

Children's Development of Mathematical Concepts: Ages 4-6 (Preschool, Kindergarten, & Grade 1)

As children mature, their development of mathematical concepts continues. Long before they know what "5 + 5" means, they are forming ideas that will be the foundation for their future learning in math.

COUNTING: Preschoolers and Kindergartners can often count up to ten, sometimes 20, objects. They can identify the larger of two numbers, and they make fewer mistakes when counting in that they repeat or skip numbers less frequently. By first grade, they may be able to count up to 100. In school, their teacher may be demonstrating counting by tracking the number of school days there are in the year using manipulatives, such as straws. Their understanding of **one-to-one correspondence** (the concept that one number corresponds with one object) strengthens.

RECOGNIZING NUMBERS: With increased exposure to written numbers in the environment, such as in books, at home, or outside, young children are better able to recognize numbers. Usually by Kindergarten, children recognize numbers up to ten. They may be learning to write numbers at school.

NUMBER SENSE: Children gradually develop an understanding of what numbers mean, how they are used, and how numbers relate to each other. This is a process that will continue through their elementary school years. At this age, they can relate to simple concepts of addition or subtraction. For example, they will understand this concept if you ask (while demonstrating), "You have four blocks. If I take away one, how many will you have?" They will start estimating, or guessing, the number of objects that are in a set. They will also come to know that a small number of objects in a set remains the same, even if those objects are rearranged. Five- and six-year olds may be able to add small sums in their heads.

SERIATION/ORDERING: As children develop, they are better able to organize a set of objects in a certain order, such as from smallest to largest. This is an important skill as they may be required to order numbers in a set as part of a math problem in later years.

SEQUENCING/PATTERNING: When items are in a repeated sequence, they form a pattern. Children will recognize and create patterns. For example, when coloring they may shade a shirt in a "blue-red-blue-red" pattern. As they mature, the patterns will become more complex. When playing with blocks they may be able to put them in a "triangle-circle-square-triangle-circle-square" sequence. Patterns are everywhere in math! In school, your child's teacher may give them "pattern practice" by having them glue shapes in a particular order.

COMPARING: Young children learn to compare objects and they notice obvious similarities and differences among items. Preschoolers and Kindergartners can often compare objects that are familiar to them, even if the items are not in sight. For example, they may see a dog in the park, and know that it is smaller than their dog at home. Since they have stronger vocabularies, their use of **math vocabulary** -- words such as bigger, smaller, more than, lighter, etc. -- increases.

CLASSIFYING/SORTING: Children become better at classifying objects by similar, obvious physical characteristics, such as size, color, height, length, or shape. Classifying similar objects is also known as **creating a set**. Younger children can classify objects by one attribute, whereas older children begin sorting by more than one attribute, e.g., creating a set of **yellow triangles** or **blue squares**.

SPATIAL RELATIONSHIPS: They recognize geometric shapes around them, and can better describe the relationships of objects in the environment. They may tell you that their “crayon rolled **under** the couch” or that the dog is “sitting **on** the table eating the birthday cake.” They can complete more complex puzzles as their understanding of spatial relationships, including **part-to-whole relationships**, develops.

MEASURING: In school, your preschooler or Kindergartner may be learning simple measurements using **non-standard units**, such as measuring how long something is using paper clips or blocks, instead of a ruler. They come to learn how to classify objects based on weight (heavy/light); capacity (holds more/less); and length (long/short). However, before age seven, children will not know that the amount of liquid in a short, fat cup remains the same even if the liquid is poured into a tall, skinny cup. They will think that the taller cup has “more” in it because it looks like more. Kindergartners and first-graders may also be learning how to weigh objects using a balance scale and gram weights.

TIME: Children this age will have a basic understanding of time concepts. For example, they may know that “five minutes” is a short time - especially if they hear at school, “Clean-up time is in **five minutes.**” They understand concepts such as **morning, afternoon, and night** and words that describe time such as **before, after, or next**, to name a few. In school, they may be learning the days of the week, and how to read a calendar. They learn that a year is longer than a month, and a month is longer than a week, etc.

PREDICTING: Through experiences, children start to make predictions about what will happen next. For example, if they see it is raining out, they may predict that there will be indoor recess at school.

PROBLEM SOLVING: Children this age can solve simple problems. For example, if you say to your preschooler or Kindergartner, “There are ten grapes and two children. How can we make sure that each of you gets the same number of grapes?,” they may use their skills in counting and grouping to make sure each child gets an equal number. In school, they may be learning how to draw pictures to solve simple problems.

CAUSE AND EFFECT RELATIONSHIPS: They understand if they go out in the rain, they will get wet. If they take their friend’s cracker, they can predict the effects of their actions: they will have more crackers, their friend will have fewer, and their friend may become angry!

IS THIS REALLY MATH?

These concepts may not seem “mathematical” but they are! These concepts lay the foundation for future learning in math. If a child learns to put objects in order from smallest to largest, they will be able to do the same for a set of numbers. A strong sense of numbers, and how they are used, will enable children to understand place value, e.g., that the number “256” consists of two groups of one hundred (200), five groups of ten (50) and six ones (6), later in elementary school. Understanding place value is necessary in learning complex addition, subtraction, multiplication, and division problems.

Understanding part-to-whole relationships is necessary when learning fractions and decimals. Problem solving will be a skill that is used throughout their school years, and lives. The list goes on!