



Ways to Learn Math Without a Workbook

By Judy Arnall, BA

The birthday cheesecake looked smaller than a half. Although the store sold the cheesecake in halves and wholes, my children and I opened the box and immediately knew something was wrong. But, we had to figure out the calculation on paper with pi, to demonstrate to the store that an error was made.

As a humanities major, I used to be afraid of math, but no longer. Although my math proficiency ends at grade 8, I still wanted to homeschool my 5 children through high school and into STEM (Science, technology, engineering, and mathematics) career paths if they so desired. With great interest, I watched how their understanding of math changed with age.

Children ages 0-12 learn math through visualization and thinking. We call it "mental math" where they figure out solutions to their everyday problems in

their head using various strategies. You see this with babies using a shape sorter, or a toddler sharing cookies, or a preschooler grouping colored Lego, or a school-ageer playing Battleship.

As unschoolers, we didn't use any math curriculum. The children experienced mental math through games, toys and play. They started learning "paper math" at age 13 (grade 8) when they took their first formal math course, taught by a teacher, in preparation for their desire to enter STEM careers. They didn't need to memorize the multiplication tables as they had already been using those mental tools since birth.

At puberty, the children's brain development allowed them to understand abstract concepts such as a "variable." They had the brain computing power to work through 8 grades of math in one year, by applying learned paper math solutions to mental math problems. They learned the names of each math tool (fractions, decimals, variable, addition) as well as when and how to apply each tool to everyday problem-solving.

If you have a child in school, math homework doesn't have to involve a textbook or workbook. Here are some handy ways children can learn math outside a classroom:

Adding and subtracting - Play board games such as monopoly, etc. Selling items and making change at a garage sale or lemonade stand. Paying for items in stores and noticing what change is given back.

Multiplying and dividing - Cooking, baking, sewing, workshop projects, and art projects. Sharing food and items among friends.

Greatest Common Multiples - Skip counting jumps on the trampoline.

Fractions - Baking and cooking from recipes. Dividing up food with siblings. Deciding how much quantity of food to buy per person for hosting dinners.

Decimals - Shopping. Splitting restaurant cheques.

Percents - Calculating tips, taxes and sale prices while shopping.

Estimation - Shopping. Tracking travel miles.

Perimeter - Measuring for baseboards, or framing pictures.

Area - Measuring for carpet, paint or floor coverings. Sewing.

Volume - Measuring parcels for the post office.

Circumference - Measuring if half the ordered cheesecake really is half a cheesecake.

Least Common Factors - Lego pieces are named 2x2's or 2x8's so figuring out how many pieces are needed to build a model.

Integers - Monitoring temperature changes. Counting money. Counting zero pairs with red (negative integers) and green (positive peices) Lego blocks.

Algebra - Computer games such as Graal, Minecraft, Zelda, etc. Shopping for packaged food items for a certain number of people. Figuring out problems.

Variables - Figuring out symbols that stand in for concepts.

Place value - Sorting and grouping toys and items. Measuring liquids, distances, and weight using the metric system that is based on 10. Counting money in games such as Monopoly. Writing out cheques. Cooking.

Coordinates and Ordered Pairs - Play the Battleship game.

Rounding - Figuring out how much allowance one has to pay for things. Estimating price total when grocery shopping.

Angles properties - Making a sundial. Studying astronomy. Visiting historical sites where people made ancient contraptions to measure time and seasons. Calculating how far from the wall, the ladder must be for safety measures.

Degrees - Formatting photos that are upside down and sideways. Learning about astronomy to understand degrees related to a sphere. Questioning why the Xbox is a 360! Playing Hide and Seek game.

Temperature - Bake and cook. Monitoring the weather.

Time - Figuring out the clocks at hospitals and airports help children learn the 24 hour clock.

Roman numerals - Read "Asterix and Obelisk" books. Visit monuments.

Reading graphs, pie charts, and figures - Reading newspapers and magazines such as The Economist, Time, and MacLeans which include many charts and graphs. Discuss how the information is presented and if it is correct.

Even and Odd numbers - Reading maps and house numbers on a street. Dividing groups based on birthdays.

Properties of geometric solids - Playing with blocks and nets.

Slides, turns, rolls and flips - Formatting photos on the computer. Playing with blocks.

Symmetry - Playing with mirrors, objects and prisms.

Perfect squares and Exponents - Examine a multiplication table and visually see the patterns. Making paper squares for cutting snowflakes and other paper projects. Seeing how squares fit into other squares.

Executive Function Skills - Playing video games, or chess helps children develop taking turns, planning the next move, toning working memory by holding multiple instructions in their heads, filtering distractions, and develop emotion self-control when they lose.

Math is fun! Cultivate a child's learning math tools through experience and the mental concepts will stick when they finally learn it on paper. Sometimes, pi is better than cake!



$$X^2 + 4X + 3$$

Excerpted from the upcoming book, *Unschooling to University*, by Judy Arnall, to be released Spring 2018 by Professionalparenting.ca Judy is the author of the print

bestseller, *Discipline Without Distress*, and *Parenting With Patience*. Visit Judy's blog at www.unschoolingtouniversity.com