

Mathematics Through *Play* in Kindergarten



“Through their play and spontaneous activities, children express themselves, experiment, construct their learnings, structure their thoughts and develop their world-view. They learn to be themselves, to interact with others and to solve problems. They develop their imagination and creativity.

Spontaneous activity and play are their way of mastering reality; this justifies giving play a central place in preschool education and organizing the space and time accordingly.”

QEP p. 52



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Thank you, Anna Ranson, anna.ranson@yahoo.co.uk

The document and all its accompanying resources are available to Québec teachers in the Learn Kindergarten Community (requires a login).
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On-Line Materials and manipulatives

The materials and manipulatives associated with some of the activities in this document can be found ON-LINE in the LEARN Kindergarten Community. To access them, log into your LEARN account at www.learnquebec.ca , go to the "Learning and community portals" and enter your Kindergarten Community. Click on the "Resources" menu item and select the Mathematics folder to download each of the five .ZIP folders which correspond to five of the six sections of this document.

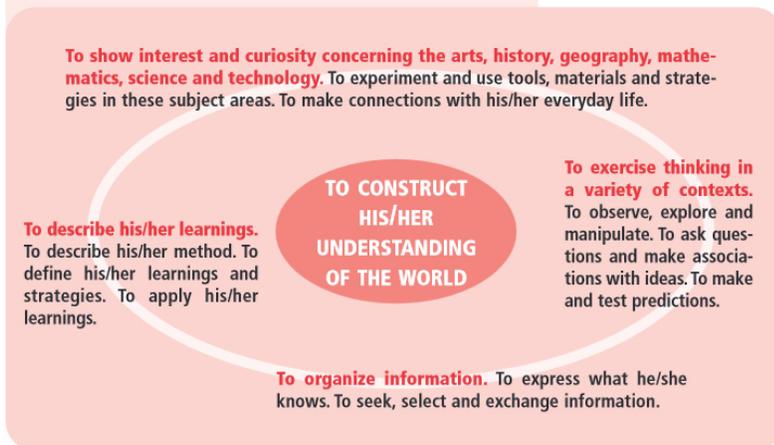
- 1- Counting_Sequence.zip
- 2- Identifying_Numbers.zip
- 3- Associating_A_Numeral.zip
- 5- Composing_decomposing_numbers.zip
- 6- Classification_&_Patterns.zip

The activities in this document are designed to help support the development of numeracy. The concepts and strategies should always be presented in a natural, playful, or thematic context and not as isolated exercises.

Connections to the Quebec Preschool Education Programme

Competency 5: To construct his/her understanding of the world

Key Features of the Competency



Evaluation Criteria

- Demonstration of interest, curiosity and a desire to learn
- Experimentation with various ways of exercising thinking
- Use of pertinent information to learn
- Description of the process and strategies use in learning

NOTE: Evaluation focuses on the observable behaviours that indicate competency development and NOT on mathematics skills and knowledge.

A child who shows interest, curiosity and a desire to learn can be observed:

- Experimenting and using tools, materials and strategies in these subject areas, eg. mathematics
- Making connections with his/her everyday life.

Outcomes at the End of Preschool Education

The children know the pleasure of learning. They are curious and are able to use their learnings and creativity in play and projects. **They use some basic elements from various subject areas:** the arts, social sciences, **mathematics**, science and technology. They share their discoveries

• Learnings Related to Cognitive Development

Mathematics: number games; counting games; association games; comparison games; grouping and sorting games; pattern games; estimation games; measurement games.

1 - Mastering the counting sequence, i.e. rote counting

Rote counting is using number words in the correct sequence. Many students come to school having the ability to count by rote to 10 or higher, and this ability provides an excellent starting point for number work.

In Kindergarten, children are introduced to numbers. There is no specific number to reach. It is suggested to teach from 1 to 20, although we can also go up to 31 in order to respect the calendar. (Marchand 2008) We can explore numbers to 100, but not delve into tens. It is enough to have fun with numbers, to find regularities, to make predictions, to learn their names. As for the concept of tens, it is preferable to speak of **packs of 10**, not of tens which relate to place value.

1- Morning Circle

Beginning of the year: use a pointer and count the number of students in the circle. Every day you'll be counting up to about 20 depending on the number of students in your class. At the beginning, the students join in saying the numbers with the teacher.

Later in the year: they say them alone and then the student of the day does the counting. Post the number on the bulletin board. Over time, bring them to mentally deduce the number of children absent from the number of children present. Observe or ask them how they do this.

Variations: count the boys and the girls separately, post the numbers, introduce the words "more" and "fewer" and use them whenever you can.

Literacy-numeracy connections: The morning message offers a variety of opportunities to count.

- Count the number of words in the sentence of your morning message.
- Count the number of sentences in your message,
- Count the number of letters in a particular word
- Count how many times the "letter of the day/week" appears in the message.

Have them show the numbers with their fingers as well as say them.

2- Calendar Counting

Use a calendar to which you can add a date every day. Every morning, during circle time, look at yesterday's date and day: "Yesterday was Tuesday, March 18." Then ask the children "What is the date today? What comes after 18?" "How do you write it?" "How did you figure it out?" They may not be able to name nineteen, but they will know that it is written 19. You may have a child write it on the board before posting the number on the calendar.

Make a game of counting forward from 1 to today's date then backwards: blast off like rockets to start the day!

Put the children's birthdays and special holidays on the calendar. Count how many more days until their birthday or a holiday arrives

View related Videos available on LEARN at <http://bit.ly/1bmL2XS>

3- Counting Songs or Poems

With each theme you start, learn a new counting song or poem that can be acted out. Begin with 1 to 5 songs that have repetitive movements. As children mature both in their ability to count and in their motor abilities, pick songs that are more complex to act out. A Web search for “Counting songs for preschoolers” will yield good results if you need to enrich your song bank.

See *Web Resources for Teachers* for a few examples

4- Build a Scarecrow-Snowman-Skeleton-etc.

Provide a **die with numerals** instead of dots. In teams of 2, the children need to reconstruct a figure. All the pieces are numbered and the figure must be reconstructed in numerical order. They take turns rolling the die until they get the correct number in the series, first 1, then 2, etc.

You can use figures that match themes or times of the year: a skeleton at Halloween, a snowman in winter, Santa at Christmas, etc.

Materials and manipulatives: Folder: 1- Counting Sequence, select Activity 4 - build

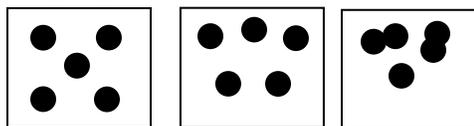
5- Board Games

Board games that require counting to move a playing piece are great for mastering the counting sequence. Children will initially need to count the dots on a dotted die but will eventually see the pattern and recognise the number immediately. At the beginning, use large dice to make the dots easier to count. Ask them to count out loud as they move the pieces. Observe how they read the die; do they count the dots or perceive the number set globally? Can they then make a one to one correspondence when they count their moves on the board?

2- Identifying, writing and representing numbers from 1 to 10

Always use several different representations of a number when you present a new one. It will help the children enrich their concept of numbers by providing different “handles” to grasp it. (Baruk, S (1997)

- Use dots in recognizable patterns or random placements



- Use the symbol: 5

- Use a stylized finger representation (drawing)



- Use the hand



- Use the word: **five** (orally and written when the occasion arises)

Anytime you ask the children to write a new numeral, model number formation on the white board. Then ask the children to practice with large movements using a paintbrush and water on the “blackboard” or in the air, (with their “air pencils”) using gross motor movements. Find a concrete way to describe the sequence of gestures: e.g. for 5 – “Give him a nice straight back, his tummy is fat, go back up to put on his hat!”

1- Interlocking Stacking Cubes or Blocks

Little cubes that stack up in a row are useful to represent numbers in a **variety of games/activities**. Always have them at hand.

For example, when you show the children a card with a number of dots (Use large cards), they each build a tower with the same number of cubes. They count the cubes and compare to the card. Use when counting and comparing numbers so the children have concrete ways to visualize number size.

*See **Materials and Manipulative Sources** (p.25) for information to help you locate this material.*

2- Build or Dress a Scarecrow-Snowman-Skeleton-etc.

Provide a **regular dotted die**, a figure such as a snowman and numbered elements of clothing. In pairs, the children roll the die in turn to build or dress the figure. If an item has already been taken, the child passes a turn. The first to finish building/dressing the figure wins.

Materials and manipulatives: Folder: **2- Identifying_Numbers**, select **Activity 2 –Build-Dress a figure**

3- Card Games

Card games are great for developing “**subitizing**” that is “**instantly seeing how many.**” (See *On-line references #3*) Subitizing is the direct perceptual apprehension of the numerosity of a group. You’ll notice that children who play card games at home display a greater ease with numbers and with subitizing. When children have learned several games and become more proficient, invite grand-parents or members of the local “seniors” club to come play with you.

-
- Go Fish
 - Old maid
 - War
 - Snap
 - Pig
 - Concentration/Memory

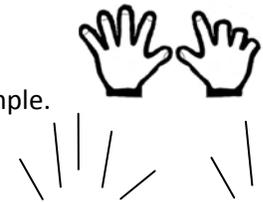
Materials and manipulatives: Folder: **2- Identifying_Numbers**, select **Activity 3-Card Games**, for the rules.

4- Stick and Finger Counting

When you introduce a new number, give each child a number of sticks to match that number. To make it more interesting, give the wrong number to a few students. The child needs to tell you how many he needs or has to give back to make the number.

First, ask them to show the same number of fingers as you gave out sticks.

With numbers larger than five, teach how to show 5 on one hand and the remaining digits on the other. Then ask them to lay out the sticks like their fingers as in 7, for example.



Show them a card with a number already learned and ask them to show you the correct number of sticks (no talking yet!). Then ask them the number name. For each number, ask them to show the number of fingers and then to lay the sticks out like their fingers.

Extension: Instantly seeing how many with other patterns, i.e. **subitizing**. Integrate this activity in a situation that lends to working with shapes. Provide the children with tokens as well as sticks. With small numbers (3-4-5-6) ask them to create a closed shape with their sticks. Explain that each shape has a name- triangle, square, pentagon, hexagon - and ask them if they know it. If they don't, name it and have them repeat it. Children **love** to learn BIG words. Then ask them to place a token at each of the "pointy ends", where two sticks meet. When they have done so, ask them to remove the sticks. What shape do the token make? How many tokens are there? Throughout the day, make it a game of finding such a shape in the environment and naming it. Make the materials available in a center for free play and observe the children using it. Do they create larger shapes? Are they curious about their names?

Repeat with numbers already learned up to 6 to help children perceive the patterns until they no longer need to "count" each dot to see the number.

5- Bowling

The game: the one who knocks down the most pins wins. Explain that the number of pins knocked down is called the "score". The highest score wins.

Materials:

- Numbers 1 to 10 to tape on the floor (See resources)
 - Score sheet (See resources)
-

Tape numbers 1 to 10 on the floor as illustrated. The children place a bowling pin on each number:

7 8 9 10
4 5 6
2 3
1

The children play in teams of 2. Each child gets 2 throws of the ball per set and they play 2 sets (about 20 minutes). Provide each with a score sheet which shows the position and numbers of the pins. The child makes an X on the number corresponding to each fallen pin. His teammate helps by calling out the numbers. They take turns throwing and calling out. When they are finished they count the total number of fallen pins and write the score on their sheet (with whatever representation they can at the time). The winner is the one with the highest score. (If they can't determine the highest, pull out the interlocking cubes for them to use.)

Materials and manipulatives: Folder: *1- Identifying_Numbers*, select **Activity 5-Bowling**

6- Match the Numbers Memory Game

This is a variation on the classic memory matching games.

Materials: a set of cards with two different representations of 1 to 5 to start with and later 1 to 10, for example dots and symbols, or words and symbols.

To play, all the cards are laid out face down and the children make pairs. The one with the most pairs wins.

Materials and manipulatives: Folder: *2- Identifying_Numbers*, select **Activity 6-Memory Games**

3- Associating a numeral with the number of objects in a collection

A **cardinal number** is a number that answers the question, "How many?"

In **rational counting**, one and only one number name is assigned to each object in a group, and the last number name said is understood to name the quantity in the group. When the students show a given number of fingers, they are doing what is called rational counting. Note that a cognitive leap is required to accept that the last number named in counting tells how many are in the whole set. This is radically different than what happens when the names of a group of children are called out. If we call off, "Meg, Tara, Zeke," then "Zeke" does not stand for the whole group, just for the last child named. When we count "one, two, three apples" three is the answer to, "How many are in the group?" But the child needs to move from seeing concrete quantities (3 apples) to the idea (concept) of 3 that lets one imagine 3 of anything, not just apples.

There is also a distinction to be made between these **cardinal** numbers and **identification** numbers which are given to objects or persons to help distinguish them in some way. For example, a number 9 bus, a hockey sweater number, a PIN, a catalogue number, etc. (Tapson 1999).

We should use the many daily opportunities offered to count all kinds of things and then ask the question "So, how many [...] are there?" For example, make it part of the morning routine. Whenever they are playing games that involve counting objects, group the children according to the registry of numbers they have mastered. When counting, it is always a good strategy to make 2 piles: one for "to be counted" and one for "counted" as they move objects from one pile to the other.

1- Counting Contexts: Morning Circle, Snack Time, etc.

Morning circle: As the year progresses, count the boys and girls separately, count collections (sneakers vs. sandals, mittens vs. gloves, clothes colours, etc.) If you collect weather data, make a table of daily weather. At the end of the week or month, count the number of sunny days (and others).

Snack time: Tabulate what the children are eating each day: who has fruit, who has cheese, who has yogourt, etc. At the end of the week, count the numbers in each category and discuss.

Write the numbers in a variety of representations. Talk about more, fewer and least, bigger and smaller for sets of things, as in "Which group has the least?" and greater than, smaller than, equal to for numbers, as in "I'm looking for a number greater than 5."

View related Video available on LEARN at <http://bit.ly/1bmL2XS>

2- Literacy and Numeracy

After presenting the letter of the day, the children determine whether they have that letter in their name. Then, they count how many students do. That number is recorded in a "Letters in our Names" poster. Use the data recorded every day to make comparisons and slowly introduce comparative terms used in math such as greater than, smaller than and equal to (for numbers).

More numeracy-Literacy activities in section 6.

3- Spilling Jars

Materials:

- 6 jars that contain sets of different objects. Each jar is identified by a colour sticker
- 6 crayons or markers in the same colours as the stickers
- pencil
- paper plate

Working within the register of numbers taught, provide jars that contain different objects in different quantities. Identify each jar by a colour sticker.

The children spill the contents of a jar into a paper plate and count how many objects it contains. They take notes on a worksheet, first identifying the colour of the jar by colouring the dot on the sheet, then the number of objects in it. The latter consolidates the concept of a number as the answer to the question “How many?”

Observe how they proceed during the counting: do they have some systematic strategy, for example, making a counted pile, putting the objects back in the jar one by one, or do they just touch the objects?

Materials and manipulatives: Folder: **3- Associating_A_Numeral**, select **Activity 3- Spilling Jars**

4- Farmer Brown’s Orchard

Materials:

- a large poster of a tree on which you stick Velcro spots
- a collection of apples also with Velcro (red and green) in a basket
- a very large die all the class can see with 1, 2 and 3 apples on its sides
- alternatively, large cards with 1,2 and 3 dots

A student rolls the die and counts the apples. Alternatively, he/she picks a number card from 1 to 3. Then he/she goes to the apple basket to pick the right number and puts them up in the tree. Count the apples in the tree. Another student comes to take one down and “eats” it. Do this while reciting a little rhyme: “Farmer Brown has X apples hanging in his tree. “Student’s name” took one down and ate it hungrily.” Then, he/she counts how many are left. Repeat until the tree is full.

Variation 1: Place the apple basket far away from the tree and the die (or cards) so that the children need to keep the number of apples required in memory while they walk.

Variation 2: On small dice that have blank sides, reproduce the large die’s configuration (1-2-3) The children pair up and play the game independently in a center on a table with a small version of the apple tree and tokens. In turn, each child rolls the die or picks a number and puts the tokens on the tree. He/she counts the number of apples. They recite the rhyme while the other child takes one away. This child now counts the apples. The first one to fill the tree wins.

Variation 3: Vary according to season or theme. With younger children you might still be doing this type of activity at Christmas or Easter, so use a Christmas tree and its decorations, or a basket of Easter eggs.

Variation 4: Provide each child with an apple tree that is in the register of numbers that he/she knows. Go _ _ _

around and put a few tokens on the apples, leaving a varying number empty. Explain that they will have to get the apples that are missing in the tree and that they can only make 1 trip to the token/apple basket. Make sure to place the basket far away so that they need to REMEMBER the number required, i.e. the child must find a way to hold the abstraction (that is the number) in their mind.

Take the opportunity to use the expression “**as many as**”: “You need to get as many apples from the basket as there are apples missing in your tree.” Or “... as there are dots on the die.”

Other themes to use: the school bus and its children, the apartment building and its people, the airplane and its passengers.

Materials and manipulatives: Folder: **3- Associating_A_Numeral**, select **Activity 4-Farmer Brown**

5- How Many Do You See?

The object of the “challenge” is to globally perceive and count objects in a variety of ways.

Materials for the teacher

- overhead projector
- transparent tokens in different colours (cut out from coloured plastic or bought)
- a transparency of the chosen thematic background, for example, a snowman, a juggling clown, a Christmas tree

Materials for the children:

- Coloured tokens and a sheet corresponding to the theme chosen by the teacher.

Using an overhead projector, the teacher places a number of tokens (from 1 to 6) on the projector and shows them for 3 seconds. The children then place their own tokens on their paper to show what they saw. They count how many they have. Then, they check whether they got it right when the teacher shows the set again.

Make sure to present the tokens in a variety of ways: grouped in patterns like on dice and in geometrical shapes (triangle, square, pentagon, hexagon – see **Identifying, writing and representing numbers from 1 to 10, Activity: 5- Stick counting**) - with no pattern, mixed colours (some children might count only one colour), spread out or close together, separated or slightly overlapping.

You can keep the same number for a while but present it in different ways to reinforce global perception when a pattern is used, i.e. develop **subitizing**. (See *On-line references #3*)

Ask the children to explain their strategies for succeeding in this task. “How did you do it?” Do they see and use the patterns? Do they look for groups of colours? Others strategies?

Note: make the game thematic by using different backgrounds on your projector and on the children’s sheet: a clown with juggling balls, a tree and apples, a squirrel and nuts, a snowman and snowballs.

Materials and manipulatives: Folder: **3- Associating_A_Numeral**, select **Activity 5-HowManyDoYouSee**

6- Which Ones Can You See in a Flash?

This activity can work well in centers.

Prior learning: when you use **ORGANISED** number representations, over time the children learn to “*instantly see how many*”, i.e. to **subitize**. Cards and dice provide examples of organized presentations which let you SEE the how many without counting. Fingers offer the same advantage.

When they have become familiar with these usual organised presentations, challenge them to create their own.

Warm up:

Using an overhead projector (or large cards) ask the children whether they can tell you the number they see without counting. Show dice representation and finger line representations of 2, 3, 4, 5 or 6. Then show unorganised representations of 3 or more dots and 3 or more lines. Do it a few times with different unorganised representations of dots or lines. Let the children explain why they can see a number more easily in the organised representation or why they have to count in the other.

The challenge: Ask the children: “*Can you find other ways to make the number easy to see without counting?*”

Materials:

- popsicle sticks on one table and tokens on another
- 3 coloured papers taped on each table, or one per child (trick: use painter’s tape which comes off easily and frames the paper with colour)
- a stack of cards with numbers 2 to 6 placed in the middle
- a note taker for each child on which he/she can reproduce how the sticks and or tokens were placed

Each child takes a random number card from the middle and picks up the corresponding number of sticks or tokens. **Instructions:** “*Make a pattern with the tokens (or the sticks) so that you can SEE the number without counting. First you make your pattern on the table, then you draw your pattern on your paper. You can make more than one*”.

At the end of the activity, they each present their FAVOURITE pattern for each number they played with. The new ways are collected and showcased on the wall and integrated in other number activities.

Materials and manipulatives: Folder: **3- Associating_A_Numeral**, select **Activity-6 See it In A Flash**

7- Let’s Clean Up this Mess!

Materials:

- 6 containers such as mushroom containers on which you tape the numbers 5 to 10
- a pile of cards which show a variety of objects in sets from 5 to 10

Ask the children to put away the cards in their proper box. This can be done in groups of 2 or 3. Observe how the children count and how they negotiate where to put the cards.

Variation 1: containers are not required. Using painters tape, tape down 6 pieces of coloured paper and put all the cards in the middle of the table. Ask the children to sort the cards by number without providing any written

number cue on the paper. When they are finished, ask them to check that each card in a pile has the same number of objects. They write that number on a post-it and stick it on the pile's paper.

Variation 2: counting by twos. Use large Duplo-style or smaller Lego blocks. Provide containers with even numbers up to the number the children have mastered. Ask them to sort the blocks into the right boxes according to the number of knobs on the pieces, regardless of colour. Observe their strategies. Do they count the knobs? Do they subitize some numbers by looking at the knobs? Do they compare sizes?

Extension: once they have put all their blocks in their proper boxes, they write the number of knobs of a typical Lego piece in each set and stick that number to the appropriate box. Ask them to put those numbers (boxes) in order from smallest to biggest (Ordinal sense) and then recite the sequence (Counting by twos).

Materials and manipulatives: Folder: *3- Associating_A_Numeral*, select *Activity 7-Clean up this mess*

8- Collect the Smileys

This is a January to May activity since final counting will go beyond 10.

Materials:

- a set of six cards with 1 to 6 smileys on them
- one die with dots

The children play in teams of two. In turn they roll the die and try to find a card that matches the number of dots on the die. If they can't, they pass. When all the cards have been picked up, the children count the **total number** of smileys they have collected. The winner is the one who has the most.

Variation 1: use a die with numerals instead of dots.

Variation 2 (later in the year): The game is the same, but they use two dice and cards from 2 to 12 smileys. They look for a card that has the **same number of smileys** as they have dots on their **2 dice**. If they can't, they pass. When all the cards have been picked up, the children count the **total number of smileys** they have collected. The winner is the one who has the most.

Observe how they do this. Do they try to get the exact pattern as seen on the card, for example 7 as 6 and 1, or do they see that 7 (6 and 1 on the smiley card) can be obtained by 3 and 4 on the dice? Lead a discussion after the game by asking the children to describe their strategies.

Materials and manipulatives: Folder: *3- Associating_A_Numeral*, select *Activity-8 Smileys*

Source: Inspired by Boucher et Deschesnes (2011)

9- Stone Soup and Witch’s Brew

Provocation: Read the story “*Stone soup*” or another book which involves cooking with ingredients.

Provide a number of recipes which you leave in the kitchen corner along with the required “ingredients” (for example plastic vegetables, fruits, etc. or pictures of ingredients).

The recipe provides the list of ingredients (pictograms and words) and the quantity of each. The children make their soup following the recipe. Alternatively, provide only the list of ingredients and ask the children to create their own recipe by deciding which ones they will use and in what quantity. They write the numbers on their sheet as they place the ingredients in the pot. Ask them to share their recipe and show their soup when play time is over or do it in a one-on-one interaction as they play.

Be creative! Vary the dishes according to the season or theme. At Halloween, provide icky ingredients to make a witch’s brew or magic potion.

See Web Resources for Teachers

10- Fire Balls

This is a gym activity. The class is divided into 2 teams of “firefighters”. Have them choose a name for their team.

Materials:

1. 20 foam balls
2. a long bench

The children from each team of “firefighters” sit in a row on either side of the long bench. Place 10 foam balls (balls of fire!) on either side of the bench. At your signal, the children get up and throw the balls across the bench to the other side. They continue to throw as many balls as they can from their side to the other side for 2 minutes. They are not allowed to cross over to the other side themselves. After two minutes, the throwing stops and the balls on each side are gathered for a count. The side with the fewest balls (the smaller **number**) wins the “set”.

Use terms such as **more/the most** and **fewer/the least** to describe the outcome. Observe and discuss the strategies used to count the balls. How are they **certain** that they didn’t count the same ball twice? For example, do they transfer balls from a not-counted pile to a counted pile?

Keep a large score sheet that marks the wins of each team. At the end, they count how many times each team has won.

4- Developing the Ordinal Concept of Numbers

Ordinal numbers, as the name implies, are used to describe the “position” of an object in a set which is arranged in order. Most common are 1st-2nd-3rd. This supposes an understanding of which number comes before and after, which number is bigger or smaller, and the placement of numbers in order. These numbers are often associated with measures, for example length, height, weight, quantity of X. Measuring activities can therefore give rise to questions such as which is bigger, smaller, has the most or the least, or to activities that place the measured entities in order, e.g. children by their size and then looking at who is 1st, 3rd, 5th, etc

1- Get in Line

Hand out number sticks (numbers 1 to the number of children in the class). Ask the children to get in line from the smallest number to the largest, in order.... (to leave the class, get their snack, etc.)

Variation 1: at the beginning of the year, provide sticks from 1 to 5 or 6 in 4 colours. Tape coloured paper on the floor and ask the children to form 4 lines, one for each colour, with numbers 1 to 5 or 6 in order. As the year progresses, increase line size to the number of children over time.

Variation 2: April/May – provide sticks to create the line but skip some numbers. E.g., 1-3-4-7-10 etc

2- Bigger Than-Smaller Than - Transition Activities

Do these activities while giving instructions for transitions (leaving the class, getting snack, putting bags away, etc.)

Provide each child with a numbered playing card. Exclude figure cards. Use 1 to 5 at the beginning of the year. Increase available numbers to 10 as children progress. Show a card (use large card versions) and give your transition instruction with a condition. E.g., “Those who have a number bigger than my (3) can ...”, “Those who have a number smaller than my (3) can...” “Those who have a card with the same number as my (3) can...”

Variation: Roll a die.

Each child rolls a die in turn and you provide the condition

- You need to get a number bigger than (4), or
- You need to get a number smaller than (4), or
- You need to get a (4).

When the condition is met, the child can proceed. If it isn't, depending on the situation in your class, the children either roll again until they get it or they move to the end of the line to get another turn later.

You may want to give the last child a fun consequence to reward his/her patience for trying over and over.

3- Guess My Number

The object of the game is to guess the number I'm thinking of in the least number of tries. It could be organised as a center.

The game is played in pairs. Numbers 0 to 10 (or more) are written on the board or a large piece of paper on a number line.

Variation 1 : modelling using large cards

The teacher picks a card, shows it to the students, but does not look at it. She needs to guess the card. She crosses out (X) each of her wrong choices on a large number line AND she places a card with the corresponding number under that X. Use sticky tack, or place the card upright in the board's chalk tray. This creates additional visual support for children who still need to count as well as providing a visual cue of number "size". She prompts the students, if needed, to teach them to give her "bigger than" or "smaller than" hints.

Variation 2: playing in teams

Provide small versions of the number line from 1 to 10.

Player 1 chooses a number and writes it down to prove he hasn't switched numbers while playing; he hides his choice from player 2. (He sits on it!)

Each time player 2 guesses a number player 1 crosses that number out on the line. This is done for 2 reasons: to count the number of tries it takes player 2 to guess the number and to support responses by the other player with such phrases as "It is bigger than 7", "It is smaller than 12", "It is between 7 and 12".

When player 2 has guessed the number, they count the number of Xs (crossed out numbers) to know how many tries it took to guess. Then, they check that the number guessed corresponds to the one written on the paper. Roles are switched. The winner of the set is the one who guessed in the least number of tries.

Increase to larger numbers as the year progresses to maintain the challenge in the children's proximal zone of development.

Variation 3 : with stacking cubes for visual support

The game is played the same way but instead, of using a number line, the children place cards from 1 to 10, in order, in front of them. In front of each card, as a visual cue, is a stack of cubes whose size corresponds to each card. They lay the stack down when the guess is wrong.

See Materials and Manipulative Sources (p.25) for information to help you locate this material.

4- How Many Letters in My Name?

When playing this at the beginning of the year, give the children a card with their name written on it. If later, ask them to write their name.

They count the letters in their name and write the number on a small paper. They can write using any representation they are capable of: dots, sticks, or numbers.

Challenge the children to form a line based on the number of letters in their name from the LEAST to the MOST, the SMALLEST number to the BIGGEST number, the shortest name to the longest name. Observe how they negotiate to get in line, explain their point of view, solve the problems that come up. For example, how do they deal with the issue of the same numbers?

5- Mystery Card

Give the children each a set of 6 playing cards with numbers from 1 to 6. Have them practice shuffling the cards and then putting them in order.

When they have mastered that, ask them to shuffle, pick out a card without looking at it and sit on it. Then, they place their cards, face up, in order and guess which one is missing. They check their answer by looking at the hidden card.

Variation: Increase level of difficulty by adding more cards, from 1 to 10 for example, by having them remove two cards from the set or by giving them two sets (e.g. hearts and spades).

5- Composing and Decomposing Numbers Into Their Parts

Becoming aware that the number 5 is made up of 3 and 2 as well as 4 and 1 will increase the child's ease with numbers. This will later help him intuitively grasp that $2 + 3$ and $3 + 2$ both give 5 without requiring rote memorisation. It will also facilitate mental mathematics through visualising numbers in a variety of ways.

1- Show Me

As you introduce a new number or count anything from 1 to 10, play "Show me X (the number) with your fingers". If they show you numbers 2 to 5 on 1 hand, ask "Can you show me that number with two hands?" Point out the variety of ways they use to obtain the number you asked for. With numbers greater than 5, ask "Can you find another to make X (the number) with the fingers of your two hands?" Ex: 6 can be 5&1, 4&2, 3&3 fingers. Play with a variety of the numbers already introduced. If you want, you can keep a record of their solutions on a chart, using both stick and numeral representations.

2- With the Help of My Friends

Materials:

- cards or stick with numbers 1 to 5
- large cards with numbers 6 to 10

The object of the game is to obtain a required number by combining the numbers held by two or more people. Make it a game with a purpose. For example, they need to make up the correct number in order to leave the class for lunch, to get their snack, etc. Or create a "magic door" in the class to go to a special area or activity.

Give each child a card or a stick with a number from 1 to 5. After they have each picked a number of stacking cubes that corresponds to their number, show them the number you want them to get, for example 8. They have to find one or more friends so that together they can make up that number. (For example 2 and 3 and 3.)

They put their stacking cubes together to verify that together they get 8. When they have the correct number, they hand in their cards (or sticks) and show their stack to the teacher. If they have it right, they hold hands and can proceed together.

Note: vary your number representation according to the time of year: dots, numbers and dots, numbers only.

Variation: By spring, you could stop using stacking cubes for verification and just provide numbers with corresponding dots on cards or sticks.

3- Dragon's Den

Provocation: read a book featuring a fiery dragon.

Materials:

- 3 to 5 hoops (depending on class size)
- Pictures of the dragon to place inside the hoops
- CD, MP3 or tape player

Place the hoops on the floor, leaving enough space around them for several children to stand around. Tape a picture of the dragon in the middle of each hoop.

This sleeping dragon does not like to be disturbed by music and dancing children. But if he is, he can only be pacified by showing him exactly what he wants to see. (Weave a story around this theme before you play the game).

The children dance to music. When the music stops, the dragon wakes up and roars (use your scariest voice!): "Who dares to wake me up? I will lock you up in the Dragon's Den, if you don't show me ..." Add a number and a body part to the end of the sentence. For example: 8 fingers.

The children place their body part over a hoop. ALL the children MUST find a place, so they will need to reorganise how they reach the required number to include any newcomer. Here are some sample dragon requests:

- Show me 5 feet.
- Show me 4 heads.
- Show me 7 elbows.

This activity lets you work body parts while composing and decomposing numbers. After the activity, discuss and reflect on the different ways they arrived at the correct numbers.

Materials and manipulatives: Folder: *5-Composing_decomposing_numbers*, select *3-Dragon*

4- Stick Counting - Extending the Activity

This is an extension of the stick counting activity you can do when introducing a number. (See section **Identifying, Writing and Representing numbers from 1 to 10**)

Materials: popsicle or stirring sticks. Give a pile to each child.

a- Decomposing numbers

Show a number without saying its name. The children pick up the number of sticks corresponding to that number. Can they **TELL** you the name of that number? Then, ask them to separate their sticks into 2 piles. Together, examine the different ways to make 2 piles with the given number. Collect the ways they find in a chart. Can they find patterns? For example 1 and __, 2 and __, 3 and __; __ and 3, __ and 2, __ and 1, etc.

b- Discover EVEN and ODD Numbers

To find the even-odd pattern in numbers, show a number and have the children pick out the corresponding number of sticks. Now ask them to try to make 2 piles with the same number of sticks in each pile.

Ask them to explain what they did to make the piles the same. Ask them what they did when they couldn't (one stick left over).

Make a chart: in one row, write the numbers that can be divided into 2 equal piles, in the other row, the numbers that can't. Do this several times over a period of a few days with different numbers up to 10. Can they find the pattern?

Tell children that when you can make two **even piles** from a number, that number is called an "**even number**". If there is a stick left over, the stick is "**the odd one out**". Relate that to "**odd numbers**". This is not required learning... just play with it.

*Note: "**Odd one out**" may not be a familiar expression for the children. It might be necessary to use it prior to this activity in a variety of contexts so that they can grasp that it applies to something remaining or that cannot be included. The odd mitten or shoe, the odd item left over, etc.*

Materials and manipulatives: Folder: **5-Composing_decomposing_numbers**, select **4-Stick Counting** for a sample collection chart.

6- Classification and Recognising/Making Patterns

We classify on a regular basis without even considering what we're actually doing. We take it for granted, but classification is a pre-number concept which requires a lot of hands-on experimentation and talk. Children can benefit from a variety of classification activities which will also support early numeracy concepts.

Use every opportunity to classify objects: clean up time is used to put crayons, blocks, scissors and all kinds of crafts away in their proper containers; sort parts of construction sets before building; etc.

1- Things that Belong Together

Level 1: mental sets

As part of thematic activities or after reading a book, create opportunities for creating mental sets:

- Ask children to think of everything they can write with, ride on, that swims, that flies, i.e. whatever the theme or book was about.
- When the occasion arises, ask children to find items in the classroom that are square or round or heavy, etc.
- Ask them to tell you which things are made of wood, plastic, metal, etc.

Level 2: Grouping with two attributes

Find a situation in which you can classify things according to 2 attributes: the thing can have one or the other or both. To make the sets visual, place their answers in two overlapping circles, (a Venn diagram presentation of sets). Then count which circle/category has the most, the least, etc.

For example combine literacy with numeracy by grouping the children's names according to the presences of either one of two letter or both. Use other natural classroom situation with the objective.

View example Video available on LEARN at <http://bit.ly/1bmL2XS>

2- Classifying (i.e. Grouping) Activity Center

This is great as an Activity Center.

Provide a set of objects in a box or basket, for example a set of buttons, or pearls, or shapes. Provide a plastic dip dish which offers 6 or 7 compartments or several small boxes and ask the children to group/sort the buttons any way they want. Observe how they proceed. Engage the children to explain their sorting strategy.

You can use any type of objects for the same purpose. LEGOs make a great sorting material because of the variety of shapes, sizes, colours and functions (doors, gears, people, axles, knob numbers (size), etc.)

3- Calendar Patterns (and Counting)

Vary the look of your calendar according to the month: apples, pumpkins, snow flakes, etc. Use different colours or images to create patterns on the calendar, for example, in September use yellow, red and green apples.

Introduce the pattern, for example, red-yellow-green. Everyday, ask a new child to determine the next in the

series and to either write or find the date. Use these occasions to observe whether the child can follow from left to right and from up to down on the calendar.

View example Video available on LEARN at <http://bit.ly/1bmL2XS>

4- Making Simple Patterns

Provide materials to create simple patterns and a few examples to start with. Ask the children to reproduce the patterns. Then ask them to create their own. When the activity is finished, they explain their pattern by pointing to and describing each part of the pattern, e.g. 2 red, 2 blue 1 green, etc.

Examples of fun manipulatives to use:

- pipe cleaners and beads, buttons
- play dough holding 3-4 spaghetti sticks on which beads are threaded
- coloured pasta on play dough strips
- letters in upper and lower case
- numbers
- shapes in a variety of colours.

Materials and manipulatives: Folder: **6- Classification_ & Patterns**, for play dough recipe and examples through pictures.

View example Video available on LEARN at <http://bit.ly/1bmL2XS>

5- Patterns in Arts and Crafts

When creating a drawing, painting or collage, ask the children to “frame” their creation with a pattern. Provide examples if needed: patterns of coloured dots, patterns of successive shapes, patterns related to the theme, etc. Ask the child to describe the pattern.

6- Grouping to count and to discover number patterns

Counting to one hundred is not required for Kindergarten children since grasping large numbers, i.e., understanding the meaning of “the BIG numbers” and of our numeration system is beyond the scope of their development. In Kindergarten we often work spontaneously with “piles of 10”: 10 tokens exchanged for a reward; making piles of 10 to help counting large numbers. Note that, for the child, there is no more reason to make piles of ten than there is to make piles of six when counting “the BIG”. The reason only becomes apparent when you consider our base-ten system with its number place value. However, counting to 100 in Kindergarten could be used to discover the pattern in numbers and to make the counting words more meaningful.

Create a BIG collection

Create a collection of objects by adding one to it every day until you reach 10. Make it thematic: fish in a fish bowl, stars on the Sky board, etc. Before adding the day’s item, ask one child to count how many there currently are. Ask all the children to show you the number on their fingers. Have a child write it on the board if possible (Strategies for helping him/her achieve this will vary according to the time of year.). Add the item and question them: “How many do you think we now have?” Ask a child to count to check their answer.

As the collection gets bigger and bigger and counting takes longer, introduce a way to put and keep groups of ten together. For example: if you make a collection of fish, put 10 little fish inside a big fish! (Made of paper or felt), or 10 Stars in a Big Star.

Continue counting the little items every day. Remind them that the big item counts as ten. Since they may not yet have reached number conservation for large quantities, they will need proof: as the big fish throws up (gross but so much fun) or the big sun explodes, one child confirms by counting what comes out and then proceeds to continue the count from there. Observe the children’s strategies: can they continue to count from 10 to 11-12, etc. or do they always need to start from 1?

Variation 1: To remember the BIG counting words

Bring out the pattern in our numeration system by using the “Hundred days of School” or any other “BIG collection” counting activity. The pattern emerges when you put the count in a table like the following:

	1	2	3 ...	9
10	11	12	13 ...	19
20	21	22	23 ...	29
30				

Have a child place an image with a numeral in the table (like for calendar).
Make the 10’s larger.

When, over time, you have entered numbers up to 30, hold a group discussion: can they see a pattern? Let them explain it to you. There’s a pattern in the numbers and a corresponding pattern in the number names: in the tens, “Teen” is used for “ten” as in four-teen, six-teen, ... (except for eleven and twelve whose names were determined by the cultural referents of medieval times). After that, the structure is the same: twenty-one, thirty-one, “fourty”-one, etc. with the first part of the number name derived from two, three, four, etc.

Ask them if they can “guess” numbers that would come next. Can they guess the number as well as the number name?

Why is the first cell blank? Children may ask about this. Zero is not introduced formally in Kindergarten as a concept required for place numbering, though it can be understood as “nothing is left – no candy left”. If you count backwards, you might start the year with counting back to “blast off”, but later, you can introduce counting back to zero. Then, you could introduce the 0 in the cell to complete the pattern.

Variation 2: Piles of tens on our fingers

Fingers give a clear, immediate perception of 10 as well as show that 10 can be made of 5 and 5.



Ask the children to show you TEN on their fingers whenever you have a “pack of ten”. Then, when you reach 20, i.e. 2 packs of ten, demonstrate how to show that number by closing and opening the hand rhythmically twice while counting out the tens. Do this for 30, 40, etc. as you associate the number of times the hands open with the numbers of packs of ten you have. In this way, they physically experience the meaning of twenty, thirty, forty, etc. as two-ten, three-ten, four-ten, etc.

Materials and manipulatives: Folder: 6- Classification & Patterns

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Boucher, J. et Deschesnes, J (2011) *Comment repérer et développer les compétences numériques des élèves au préscolaire?* Presentation given during a professional development day, Saint-Bruno, Québec, October 28.

Marchand, E. (2008) *Les maths au présco*. Presentation given on November 21. Québec: CSVDC

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Tapson, Frank (1999) *Oxford Study Mathematics Dictionary*. UK, Oxford University Press.

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1- *Illuminations: resources for teaching math*

<http://illuminations.nctm.org/LessonDetail.aspx?ID=L501>

Consulted on October 5, 2013

2- *Ordinal aspect of numbers*

<http://illuminations.nctm.org/LessonDetail.aspx?id=L869>

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Hosted by: [Texas School for the Blind and Visually Impaired](http://www.tsbvi.edu)

Research and Development Institute, Inc.

<http://s22318.tsbvi.edu/mathproject/ch1.asp>

3- *Subitizing: What Is It? Why Teach It?* Douglas H. Clements

<http://teacherweb.com/wa/nachesvalleyprimaryschool/msclark/subs.pdf>

Consulted November 13, 2011

4- *Kids Haven't Changed; Kindergarten Has: New data support a return to "balance" in kindergarten*. Laura Pappano. In Harvard Education Letter, Volume 26, Number 5, September/October 2010

<http://hepg.org/hel/article/479>

Consulted on October 6, 2013

Web Resources for Teachers

Counting songs for preschoolers

<http://bussongs.com/counting-songs.php?all=1>

Dr Jean - Macarena count to 100 (Shows the Macarena moves)

<https://www.youtube.com/watch?v=iGKXZVxAffM>

I can count to 100 by Mark D Pencil

<https://www.youtube.com/watch?v=v9-pEVaO4pM>

Let's Get Fit! (Counting by 1's to 100)

Coordination – strength, endurance. Use at the end of the day!

<https://www.youtube.com/watch?v=S4rhzjD5ohw>

The big number song by Kids TV 123

<https://www.youtube.com/watch?v=e0dJWfQHF8Y>

Card Games:

Go Fish, Crazy eights, Old Maid, War, Snap, Pig, Slapjack

<http://www.todayparent.com/family/activities/10-kid-friendly-card-games/>

 *Pete the Cat and his four Groovy buttons*. Eric Litwin, illustrated by *James Dean*. Harper Collins, 2012
Video: <http://www.youtube.com/watch?v=X7va0beuK58>
Song: <http://harpercollinschildrens.com/feature/petethecat/audio/Pete-the-Cat-and-His-Four-Groovy-Buttons.mp3>

 *The Witch with No Name*, iPad Book App, developed by Slim Cricket. Consulted November 2013
<https://itunes.apple.com/ca/app/the-witch-with-no-name-hd/id529520197?mt=8>

Materials and Manipulatives Sources

Brault & Boutillier

Cube-A-Link Cubes

<https://www.bb.ca/en/search/2262947/>

Interlocking Centimath Cubes

<https://www.bb.ca/en/b2b/catalog/school-3/p/interlocking-centimath-cubes-757/>

Amazon.ca

Didax- Unifix cubes

<http://www.amazon.ca/Didax-Unifix-Cubes-100-Count/dp/B007BFPLF6>