on your computer:** <https://www.mathlearningcenter.org/resources/apps>

## Using Number Talks:

Number Talks are a valuable teaching strategy that should be used BOTH with the whole class and in small guided math groups.

Some of the potential learning intentions:

- Develop multiple strategies (Mental Math) for Decomposing
- Develop the ability to compute with flexibility, accuracy and efficiency



**LRS #171347**

Keep it short - no longer than 10 - 15 minutes and a few times a week. Be intentional - choose a related sequence of images or equations. Be sure to give the students lots of practice with the same kinds of problems. It is about the students noticing/discovering strategies that make sense to them. We do not “teach” the strategies. When a student shares a strategy, we name it and nurture it.

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*Example:*

**Julie:** “I look for partners for ten and then I think 10 and some more”

**Teacher:** “Students, what could we call this strategy?”

**Students:** “Making Ten”

**Teacher:** “Great, let’s add Julie’s example to our chart of strategies we’ve discovered for addition. “

Items you could use:

- Dots, Fingers, Tally Marks, Dominos, Five and Ten Frames, Base Ten Blocks, Coins, images, Greg Tang books
- Online visual tools including the math rack (rekenrek) and ten frames through <https://www.mathlearningcenter.org/resources/apps>
- Dot arrangements or Real life images of groups of items (arrays) <http://ntimages.weebly.com/photos.html>

Guiding Questions:

Who would like to share their thinking?

How many do you see?

How do you see them?

Does anyone see them differently?

Is there an equation you could use to describe how you saw it?

Blogposts on Number Talks:

- On my site, you can find quick information documents on Number Talks <http://www.meaningfulmathmoments.com/number-talks.html>
- Sandra Ball has also written about Number Talks: <https://startingwiththebeginning.wordpress.com/number-talks/>

Video Examples:

Addition Number Talk  $16 + 15 =$  <http://bit.ly/additionnumbertalk>

Multiplication string  $7 \times 7$  by Math Solutions - <http://bit.ly/multiplicationnumbertalk>

Number Talks at Harold Bishop <https://vimeo.com/260886488>

Number Talks at Berkshire Park <https://vimeo.com/260303277>

Multiplication video in a combined Grades 4/5 class <https://www.teachingchannel.org/videos/4th-5th-grade-number-talks>

Number Talk with Dot Images in Grade Four <https://www.teachingchannel.org/videos/dot-image-lesson-4th-grade>

## How Many?

A “How Many” conversation occurs around a photo that provides multiple ways to interpret different quantities (e.g., One pair of shoes, two shoes, one box, 10 holes, etc.) These photos help focus attention on the units being counted. After a child shares how many they see, it is important to ask the students “How do you know” or “How could we check?” to discover their thinking.

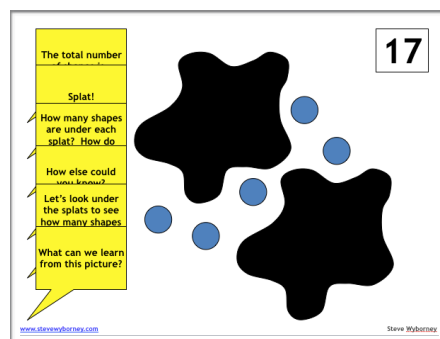


Not only is “What counts as one?” an important question, its answer changes based on your perspective, and so it offers opportunities for **play**. Children like to play; they need to play. Children find numbers wonderful, delightful, interesting and fun. Numbers constitute a playground for children’s minds?

- Christopher Danielson (2017) Author of website: <https://talkingmathwithkids.com/>

## SPLAT!

Created by Steve Wyborney, there are FREE SPLATS for every grade level including single splats, multiple splats, and splats with fractions. Students are provided opportunities to decompose and recompose quantities. To download Splats to try with your class go to Steve’s website <https://www.stevewyborney.com>



## Estimation Clipboard

The Estimation Clipboard is a set of 40 lessons that each include 4 highly similar images. Each image provides an invitation to estimate. Then as new images are introduced, the students’ context and intrigue will grow – and so will their excitement. These can be found on Steve Wyborney’s site <https://www.stevewyborney.com>



### Tips for Using The Estimation Clipboard

1. When the first image (of 4) appears, invite the class to share some estimates aloud. Typically, a few students will offer some estimates. Don’t spend much time on the first image. After you have received a few responses, reveal the answer.
2. Make a mental note: If you hear answers from a small number of students, you are also hearing silence from nearly all of your class. Anticipate engaging all students in mathematical reasoning by the time you reach the third image.
3. When the second image appears, invite the class to share some estimates aloud again. You will likely hear estimates from more students than the first time. You may want to spend a little more time on the second image, but the power of The Estimation Clipboard is yet to come.
4. When the third image appears, change your approach. Remember, you haven’t heard from several students at this point, but everyone’s context is growing. When you show the third image, instead of asking for answers aloud have all of the students write down their estimate. Then have them discuss these two questions with a partner: “What was your estimate? Why did you choose it?” Listen carefully to the reasoning.
5. When the moment is right, reveal the third answer. Notice how your students are becoming increasingly engaged in the estimation process. That’s partly because you are re-inviting them into a growing context. It’s also because they have engaged in writing and discussion. The moment of writing has become a springboard for discussion. They have been given space to voice their ideas, and they are learning more about their ideas as they discuss them.
6. When the fourth image appears, repeat the process from the previous step. Everyone in the classroom writes down their estimate, and then everyone tells their partner what estimate they chose and why they chose it. Expect the conversation to take a little longer here and notice that the conversations about the estimates – and about estimation itself – are becoming more detailed. You may see several students pointing to the screen during their discussions.
7. When you reveal the final answer, listen to your class. Simply listen. Just take a moment to notice.
8. Eventually, perhaps after you have tried several sets, introduce the concept of using a range to estimate – rather than using a single number. Look for opportunities to encourage your students to self-select whether a range or a single number would be more useful.
9. As a learner yourself, engage in the process. Be a wonderer in front of your students. If you want a good question to wonder about, begin with this one: “What is estimation?”
10. Enjoy the journey and feel free to share your learning experiences with others! You can find me on Twitter @stevewyborney



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## INDIVIDUAL (OR PARTNER/SMALL GROUP) PRACTICE:

### Learning Stations:

#### What are they?

Learning Stations often called Numeracy Centres, Math Stations, or Daily Math Investigations are mathematical activities designed for individuals, partners, and/or small groups of students. These activities are inviting, engaging and assist students in developing Mathematical understanding. Numeracy Centres are one component of balanced numeracy. It is a supplement to whole class instruction.

#### Why are they important?

- Students need daily opportunities to engage with mathematical ideas in purposeful and playful ways.
- They provide time for authentic, independent practice that connects to what they have learned through whole class quality instruction.
- Students need opportunities to develop the core and curricular competencies. Through the 'doing' of the mathematics, students will be building their confidence, seeing themselves as mathematicians, and seeing the connection of mathematics to their world.
- They give students choice, which increases motivation and fosters a positive disposition towards Mathematics.
- They give teachers an opportunity to meet with students one-on-one or in small groups to provide explicit instruction, engage in guided math, and/or have conferences.
- They allow students to revisit concepts. Learning takes patience and time.

#### What to think about?

- What are my students' interests? How can I incorporate these in the activities?
- What activities can be used to foster the development of key mathematical concepts and competencies?
- How can I modify the centres to make them open ended and invitations to learning?
- How can I differentiate activities to meet the diverse needs of my students?
- How will I be responsive to misconceptions and gaps of understanding?
- How will I record my observations?
- What questions will I ask to move the learning forward?

#### What to do?

Determine where your students are at mathematically. Think about what are the students' strengths, stretches, and what is needed to move their learning forward. Next create five or six centres to meet their needs. Think about incorporating centres based on the time of the year, student interests, and different mathematical concepts (e.g., not all patterning centres). Teach these centres (e.g., model how to use the materials, take turn, clean-up). Give them a try and make observations. Modify the centres if needed.

#### What to look for?

What are the important math concepts my students need to know? Are the students demonstrating their understanding?

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Are my students able to reflect on their learning and can they articulate this?  
What questions will I ask to nudge learning forward?

## Games

- Guided Math has created and shares many games [http://www.guided-math-adventures.com/?page\\_id=125](http://www.guided-math-adventures.com/?page_id=125)
- Box Cars and One-Eyed Jacks <https://www.boxcarsandoneeyedjacks.com/product-category/math/>
- Multiplication Games <http://bit.ly/multiplicationfactgames>
- Addition and Subtraction games created by Sandra Ball <https://startingwiththebeginning.wordpress.com/building-a-foundation/>



### Visual Scaffolding Fact Cards

- Addition, Subtraction, and Multiplication Scaffolding Cards <http://bit.ly/additionscaffoldingcards>
- Multiplication Subitizing Cards <http://bit.ly/multiplicationsubitizing>
- Ten Frame Multiplication visual cards <http://bit.ly/tenframemultiplicationcards>

## Playful Provocations

### Places to get ideas:

- Intermediate Daily Math Investigations created by Selina Millar <http://bit.ly/intermediateinvestigations>
- Janice Novakowski Reggio-Inspired Mathematics [http://janicenovkam.typepad.com/reggioinspired\\_mathematic/](http://janicenovkam.typepad.com/reggioinspired_mathematic/)
- Patterning, Number Concepts, Fractions, Multiplication provocations can be found on my site under the “Instructional Ideas”

## Open Ended Questions

These same questions can be used as learning stations.



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## GUIDED SMALL GROUP INSTRUCTION:

Learning opportunities that support students' strengths and stretches and intentionally move them forward. Groups are **FLEXIBLE** and composition changes according to the needs of the students. It might include working with students on practice questions, teaching a new game, reviewing a concept taught to the class or working with students who are unsure how to start a problem. What is the role of the teacher?

Types of groupings:

Readiness, Heterogeneous, and Random groups

What might you do?

- facilitate a focus lesson
- problem solving
- reinforce a new learning station
- assess student
- discuss common errors
- provide intervention

### 5 Practices for Orchestrating Mathematical Discussions

#### 1. ANTICIPATE

- Do the problem yourself
- What strategies are your students likely to use

#### 2. MONITOR

- Circulate, observe, listen
- Identify and keep track of the strategies used
- Ask questions to discover and nudge thinking

#### 3. SELECT

- Crucial Step - what do you want to highlight? The content focus!
- Purposely select those that will advance mathematical ideas

#### 4. SEQUENCE

- In what order do you want to present the student work samples?
- Do you want the most common/accessible? Perhaps misconceptions first? Build in sophistication? Concrete to abstract?

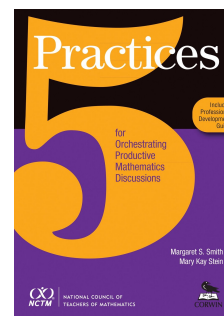
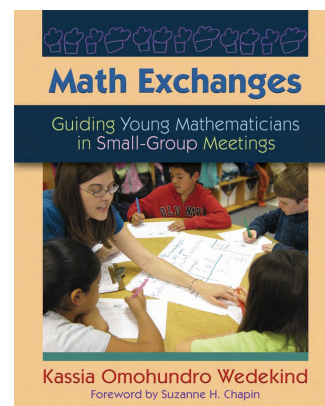
#### 5. CONNECT

- Craft questions to make the mathematics visible.
- Compare/contrast 2 or 3 students' work - what are the mathematical relationships?

### Talk Moves

Great discussions are one outcome of a classroom culture where students' thoughts are welcome and where students are regularly expected to speak, listen and respond to one another. Talk Moves are strategies that help us build that culture. These include:

- REVOICING "So you're saying that...." "Do I have that right?"
- REPEATING "Can you restate what \_\_\_\_ just said?"
- REASONING "Do you agree or disagree and why?"
- ADDING ON "Would someone like to add on to that?"
- WAIT TIME "Take your time.. we'll wait"
- TURN AND TALK "Partner talk or think-pair-share"





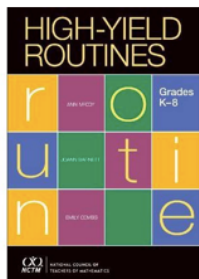
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Strategy (Anticipate)	Who and What (Monitor/Select)	Order (Sequence)

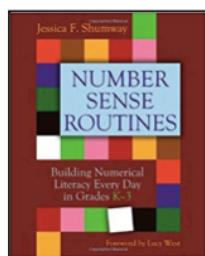
## Resources:

Here is link to two pages with tons of places to find rich tasks. This is on the BC Numeracy Network <http://bit.ly/aug30resources> The BC Numeracy Network also has great resources <https://sites.google.com/view/bcnumeracynetwork/home>

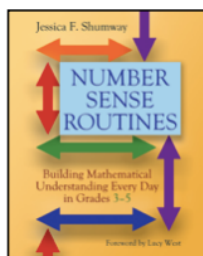
For more Number Routines - see my website <http://www.meaningfulmathmoments.com/math-routines.html> or <https://visiblethinking.weebly.com/daily-routines.html>



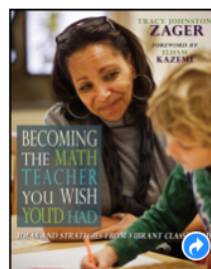
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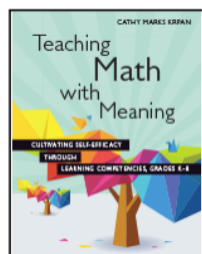
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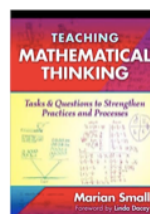
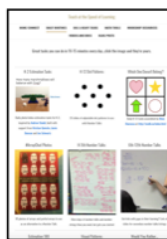
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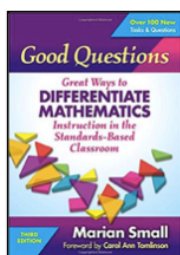


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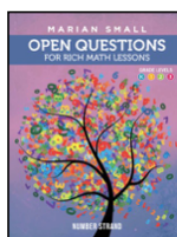


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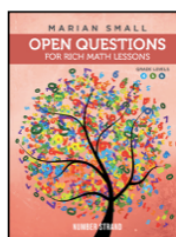
<https://visiblethinking.weebly.com/daily-routines.html>



LRS #177529



LRS #173627



LRS #173628



Coming Soon

Consider registering for the Open Questions Series - check Weekly Memo  
After School 3:30 p.m. - 5:00 p.m. on  
October 11th  
January 16th  
February 5th



LRS #179551