

A New Perspective on Math at Home

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Dr. Raj Shah has always had an affinity for math. Powered by his love of math, he earned a Ph.D. in Physics in 1999, which led to a career in R&D at Intel. In 2008, he quit his job and founded Math Plus Academy, an after-school STEM enrichment program for kids from ages 5-14. His mission is to introduce kids and adults to the wonders of mathematics. Dr. Shah also contributes his time to Math Teacher Circles, the Julia Robinson Math Festival, and is a founding member of The Global Math Project. He believes that everyone can enjoy math, develop strong number sense, and become a perseverant problem solver.

Introduction

Math education has changed considerably over the last several years. Most parents were schooled to believe that math is about memorizing facts, procedures, and formulas, and then using that knowledge to produce right answers on tests. As a result, they struggle with two important ideas that are fundamental to how we wish to teach mathematics. First, we want to teach students that there is more than one way to solve a problem. Second, we want students to understand what they are doing and to be able to explain their thinking.

Given these striking differences, it is no surprise that parents and guardians feel uncertain about how to help their children at home.

Parents have three pressing concerns:

1. **How can I make sure my child gets good grades?**
2. **How do I increase my child's confidence?**
3. **What do I do when I don't know the math and can't help my child?**

It's our responsibility as teachers and administrators to empathize with the uncertainty that parents feel and educate them to see that there is more to math than right answers.

In addition, we need to provide parents with the tools and techniques to support their child at home in a way that benefits the child in school and beyond. We can do this without having to teach parents all the math.

This paper provides tips and strategies you can share with parents to help them feel confident about helping their child, even if that child struggles with math. Many of the suggestions presented here can be effective for students throughout their school experience, from KG to 12th grade.

A New Perspective on Math

Unfortunately, most people believe one or more of the following myths about math:

- Math is just a collection of facts, formulas, and procedures to be memorized.
- Math is about getting the right answer as quickly as possible.
- Some people have a natural ability to do math and others don't (fixed mindset).

Allowing a child to believe any of these will destroy his or her interest and enjoyment of mathematics. (If a parent believes any of these, they should not tell their children!)

When asked to define math, most people reply with a list that includes addition, subtraction, multiplication, fractions, algebra, and so on. These are all nouns that label the content areas we learn in school. However, there's so much more to math.

We must encourage parents and students to think of mathematics as a VERB!

Math is THINKING, REASONING, ANALYZING, WONDERING, DISCOVERING PATTERNS, and SOLVING PROBLEMS.

Parents need the tools to create an at-home culture that allows kids to explore their own questions, make mistakes without being judged, and solve challenging problems. When that happens, students are in the ideal space to develop the mathematical thinking skills to succeed in school and beyond.

Ways Parents Can Help, Even When They Don't Know the Math

As a parent, it can be frustrating to discover that the way you learned math is not the way your child is learning it.

Let's reassure parents that there is no shame in not knowing the "new math."

We can't expect parents to learn all the new math strategies, and that is OK! Let's remind parents that their job is not to explain HOW to do math. That's the teacher's job. If parents view themselves as partners in the learning process and not as teachers, then they can focus on:

- Making math about **trial and error** and not right vs. wrong
- Encouraging thinking **by asking questions**
- **Keeping the mood relaxed** and not increasing the pressure a child feels
- **Being less helpful** - If you end up doing the work FOR the child, they won't learn
- **Playing games & tackling puzzles together**

In fact, not knowing the "new math" can be a huge advantage because now the parent and child can discover new things together. When parents change their mindset in this way, they find that their stress and anxiety plummet, and they are better able to provide positive support for their child.

Questions Parents Can Ask to Help Their Child Develop Understanding	Things Parents Should Try When Their Child Gets Stuck on a Problem
"What is the problem asking?"	Help them list all the things they notice about the scenario (don't focus on the question at first.)
"What do you notice?"	Simplify the problem and try to solve that first, then add back the complexity.
"What questions do you have?"	Draw pictures and diagrams.
"How do you know?"	Swap out complicated numbers for easier ones. Change fractions, decimals, or negatives to 2 and 10. This will help build an intuition for the mathematics first.
"What if you could simplify the problem?"	Encourage breaks when you sense your child getting frustrated.

Help Children Develop a Growth Mindset

Stanford psychologist Dr. Carol Dweck identified two learning mindsets that she called fixed mindset and growth mindset. Her research on this topic is summarized in her excellent book, *Mindset*.

A person with a fixed mindset believes that traits like intelligence are innate and cannot be changed. On the other hand, a person with a growth mindset believes that abilities can be improved with effort.

People with a fixed mindset would say Michael Jordan had an innate talent for basketball. People who believe in growth mindset might say that Michael Jordan practiced more often and more effectively than his peers, and that is what led to his supreme ability and results.

The risk is that if you believe talent and ability are fixed, you won't work as hard to increase your own ability.

Parents Can Promote a Growth Mindset

The good news is anyone can change their mindset.

1. **Simply tell children about the two mindsets.** Research shows that just knowing two mindsets exist can help children move toward the growth mindset.
2. **Praise effort over outcomes.** When your child comes home with an A on a math test, try saying, "I can see how your studying paid off. Great work!" rather than "Wow! You're so smart!" If your child got an A without much effort, try saying, "Looks like that test was too easy for you. Maybe we can work on more challenging problems together." This will teach him or her to value the process of learning more than the grades, and offer a reminder that it's OK to struggle.
3. **Identify an endeavor in which your student demonstrates a growth mindset** and engage in a conversation about how that feels. Maybe the thing they enjoy and practice is music or sports or video games. Everyone has different mindsets for different aspects of their life. This conversation will help your child see that they CAN have a growth mindset in mathematics.
4. **Look for signs that reveal a fixed mindset.** Students with a fixed mindset will try to hide their mistakes and make excuses to avoid trying because they are afraid to make mistakes. In their minds, mistake are confirmation that they can't do math. They don't recognize mistakes as part of the learning process.
5. **End every sentence that starts with "I can't do..." with the word "yet."** Again, this will reinforce the notion that learning is a process.

Foster a Love of Math Using Games

Most parents understand the importance of reading stories to their young children every night. Children’s books are whimsical and full of colorful pictures. It’s all designed to be fun, not a chore.

Unfortunately, no one tells parents to do the same for math!

Instead of finding ways to immerse kids in hands-on mathematical experiences, parents often get workbooks or flashcards and use them to help kids memorize “math facts.” This would be like replacing nightly “reading time”, by studying the dictionary. Kids would hate that! And yet, that’s exactly what we do to math—reduce it to repetitive drills. The good news is there is an analog to “reading time” called “game time.”

Games are to math as books are to reading.

Encourage parents to play games at home as often as possible. Playing games helps children develop mathematical skills naturally without turning math into a chore. This is as true for preschoolers as it is for middle schoolers.

Games provide many benefits

- They are fun for the whole family
- They are interactive and collaborative
- They take the pressure out of math and put it into meaningful context
- They involve problem solving, critical thinking, estimation, and arithmetic skills

Which games are the best?

Almost any game you can think of requires planning, logic, and mental math—all skills that are vital to excellence in mathematics. Even a “word game” like Scrabble involves mathematical thinking when placing words to optimize your score. Family traditions are the glue that holds families together. Parents can start a family game night by choosing one night a week to play games. Turn off the TV, the phone and all other distractions and just have fun!

You’re never too old to play games. The games listed below are good for ALL ages from KG to 12th grade and on to adult! Yes, even high schoolers can enjoy good games.

Five game suggestions

1. SET (Ages 7+)

This game takes a few minutes to learn and enhances visual/spatial reasoning skills. Each player surveys the field of 12 cards, while looking for groups of 3 cards that are all the same or all different with respect to shape, color, number, and pattern. Try the single-player online version to learn how the game works.

2. Qwirkle (Ages 6+)

Qwirkle is like Scrabble, but with shapes and colors instead of letters. Players can build on each other's lines with new tiles. The creative player can find clever ways to maximize their score. Qwirkle can be played with school-age students. As you play more, you and your child will discover new winning strategies.

3. Carcassonne (Ages 8+)

Carcassonne is a tile-based game for 2 to 5 players. Players build a landscape by adding tiles to the board as the game goes on. After strategically placing a tile, players have several options for placing their “followers” on the board. This allows the game to be played with a diverse set of competing strategies, which makes the game a lot of fun.

4. Settlers of Catan (Ages 8+)

Settlers of Catan is the winner of several gaming awards and was called “the board game of our time” by The Washington Post. Players try to build colonies as they acquire and trade resources. This is another game that allows for multiple competing strategies. A typical game lasts 60 to 90 minutes.

5. Forbidden Desert (Ages 8+)

Forbidden Desert is a cooperative game where each player takes the role of an adventurer with a unique skill that will aid the team. Players work together using each other's unique skills to survive on an ever-shifting game board. The teamwork needed to play this game makes it a nice change from most competitive games.

Other recommend games/puzzles

- Chocolate Fix & Rush Hour (Ages 7+) by Think Fun—Logic and Reasoning
- Hive (Ages 7+) by Gen42 Games—Strategy
- Zeus on the Loose (Ages 5-9) by Gamewright—Addition/Subtraction Sense
- 24 (Ages 10+)—Mental Math
- Prime Climb (Ages 9-12)—Mental Math
- Sumoku (8+)—Strategy

These games provide kids with great opportunities to develop their thinking and communication skills. Games present a wonderful and natural learning opportunity for all ages.

Summary

Parents are actively seeking out ways to help their children, but many are lost and confused. We hope you can share the strategies and tools highlighted here with parents at math nights and parent conferences. This can give parents a powerful roadmap that will help their children develop the mindset and skills for mathematics and learning.