



Numbers in Space

Bringing Math Down to Earth with Manipulatives

by Nicole W. Cooley

“David, what is $6 + 1$?”

Blank stare.

“David, how old are you?”

“Six.”

“How old will you be on your next birthday?”

“Seven.”

“Do you see that, David? You are six. On your birthday you will add one year, that is six plus one, and then you will be seven.”

David looks at me with the “deer in the headlights” look I often see when trying to teach math concepts to my Asperger’s children. Meanwhile, their “typical” brother is laughing hysterically. A whiz at math, who seemingly began to recite math facts from birth, Robert finds their confusion over something so obvious (to him) extremely funny.

“Robert be quiet! Ok, David, let’s take a break from math.”

As I look at David’s puzzled expression I can almost see the cartoon bubble over his head telling me, “Six, I understand. One, I understand. Seven, I understand. What six and one have to do with seven makes no sense whatsoever.” I call it “numbers in space.” My sons with AS can count. But the relationship between numbers in basic mathematical equations eludes them. They have trouble connecting the “quantity” of a given number to the “symbol” of the number in their mind. I need to make it more concrete. It’s time to think outside the box again.

Fortunately, I love to think outside the box. I have “high energy multi-tasking ability” (more commonly referred to as ADHD), so I enjoy the challenges that come with educating my different-thinking children at home. It’s time to roll up my sleeves and look into my visual bag of tricks. I decide to change the math curriculum a little over half way through David’s kindergarten math book. (I have lots of half finished texts on my shelf!) TouchMath® worked for his older brother – why not give it a try with David too?

TouchMath (www.touchmath.com) puts dots on numbers so the “quantity” of a given number is visible on the “symbol” itself. One has one red dot. Six has three “double bullseye” dots. Starting the next week, David and I learn to count the dots together and I watch his face light up for the first time doing math. Bingo! We’ll revisit addition again in a few more weeks. With the dots, David will finally be able to “see” how the numbers are related. There will be the same number of dots on both sides of the equation.

I use a lot of manipulatives in our homeschool program. When David’s older brother John was in kindergarten, we counted trains. John loved trains, and fortunately, we had tons of them! We’d compare the numbers of freight cars that Thomas the Tank Engine pulled versus his “friend” James the Red Engine. Plus, it is simply fun doing math with magnetic trains! Addition and subtraction is literally a snap!

I also love the colorful math blocks sold by the Math-U-See company (www.mathusee.com) founded by expert math teacher, Steve Demme. With each denomination having its own color, it appeals visually to the AS child and avoids confusion when the blocks are all the same color. I spent many happy hours showing John over and over the different

ways to make ten with the blocks. We put a dark blue “ten bar” on one side, and lined up the smaller blocks on the other to make the same length. Even though we’ve now progressed to concepts like averages and the area of geometric shapes, John still likes to play with blocks while figuring his math. They’re still useful when explaining new concepts, too.

Counting is more concrete for the AS child than is memorizing math facts. For instance, with addition, John can quickly figure the answer by starting with the first number and then using the touch points (in his head) to count up the second number to arrive at his answer. “5 + 3” becomes “5...6, 7, 8” in his head as he visualizes the three dots on the second number and mentally counts them. In the early days, I painstakingly colored dots on all his math worksheets. Now, he can tap his pencil where the dots would be located on the numbers.

John also uses counting to solve multiplication and division problems. First I taught him to “skip count” 2s through 9s using songs. TouchMath and Math-U-See have CDs with skip counting songs. John is musical, so music is a natural way for him to learn. But, it’s also a good tool for most children. His brothers learned the songs along with him. I also have colorful posters with all the skip counting facts on the walls of their playroom. (Another idea is to use different colored post-it notes!) To solve a multiplication problem, John starts with the first number and then skip counts the dots on the second. “2 x 3” becomes “2, 4, 6” as he taps the imaginary dots on the second number.

Multiple digit multiplication was a bit harder. John amazed me at his ability to approach each math problem on a page with an entirely different technique. None of them were correct, unfortunately. The challenge with multiple digits came

in the switching of operations. You must multiply, then add, then multiply, then add. It is confusing. Steve Demme’s Math-U-See approach solved this problem. He teaches kids to first do all the multiplying and layer the numbers below in a few extra horizontal rows instead of “carrying” at the top of the multiplication problem. Once you are finished doing all the multiplying, you then add up the columns to arrive at the answer. After six months of frustration, finally John had success.

Another helpful trick when teaching math is to decrease the processing steps involved. Writing is difficult for both my AS sons. It is also an additional sensory processing step: you have to first think of the answer and then tell your hand what to write. I often offer to do the writing for my sons if they can orally tell me the answers to write. John’s psychologist, Dr. Marcia Braden, developed a great tool – velcro Math-Equivalence Boards® – to eliminate the writing. (Find them at www.marciabraden.com/resources.) The numbers and equations can be built on the board and ripped on and off. AS kids love “hands on” kinesthetic approaches like this one.

We are working on division these days. John continues to use his skip counting processes to figure out division facts. I ask him, “How many 2s in 6?” I see the fingers come out as he counts out, “2, 4, 6” and promptly tells me with a smile, “Three, Mom!” David is right behind him, even asking to do math each day for the first time. For me, thinking outside the box means getting into a big box of visual tools. Seeing the smile of success in their eyes, it is all worth it. ■

Nicole W. Cooley, a writer and mother, credits much of her math wisdom to the gifted teachers and therapists who have supported her children over the years. Contact Nicole via her website www.NicoleWCooley.com.

