Number Concepts in Grades 3 - 5

UNDERSTAND: Numbers represent and describe quantities.

Numbers are related to each other through a variety of number relationships. The number 67, for example, is more than 50, 3 less than 70, and composed of 60 and 7 as well as 50 and 71. Each of these forms of 67 may be useful in a variety of situations, from estimation to comparison to computation. "Really big" numbers possess the same place-value structure as the smaller numbers that students have worked with in earlier grades. But quantities as large as 1000 or more can be difficult to conceptualize because of their size. Whole numbers can be described by different characteristics such as even and odd, prime and composite, and so on (John Van De Walle, Teaching Student Centered Mathematics: Grades 3 – 5, 2006 p. 39).

Important information on Counting, Estimation Place Value written by Janice Novakowski http://janicenovkam.typepad.com/reggioinspired_mathematic/instructional-resources.html

KNOW:
What is the learning trajectory for developing an understanding of number concepts? Although, we have used grade levels, we understand that learning is developmental and children learn at different rates and at different times; therefore, it was important to include grades below and above the current levels we are teaching.

Grade Two
- Counting: Skip counting by 2, 5, and 10, using different starting points, increasing and decreasing (forward and backward)
- Comparing and ordering numbers to 100, benchmarks of 25, 50, and 100
- Place Value: understanding of 10's and 1's
- Even and odd

Grade Three
- Counting: Skip counting from any number and any starting point, increasing and decreasing (forward and backward) and skip counting is related to multiplication. Investigating place-value based counting patterns (e.g., counting by 10's, 100's; bridging over a century, noticing the role of zero as a placeholder)
- Comparing and ordering numbers to 1000 and estimating large quantities
- Place Value: understanding of 100's, 10's and 1's and the relationship between digit places and their values
- Fraction concepts (NOT DISCUSSED TODAY)

Grade Four
- Counting: Multiples, flexible strategies, and whole number benchmarks
- Comparing and ordering numbers to 10 000 and estimating large quantities
- Place Value: understanding of 1000's, 100's, 10's and 1's and the relationship between digit places and their values
- Fraction and Decimal concepts (NOT DISCUSSED TODAY)

Grade Five
- Counting: Multiples, flexible strategies, and whole number benchmarks
- Comparing and ordering numbers to 1 000 000 and estimating large quantities

DO:
What will my students DO to show me their knowledge and understanding?
What curricular competencies do we want to focus on?

Communicating and Representing
- Communicate their understanding of patterns in many ways including orally, concretely, pictorially, symbolically, in written text and/or using screencasting apps such as ShowMe.
- Use mathematical vocabulary
- Explain and justify
- Represent understanding concretely, pictorially, and symbolically

• Place Value: understanding of 100 000's, 10 000's, 1000's, 100's, 10's and 1's and the relationship between digit places and their values • Fraction and Decimal concepts (NOT DISCUSSED TODAY)	
<u>Grade Six</u> • Place value from thousandths to billions • Compare, Order, Estimate	

How will I find out what my students already know? How will I activate their prior knowledge?

What do my students know about number concepts? And what misconceptions do they have?

What questions do my students have about number concepts?

What opportunities are there for integrating aboriginal perspectives?

Structured and Guided Inquiry Questions:

How can you count your collection? Students need TONS of opportunities at this level counting in multiples using large quantities.

<u>Inviting and inspiring materials</u>:
- Loose materials in plastic bags (e.g., pasta pieces, buttons, pennies, glass stones, rocks, pompoms). Depending on your students you may want to have several different quantities available (e.g., 20 – 50 kit, 50 – 100 kit, 100 – 200, and 300 - 500 kit, and a kit with items that come in multiples like boxes of pencils that come in 12's)
- Tools to help students organize their count – including ice cube trays, cups, cupcake liners, ten frames, etc.

<u>Guiding Questions</u>:
Estimate how many are in your collection.
How can you count your collection?
Can you count it another way?
Can you record how you counted?
What happens when you count your collection another way? (e.g., Does the total change?)
I notice your finding it challenging to count by 4's… is there something you could use to help you keep track (e.g., hundred's chart and a highlighter)

Recording template/Helpful articles/resources: http://www.meaningfulmathmoments.com/counting-collections.html

You skip count forward by a number and you say 40. What might you be skip counting by? What were you not skip counting by?

<u>Inviting and inspiring materials</u>:
- Hundreds charts
- Open number lines
- White boards

<u>Guiding Questions</u>:
How would you describe your pattern?
Explain how you determined the numbers to skip count by.

Use tiles to show the pattern 1, 3, 5, 7, 9. Which of your ways helps you see that all of these numbers are odd?

Or Use tiles to show the pattern 2, 4, 6, 8, 10. Which of your ways helps you see that all of these numbers are even?

Inviting and inspiring materials:
- Counters (e.g., square tiles, unifix cubes)
- Read aloud Even Steven or Odd Todd, One Odd Day, My Even Day

Guiding Questions:
What makes a pattern helps you the most? The least?

Number Lines:
- Create the line with numbers provided (depending on your students you can provide 2-digit, 3-digit, or 4 or 5 digit numbers
- What numbers might be at the marked points? Place some numbers on the line and some question marks.
- Fix the line – place numbers randomly on a line – students need to order them from least to greatest

Guiding Questions:
What number did you start with? Why?
What numbers helped you determine the missing numbers?

You use ten frames or base 10 blocks to represent a number. Can it take fewer blocks to represent a greater number?

Inviting and inspiring materials:
- Ten Frames or Base 10 blocks
- White boards

Guiding Questions:
Tell me about your thinking… how did you decide which base 10 blocks to use?

Build a number with six base-10 blocks. What might the number be?

Inviting and inspiring materials:
- Base 10 blocks

- White boards

<u>Guiding Questions</u>:
Tell me about your thinking… how did you decide which base 10 blocks to use?
What is the largest number you can make? Smallest?

Are there more ways to represent 57 or the number 37? Why do you think that? *The teacher can change the number of digits based on the needs of the students.

<u>Inviting and inspiring materials</u>:
- Base 10 blocks
- White boards

<u>Guiding Questions</u>:
Tell me about your thinking… how did you decide which base 10 blocks to use?
Can you explain/justify your response?

Pick a 2-digit, or 3-digit number. How many ways can you represent that number using different combinations of ten frames or base 10 blocks.

<u>Inviting and inspiring materials</u>:
- Numbers (e.g., wooden, plastic, number tiles, paper numbers, stickers, dice)
- White boards
- Base 10 blocks

<u>Guiding Questions</u>:
What is the fewest number of blocks you can use to represent your number? Or the most blocks?
Can you represent your number another way?

Choose 3-digits, 4-digits, or 5-digits. What different numbers can you make with them? Can you order the numbers?

<u>Inviting and inspiring materials</u>:
- Numbers (e.g., wooden, plastic, number tiles, paper numbers, stickers, dice)
- White boards

Guiding Questions:
What is the largest number you can make? Smallest? A number in-between?
Describe the different numbers you made?
Can you order the numbers you made?

Choose a 4-digit number. How many different ways can you represent it?

Inviting and inspiring materials:
- Numbers (e.g., wooden, plastic, number tiles, paper numbers, stickers, dice)
- White boards
- Play money
- Base 10 blocks and/or ten frames, hundreds frames

Guiding Questions:
Can you write your number?
Can you represent your number using money? Can you do it another way?
Can you represent your number using blocks? Can you do it another way?

How Heavy is 1000? How long is 1000? How far is 1000?

Inviting and inspiring materials:
- How Much, How Many, How Far, How Heavy, How Long, How Tall Is 1000? By Helen Nolan and Tracy Walker
- Whatever materials the students ask for to help them explore their own question

Guiding Questions:
What question would you like to explore?

One million can be described as 1000 thousands. What are some other ways to describe one million beyond saying it is big.

Inviting and inspiring materials:
- Children's literature books like How Big is a Million by Anna Milbourne and Serena Riglietti, A Million Dots by Andrew Clements, How Much is a Million by David M Schwartz and If You Made a Million by David M. Schwarz
- Rice, beans, and images of large quantities
- Place Value Dice

- Place Value Tent Cards

Guiding Questions:
Can you visualize a million? What might it look like?
Can you describe a million using other numbers?

Journal Prompts:

A pattern is…	Today I learned…
A pattern I created today…	Can you record one of the patterns you created in your math journal?
I'm proud of…	I wonder…
I'm thinking now…	I tried…
I know	I noticed…
This reminds me of…	A connection I have…

Which children's literature books could be used as provocations:

Estimation
- Great Estimations by Bruce Goldstone
- Greater Estimations by Bruce Goldstone
- Betcha by Stuart J Murphy
- Counting on Frank by Rod – highlights curiosity and many estimation questions
- The King's Comissioners by Aileen Friedman
- How Many Seeds in a Pumpkin by Margaret McNamara
- How Many Jelly Beans by Andrea Menotti

Even and Odd
- Missing Mittens by Stuart J. Murphy
- Among the Odds and Evens: A Tale of Adventure by Priscilla Turner
- Even Steven Odd Todd by Kathyrn Cristaldi
- One Odd Day by Doris Fisher
- My Even Day by Doris Fischer

Place Value Books

- A Place For Zero by Angeline Sparagna LoPresti and Phyllis Hornung
- Place Value by David A. Adler
- Earth Day Hooray by Stuart J. Murphy
- The King's Commissioner by Aileen Freedman
- A Fair Bear Share by Stuart J. Murphy

Place Value Books

- A Place For Zero by Angeline Sparagna LoPresti and Phyllis Hornung
- Place Value by David A. Adler
- Earth Day Hooray by Stuart J. Murphy

Books about Numbers

- A Million Dots by Andrew Clements
- How Big is a Million by Anna Milbourne
- How Much is a Million by David M Schwartz
- How Much, How Many, How Far, How Heavy, How Long, How Tall is a 1000? By Helen Nolan
- Zero by Kathryn Otoshi
- Zero the Hero by Joan Holub
- Millions of Cats by Wanda Gag
- 365 Penguins
- Can You Count to a Googol? By Robert E. Wells
- If You Made a Million by David M. Schwarz

Formative Assessment:

How will I document and communicate the students' learning?

- Photos and videos
- Student journals
- Performance based assessment
- Checklists – based on observations
- Anecdotal notes
- Conferences with individual students
- Screencasting apps such as ShowMe or Explain Everything

Summative Assessment:

How will I continue to support my students' understanding of Number Concepts throughout the year?

- Daily Number Routines including: The other part of 100 or 1000, Choral Counting, Count Around the Circle
- Weekly Counting Collections
- Reading and discussing any of the above books
- Same/Different (e.g., 2500 and 25 000) What's the same? What's different?
- Estimation 180 http://www.estimation180.com/
- Open-ended Problems (e.g., I see 20 legs out by the pond. Some are frogs and some are ducks. What combinations could there be?)
- Tell Me Everything
- Number Lines
  - Fix the line
  - Guess the missing numbers
  - Build the line