
Building Number Sense Through Numeracy Routines

Presented by Jen Barker

DEC, Surrey BC - October 10, 2017

Contact Info:

Email: barker_jennifer@surreyschools.ca

Twitter: @Barkerjbarker

Website: www.meaningfulmathmoments.com



What are Number Routines?

Number routines are a collection of easy to prep, 5 to 10 minute routines that you can use daily as warm-ups, mini lessons, with the whole class or in small groups. They focus on the big ideas in Mathematics.

Why Use Numeracy Routines?

- Builds a Math community where students feel safe to take risks and can learn from one and other
- Provides daily number sense experiences that assist students in developing mental math skills and computational fluency
- Fosters discussions about numbers and their relationships
- Responsive to students' understandings
- Allows for spiralling through concepts and helps students make connections to the big ideas in mathematics
- Emphasizes the core and curricular competencies in relation to mathematical content.
- Provides opportunities for students to clarify their thinking, consider strategies, and build a repertoire of efficient strategies

Which Curricular Competencies Are Developed?

Reasoning and Analyzing

- estimate reasonably
- develop mental math strategies and abilities to make sense of quantities

Understanding and Solving

- use multiple strategies to engage in problem solving

Communicating and Representing

- communicate in many ways including orally, concretely, pictorially, symbolically

Connecting and Reflecting

- visualize and describe mathematical concepts
- connect mathematical concepts to each other
- share and reflect upon mathematical thinking

What is Number Sense?

When you think of a student who has number sense, what comes to mind?

Marilyn Burns describes students with number sense:

“[They] can think and reason flexibly with numbers, use numbers to solve problems, spot unreasonable answers, understand how numbers can be taken apart and put together in different ways, see connections among operations, figure mentally, and make reasonable estimates.”

Burns, Marilyn. About Teaching Mathematics: A K-8 Resource. 3rd ed. Sausalito, CA: Math Solutions, 2007. Print.

Number sense involves having an understanding of the following concepts:

SUBITIZING
PLACE VALUE
PATTERNING
LINEAR MEASUREMENT

COUNTING
DECOMPOSING
ESTIMATION

Dot learn more abut these, you can download easy to read documents about each of these on Janice Novakowski’s website http://janicenovkam.typepad.com/reggioinspired_mathematic/instructional-resources.html

DECOMPOSING:

Number Talks With Quick Images

Potential learning intentions:

- Subitizing
- Visualization
- Multiplicative Thinking
- Decomposing and Recomposing
- Mental Math Strategies

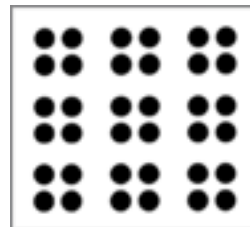


Items you could use:

- Ten Frames or Base Ten Blocks
- Greg Tang books
- Real life images of groups of items (arrays) <http://ntimages.weebly.com/photos.html>

Guiding Questions:

- How many do you see?
- How do you see them?
- Does anyone see them differently?
- Can you draw them?
- What equation could describe how you see them?
- How could you express this as an equation?



Number Talks With Equations or Number Strings:

The potential learning intentions:

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

10 - 15 minutes of focussed discussion on either one question or a “string” of questions designed to elicit a particular strategy (e.g., doubles plus one)

Guiding Questions:

- What answers did you get?
- Who would like to defend their answers?
- What strategies did you use?
- Did anyone think about this problem in a different way?

$$\begin{aligned} 4 + 5 + 6 &= \\ 14 + 25 + 36 &= \\ 114 + 225 + 136 &= \end{aligned}$$

Video Examples:

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

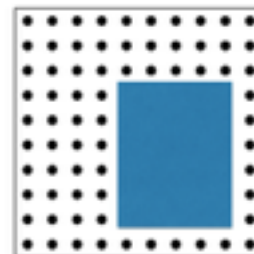
Number Talk with Dot Images in Grade Four <https://www.teachingchannel.org/videos/dot-image-lesson-4th-grade>

Missing Part Cards:

The potential learning intentions:

- Decomposing
- Introduction to Algebra
- Commutative Property
- Computational Fluency
- Place Value
- Mental Math

$$7 = \begin{array}{c} \bullet \bullet \\ \bullet \bullet \end{array} + \begin{array}{c} \square \\ \square \end{array}$$



Items you could use:

- Hundreds Boards made up by ten frames - <https://startingwiththebeginning.files.wordpress.com/2016/05/quick-image-100-ten-frames.pdf>
- Part Part Whole Cards 10 – 20 http://www5.sd71.bc.ca/math/uploads/lessons_activities/grade1/Number/part%20part%20whole%20cards%2010%20to%2018_part1.pdf
- Canadian Money Part Part Whole Cards
- http://www5.sd71.bc.ca/math/uploads/lessons_activities/grade3/part%20part%20whole%20money.pdf

Guiding Questions:

What is missing?

How do you know?



ESTIMATION

The potential learning intentions:

- Develop estimation skills
- Visualization
- Spatial Sense of quantities and magnitude
- Relationships among number
- Mental Math Strategies

Guiding Questions:

Are the students able to estimate reasonably?

Do they adjust their estimates when they gain more information and/or hear another student's reasoning?

If students count the quantity after estimating, do they make a connection to their estimate?



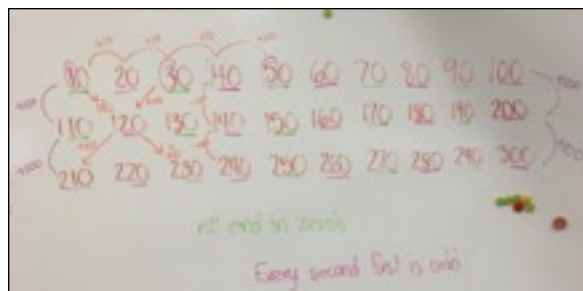
Website: <http://www.estimated180.com/days.html>

COUNTING

Choral Counting:

Potential learning intentions:

- Number symbol relationship
- Forward and backward number sequence
- Base Ten Understanding
- Patterning/Skip Counting/Multiples



Ways to count:

- Count by 1's, 2's, 3's, 5's, 10's etc., starting at 1 and at other numbers
- Counting Backwards
- Counting Forwards
- Skip Counting
- Stop and Start Counting
 - Start at 10.0 and stop at 14 counting by tenths
 - Start at 12 and stop at 18 (practice the tricky teens)
 - Start at 187 and stop at 214 (practice getting over the decades)
 - Start at 1/2 and count by halves to 20

Note: It is recommended that the teacher write the numbers on the board in an intentional way to elicit the ability for the students to see patterns.

Video Examples:

Discovering Number Patterns With Skip Counting with Grade Three <https://www.teachingchannel.org/videos/teaching-number-patterns>

Counting Around The Circle

Whole class activity: Each person says a number around the circle.
Or it could be done in a small group – counting around the table.

Set expectations:

- Everyone needs to listen to others and count in their heads
- Everyone needs time to think and apply strategies



Guiding Questions:

Estimate at the beginning – “If we start at ____ what number do you think our last friend will say?”

Reflecting - Looking at the written numbers that we just counted - “Does anyone see any patterns?”

Knock-down

Pick a target number (e.g., 36) and explain that the class will be skip counting by three's. Everyone stands up. First student says “three”, next “six ” until one students says the target number. That student turns to the student beside them and pretends to knock them down. That student must sit. Play continues until only one child is left standing.

***To differentiate and add more challenge allow each student to choose whether or not to say one, two, or even three numbers. Watch which children use strategies to knock down their peers.

Number Lines:

For this to be effective, the number lines should be within reach of the students.

The potential learning intentions:

- Counting
- Understanding quantity and magnitude
- Relationships among numbers
- Computational Fluency



Students can engage with number lines by:

- building number lines (using clothesline)
- discussing the missing numbers on a number line
- fixing a mixed up number line
- playing “Guess my Number” with too high and too low clues
- solving equations using the open number line



Video Examples:

How to video <https://clotheslinemath.files.wordpress.com/2016/09/clothesline-intro.m4v>

Or <http://www.estimated180.com/clothesline.html>

Blogpost about Clothesline with Kindergarten Students

<http://blogs.sd38.bc.ca/sd38mathandscience/2016/11/29/introducing-clothesline-to-the-kindergarten-students-at-general-currie/>

Tent Cards:

0 - 20 Tent Cards with multiple representations (tally marks, dots, fingers, numerals, ten frames) https://startingwiththebeginning.files.wordpress.com/2016/05/0-20_clothesline-pages.pdf

Fraction and Decimal Tent Cards <http://www.meaningfulmathmoments.com/clothesline-numberlines.html>

Guiding Questions:

Where do ___ and ___ belong?

How do you know? Explain your thinking?

How would you solve “equation” (e.g., $67 - 38 =$) using an open number line?

Today’s Number:

Select a number and state this is “Today’s Number”. Using either white boards, paper, loose materials or whatever you choose to provide your students, ask them “Show me all the different ways you can make Today’s Number”. Highlight different ways that the students use, including: expanded notation, tally marks, using a pattern (e.g., $15 + 1 =$

16, $14 + 2 = 16$), using three addends, the commutative property, etc. To encourage students to use strategies shared by their friends, do the same number two days in a row.

True / False Equations:

The True/False Equations activity engages students in considering the meaning of equality and developing relational thinking. In this activity, the teacher poses an equation, asks students to decide whether the equation is true or false, and facilitates a discussion around how they might prove whether it is true or false. True/false equations provide a context in which students develop understanding of the equal sign to mean “the same as.” By providing opportunities for students to develop a robust understanding of equality and strategies for thinking relationally we can support their development of algebraic reasoning from an early age.

$$2+7=2+5+2$$

$$5 \times 24 = 10 \times 12$$

$$80 \div 4 = (80 \div 2) + (80 \div 2)$$

Video Examples:

Grade Three class <https://www.teachingchannel.org/videos/true-false-equation-routine>

Which One Doesn't Belong:

The potential learning intentions:

- Focuses attention on attributes of number and number relationships
- Engages students in problem solving
- Encourages using Mathematical vocabulary

Show the image and let the students discuss.

Guiding Questions:

What do you notice?

What makes all the items alike?

What makes them different?

Which one doesn't belong?

Can you share your reasoning to justify your answer?

| | |
|----|----|
| 17 | 26 |
| 44 | 65 |

Website: <http://wodb.ca/index.html>

Twitter Hashtag: #wodb <https://twitter.com/search?q=%23wodb&src=typd>

Other Excellent Resources:

- Various Number Routines - <http://visiblethinking.weebly.com/daily-routines.html>
- Teacher Education by Design Has outstanding **VIDEOS** tedd.org You will need to register on the site but registration is free.
- Carole Fullerton's book's - Sums and Difference, Multiplicative Thinking, Place Value for Primary or Intermediate <https://mindfull.ecwid.com/#!/Teaching-Resources/c/14772493/offset=0&sort=normal>

KEY RESOURCES:

