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King Street
Cooperative
Preschool

Beyond Counting

Supporting Mathematical Development in the Preschool Years

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For many, preschool math means learning how to count and to recognize the numerals 0 – 10. These are indeed useful skills which certainly have a place in the preschool curriculum. However, the study of mathematics is far richer than a program focusing on rote skill alone would lead one to believe.

Young children are very capable learners who are naturally drawn to mathematical ideas and concepts. They make sense of their environment, for example, by putting materials into groups and counting the number in each group. They compare one group of items with another to see which group “is more” (or who has more!). They fill a larger container with sand by using a smaller container repeatedly and announce, “The big box holds three jars of sand.” In effect, they have measured the capacity of the bigger box by using the small jar as the unit of measurement. They find patterns in the clothing that they wear and declare that two cats and two dogs makes four pets altogether. They see a sign at a local gas station and say, “That’s an oval!”

Not everything that counts can be counted. Not everything that can be counted counts.

–*Albert Einstein*

Our goal in the preschool years is to give children many opportunities to explore several big mathematical concepts in a variety of ways and with a variety of materials, because we know that **important mathematical ideas develop over time**.

Children at the preschool level are concrete learners, meaning that they need to work with real materials that can be held and manipulated. Symbols should be used as a label for real objects, rather than introduced in isolation. For instance, “you just counted 12 red pegs! Do you want me to write the number 12 for you so you can put it next to your pegs?”

Remember to approach learning playfully. Research shows that deeper learning and understanding occur when children (and all people, really) are emotionally invested in a task because it is interesting and enjoyable. While children are at play we can support and extend their understanding by creating and introducing materials, games, and experiences that teach mathematical concepts in an engaging and real way.

The National Council of Teachers of Mathematics recommends that children explore the following five content areas in the

preschool years, with a particular emphasis on Number Sense and Geometry. It may be helpful to think about these areas when playing with children at home or in the classroom.

1. Number Sense: Some aspects of this concept include counting (knowledge of the number sequence, one-to-one correspondence - the idea that each object you are counting corresponds to just one number, and an understanding that the last object counted is the sum of the group), comparing quantities (more/less), and adding to and taking away from a group.

2. Geometry and Spatial Relations: This consists of recognizing and naming shapes, experimenting with how different shapes come apart and fit together (a square can be cut into two triangles; two trapezoids make-up a hexagon), relative location and direction (over, under, far, near, next to, behind, between), spatial reasoning and visualization (holding a mental picture of an object and reasoning whether it will fit in a certain space), transformations (sliding, rotating or flipping shapes and other objects – rotating a puzzle piece to fit properly in place is a good example of this), and symmetry.

3. Pattern: The search for patterns is very important in mathematics because it helps to reveal the order that exists in situations and events around us. Our number system is also based on patterns. We want to help children learn to recognize, copy, and extend a variety of patterns (color, shape, size, sound, object, etc.), both repeating patterns – “ABBABBABBABB” and growing patterns (see picture below).



4. Measurement: Children first explore this concept through non-standard or comparative measurement - comparing one object to another to see which is bigger or measuring with a small object like colored pegs or crayons. Introduce standard measurement tools (rulers, measuring cups and spoons, scales, etc.) but remember that these are exploratory experiences and mastery is not the goal.

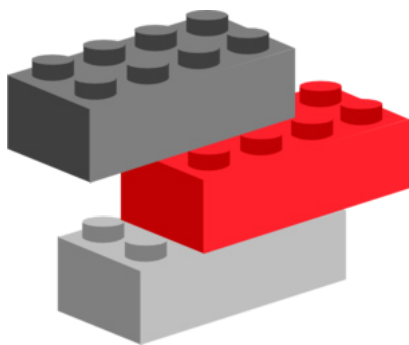
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5. Data Analysis: This is the process of classifying, organizing, representing, and using information to ask and answer questions. Children explore this concept by sorting objects into groups based on a certain attribute (color, type of animal, sound) and seeing how information can be organized onto graphs and charts.

How to support your child(ren)'s mathematical development at home

- **Find opportunities to count together for fun.** Make sure that you are counting something tangible so that your child is practicing other aspects of number sense in addition to the counting sequence. For instance, "I wonder how many stairs there are?" or "Let's count how many trees we pass on our walk to school."
- **Have your child help you use math to solve everyday problems.** "We have 8 pieces of chocolate and there are 4 of us. How many should we each have so it's fair?"
- **Notice numerical operations that are happening around you.** "There were two of us and then Jill and Danika came over. Now there are 1-2-3-4!" Or "You have six goldfish crackers and you ate one; now how many do you have left?" (Note: subtraction is a much more difficult concept for young children than addition because, if they see it, it really hasn't been taken away. A great introduction to subtraction is through eating, since pieces of food really do disappear when they are taken away and children can focus on counting what is left in front of them.)
- **Read lots of counting books and counting rhymes.**
- **Play board games that involve counting out how many spaces to move.**

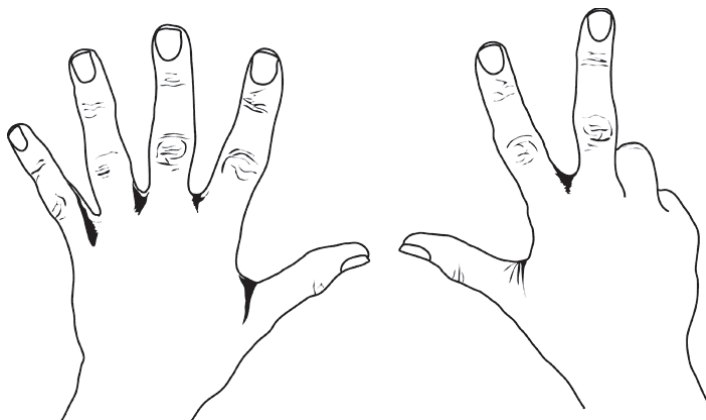


- **Offer play materials that have different shapes.** Pattern blocks or attribute blocks are good examples.
- **Make shape collages.** Use materials of only one shape at a time (a circle collage could use bottle caps, poker chips, coins, round paper cut-outs, lids, rubber bands, etc.)
- **Notice shapes in your environment.** Talk about the shapes you see while you are at home or out on adventures. Use shape as a description when directing your child toward something ("I see your robot next to the oval table.").

- **Go on a "shape hunt."** Have your child look for as many circles, squares, triangles, and rectangles as he or she can find in the home or outside. Do the same with three-dimensional objects like cubes, cones, spheres, and cylinders. Point out that street signs come in different shapes and that a can is like a cylinder.

- **Play "I spy", looking for different shapes.** "I spy something that is round." "I spy something that is rectangular." "I spy something that looks like a cone."

- **Hide a toy and use directional language to help your child find it.** Give clues using words and phrases such as up, down, over, under, between, through, and on top of.



- **Look for patterns in storybooks and songs.** Many children's books and songs repeat lines or passages in predictable ways, allowing children to recognize and predict the patterns.

- **Create patterns using your body.** Clap and stomp your foot in a particular sequence (clap, clap, stomp), have your child repeat the same sequence, and then create variations of the pattern together.

- **Use household items to create and extend patterns.** Lay down a row of spoons pointing in different directions in a particular pattern (up, up, down, up, up, down) and ask your child to extend the pattern. Make a game of it and take turns being the pattern-maker.

- **Compare your heights to objects at home.** ("Do you think you are taller than the lamp?" or "What a tall tower you built! Do you think it is taller than Papa?" "What about your sister?")

- **Model using tools for measurement.** Involve your child when you use a tape measure or ruler to help with a household project or craft.

- **Cook and bake together.** Talk about the various measuring tools you use while you make something yummy together. Then bring some to school to share with your teachers :-).

- **Sort out items at home.** Unload the groceries together and talk about what things go where (refrigerated items together, frozen items together, etc.). Clean-up time is another great time for sorting since like things are often kept together.

Enjoy the process and honor the struggle; having fun counts!