

## Introduction to Math

Were you taught to think of math as numbers, operations, and formulas? Does the thought of teaching math to your child get you pumped up, or does it trigger memories of tedious and meaningless worksheets? I'm happy to report that Montessori math is not like the math that you and I experienced in school.

Dr. Montessori thought of math from a developmental perspective. She saw it as the area of knowledge that represents the human drive for exactness. She had this perspective because she was a keen scientific observer of human behavior, and she noticed that human beings had what she called a "mathematical mind", a term she borrowed from the 17th century French philosopher Blaise Pascal. The mathematical mind consists of several human drives, including the need for order, precision, and exactness, and it's present in different manifestations from the time of birth.

In the second plane, the mathematical mind presents itself as a desire for exactness of knowledge. This is the reason our children want to know why, how, when, and where. Our job as guides is to provide the means to support this drive, by providing the right materials, precise language, and aids to the imagination.

### MATERIALS

You're now becoming familiar with the brilliance of Montessori materials. Dr. Montessori considered them to be "the teacher that never judges and always gives a prompt response." While the distinction between guide and teacher is sometimes blurred, it helps to think that our job is not to teach a concept, but to show the child how to use the material in such a way that they can be freed from the adult and can have their own experiences at their own pace.

### LANGUAGE

Dr. Montessori realized that the first plane child works in order to understand, which is why with little children we first let them explore with their senses and then we give them language. Meanwhile, the second plane child wants to understand in order to feel connected to his work. Therefore, we have to give them precise language right away, by providing etymologies and analogies, and by explaining how the material connects with real life.

### AIDS TO THE IMAGINATION

We know the second plane child has a powerful imagination, and we also know that it needs our help to remain focused on the job of development. Aids to the imagination are concrete representations of abstract concepts, and these can include charts, graphs, timelines and illustrations. They are created by the adult guide, and serve as a bridge to help the child find answers to their questions and reach abstraction.

### ABSTRACTION

Abstraction is the ability to move beyond the materials and process a mathematical concept directly on paper. You cannot teach true abstraction, just like you cannot digest your child's

food for them. We can follow the traditional education method of teaching steps, sequences, and shortcuts, but these will never lead to true understanding. We must let the child do the mental work of understanding the materials, because this process provides nutrition for their brain.

You might have noticed that the Montessori math materials are cumbersome, slow-moving, and methodical in nature. There's a reason for this: When we allow the second plane child to work with the materials in a precise sequence and at their own pace, without any pressure to reach abstraction, they'll be driven to figure things out on paper in order to circumvent all those little beads and tiles. Abstraction will happen spontaneously, when you least expect it. The child might pass through a stage of using the materials to check for accuracy, first working on paper and then turning to the materials as a control of error, but this will happen by choice and only for a short time.

While it is essential that we respect this process and not show the child shortcuts with the materials, it is just as crucial that we not keep them tied to the material once they're working on a concept abstractly. This would be like clipping the wings of a bird who just learned how to fly. I don't care how much those Racks & Tubes cost you, when your child figures out how to do division abstractly, it's time to put them away.

Now, you might be thinking that the traditional approach, with its tricks, shortcuts, and lockstep curriculum is much more efficient. And you would be right, if your only goal were the development of academic skills. But if you're drawn to Montessori, it's because you want more for your child. In Montessori, we have a dual goal: the skill on one hand, and the development of the human personality on the other hand. We want to raise children who love work, who have mental flexibility, and who want to work for understanding - not just for a grade or a checkmark. Education is the means, but human development is the end goal. That's why Dr. Montessori called her approach "Education as an aid to life." We want to put the person at the center of education, not the set of skills.

## SUMMARY OF ELEMENTARY MATH

Elementary math technically begins by exploring the hierarchies into the millions. In parallel, we want to make sure children are solidifying understanding of the four basic operations, and so we'll want to guide them through addition, subtraction, multiplication, and division. Starting with addition is ideal, but from there, you're free to follow the child if you're not tied to government standards.

Once children have a strong grasp of the four basic operations, they can follow different paths. Elementary math work covers long multiplication and a variety of aspects of multiplication, including multiples, powers, squaring, and cubing. We also cover long division, along with aspects of division that include factors, divisibility, square roots, and cubed roots. We also explore math in different bases, as well as fractions, decimals, and signed numbers. Regardless of which path your child is traveling, the developmental thread that runs through the

entirety of the second plane math approach is given through the Story of Numbers, which is the fifth Great Story. In this story, we celebrate human ingenuity and creative problem-solving.

I'll be sharing the Story of Numbers with you soon. In the meantime, I invite you to observe your child and notice their mathematical mind at work. Look for their need to estimate and calculate with precision. Then get your hands on the Montessori materials and use your own mathematical mind to appreciate their genius and true purpose. Have fun!