How to Help Your Kids Fall in Love with Math



We're probably not the first people to try to convince you, or your kid, that math is fun and useful. We really believe it, but we also know it doesn't always feel that way, especially to kids. More often than not, their main exposure to math is in school, where the need for standardization, and the pressure to perform, can kill their curiosity and confidence. Far too many kids grow up telling people they're just no good at math, and it's all the more tragic because it could be avoided.

Here's the truth:

- Math is only fun when you let yourself have fun with it. If you approach it playfully, follow your kid's curiosity, and let them step away when they lose interest, they'll have a good time.
- Math is only useful when you understand how it's connected to things you care about. If you start with something that's meaningful, interesting, or funny, and nudge your kid to think more deeply about it, then they'll see the value.
- Math isn't always easy, but it doesn't need to be. As long as your kid is focused on the joy of discovery, rather than the fear of failure, they'll be able to tackle hard problems. If you show them that it's OK not to know all the answers and they'll be more likely to find them.

We've put together a list of five ways you can introduce your kid to the joy of mathematical thinking, each with a few example activities you can try out to get started. Pull one from the list and try it out today!

Embracing Impossible Questions

Kids are always asking questions, right? Many of them might seem impossible to answer. But consider this: math is a tool designed to answer just those kinds of questions! It allows us to extrapolate from very limited information and make accurate guesses about things we could never measure by hand. Taking the time to engage seriously with those questions can be an excellent way to learn.

Any question that you can translate into numbers will work. The simplest ones might contain phrases like "how many" or "which would be bigger," or "would it be enough?"

Here are a few examples to tickle your fancy:

Activities:

1. If you stacked up pennies to your own height, how much money would it take? What if you did the first quarter of your height in quarters, the next quarter in dimes, the next in nickels, and the last in pennies?
2. How many pancakes would it take to cover the surface of the moon? (You can look up its area, of course!) But the pancakes are circular, so to cover it completely, they'd have to be overlapping. How much of each pancake "doesn't count" for this question?
3. If you melted down every car in this parking lot, how big of a robot could you build with the metal? When things get complicated like this, it helps to break it down. How many cars are there? How much metal per car? What shape is your robot? (It will be easiest to calculate if you build it out of cubes!)

Why it works:

When you approach an impossible question using math, you show that it has value as a tool to understand the real world. When your kid makes progress answering that question, they learn that it can be satisfying to think critically, and they build confidence in their ability to tackle problems they've never seen before.

Allowing your kid to pursue the questions that interest *them*, rather than what will be on the test, fosters intrinsic motivation. Math becomes enjoyable play, rather than stressful work.

Pros and Cons:

^ Doesn't require any materials or preparation.

^ Can be adapted for all levels of ability.
^ You can do it while driving to school, over the dinner table, or anywhere!

v Doesn't work as well if the kid has to work on their own, especially if they're younger or easily distracted.

Discovering the Drama of Math

Math has been at the center of earth-shaking inventions, fiery academic arguments, and millions of hours of obsessive study. One of the best ways to catch that passion is to learn from passionate people, and fortunately, our world is full of them and the things they've made.

With a bit of exploration, your kid will probably find some favorites of their own. Until then, we recommend searching in many different directions and see which topics and communication styles connect with them. The following list contains some of the works we've liked best.

Activities:

Video:

1. *Donald Duck in Mathmagic Land - This Disney classic might be overshadowed by some of its less nerdy contemporaries, but it introduced a whole generation, (maybe your parents' generation,) to the wonder and whimsy of math. It's rated G, suitable for kids eight and up.*
2. Matt Parker's *10,000 Domino Computer* - Imagine spending more than 30 hours building a computer out of dominoes. That's a testament to the dedication and fascination math can spark, even in adults. Seeing it in action will impress young kids, even if they don't understand how it works.
3. Vi Hart's *Doodling in Math Class* videos. Check out *Spirals, Fibonacci, and Being a Plant* - These videos celebrate the simple pleasure of playing with ideas. Vi Hart treats math as a toy, a mystery, and a work of art. Her playful perspective and fast-talking delivery should resonate with kids of middle-school age.
4. Grand Sanderson's video (on the channel 3blue1brown,) *But What is the Fourier Transform?* - This exploration is more in-depth, and gets into mathematical specifics. Sanderson demonstrates both the wonder and the practical utility of mathematics, and often gives a viewer the chance to answer questions on their own before explaining the solution. It's likely to land for a kid in high-school.

Books:

1. *The Phantom Tollbooth by Norton Juster is a classic children's book less about math as it is about thinking in general. It's very silly, and perfect to read aloud to an elementary aged kid.*

2. *Things to Make and Do in the Fourth Dimension by Matt Parker - A joke-filled collection of math tricks and puzzles, used to elucidate some fundamental truths about numbers. Suitable for teens and adults alike, and it will give you some fun math tricks to show your friends.*
3. *Logicomix by Apostalos Doxiadis - A graphic novel story of Mathematician Bertrand Russel's lifelong quest to establish a foundation for all mathematics. It's a story of the intersection between math, life, and philosophy, and suitable for early teens who like to think deeply on those topics.*
4. *How to Solve It by George Pólya - A book which breaks down and thoroughly explains the process of solving problems, mathematical and otherwise. Its language may be more difficult to understand for kids, but its methods and practice problems could be a great benefit to a high-schooler on track for a STEM career.*

Why it works:

In order to get interested in math, your kid will have to get a taste for what kinds of math are out there. By sampling content made by and about passionate mathematicians, they'll become familiar with different types of math, and they'll get to see what other people find fascinating about them.

Pros and Cons:

^ By connecting your kid with a source of high-quality information, you can help them learn without being a math expert yourself.

^ A Youtube channel or a good book can give your kid a way to learn and engage their mind without needing much supervision.

v Resources will need to be selected carefully to ensure that they're suitable for your kid's level of ability and areas of interest.

v Computer time offers many opportunities for distraction. There's always a risk associated with leaving your kid in front of a screen.

Math Out in the World

Most people are used to finding math flattened onto paper, compressed into equations and word problems. In fact, math is everywhere! It's in a pinecone, a city street, and the clouds above your head.

Ideally, you should try to find something your kid already wants to do and start asking deep questions about it. If they want to watch a Nascar race, you could ask them whether it's better to take a corner on the inside or the outside, and why. You could go to a baseball game and think about which direction the batter should hit the ball in to buy the most time for his run to first base.

Here are a handful of ideas you could use to introduce your kid to the math all around them.

Activities:

1. If you're lucky enough to live near a math museum, like the Exploratorium in San Francisco, or the Museum of Mathematics in New York City, you can spend a day to take your kid to an exhibit. They have exciting demonstrations, and they'll handle the explanations for you!
2. Next time you're on a walk with your kid, look at some leaves and flowers. If they fold the leaves in half one way, they'll match up, but the other way, they won't. How about the flowers? How many ways could they fold them and still have them match up? Is it the same for all flowers?
3. Take your kid to a concert, and tap along to the music. How many taps does it take before a pattern in the music repeats? Can they figure out what numbers the music is based on? (To take this further, go home and do the same with a waltz, and then with *Take Five* by Dave Brubeck.)

Why it works:

When your kid only encounters numbers and math in school, then math will start to *feel* like school. When you expose them to math in other contexts, then math can feel like nature, or like a fun day out on the town.

Finding math in the real world will also help your kid broaden their definition of math. They can discover how it connects to things like visual art, music, botany, or architecture. Those connections will make the study of math more meaningful to them.

Pros and Cons:

^ Exploring the math of the natural world can get your kid thinking about biology and ecology as well as math.

^ It's a good excuse to spend time with your kid, and to get them out of the house and away from screens.

v Day-trips and long-term experiments require more adult supervision.

Hands-On Math

Numbers and symbols are just one way to express the underlying relationships and patterns that we call "math." At Zometool, we say "the structure of number is the structure of space." In other words, your kid can develop an intuitive understanding of math by playing with shapes and angles, by putting things together and seeing what fits. Here are a few ways to get them started.

Activities:

1. Let your kid go wild with a simple math manipulative. We recommend Pattern Blocks. These will help them get a feel for angles other than the standard 90 degrees.
2. The next step is to move from just two dimensions up to three, and there's nothing better for it than Zometool. The shape and color coded design makes it easy to discover the relationships between complex shapes.
3. If your kid wants to move beyond a manipulative with built-in rules, consider setting them up with a way to build without limits. This could be paper and tape, or wood and hand tools, or even access to a 3D printer. Designing their own models from scratch will get them thinking more deeply about how different shapes relate.

Why it works:

A good math manipulative has information about math built into it. It doesn't require specific instructions; your kid will learn about mathematical relationships through free play. As their understanding grows, they can test the limits of their understanding by trying to build specific shapes or achieve particular goals. As they challenge themselves more, and need to think more clearly about what's happening, their understanding will naturally grow toward explicit mathematical rules and principles.

Rather than having to check their work with a calculator, your kid will be able to tell immediately whether they've achieved what they wanted to. Clear, immediate feedback prevents the feelings of uncertainty that can make a task feel more daunting.

Pros and Cons:

^ There don't need to be any numbers involved, so it's perfect for kids who say "they don't like / aren't good at math."

^ Depending on the project they choose, your kid could learn some valuable skills outside of math, as well.

v Certain projects might require specific materials and tools, which raises the price tag.

v Because the stakes can be higher in a creative project, your kid may get frustrated and need help getting unstuck.

The Math of Games

Is your kid competitive? Do they like to win? Math is the ultimate tool for victory in most games of strategy, and even some games of chance. By using math to analyze the rules of a game and predict the results of different moves, your kid can achieve the victory they crave. More importantly, they'll learn a lot along the way.

Activities:

1. An easy way to start your child thinking about the math of games is to play a game that's all about math. For younger kids, you can check out Adsumundi or Prime Climb. Plenty of other card games are secretly math games, too. Blackjack, for example, is addition with a side of statistics.
2. Bring things to the next level by prompting your kid to predict the results of a particular "move" or choice. You could play a game of poker, and pause to ask if your kid can guess how likely their hand is to win. Now show them the cards everyone else is holding. With all those cards taken out, how many of the cards left in the deck would let them win?
3. If your kid starts to enjoy thinking about the statistics and logic of games, you might suggest that they try designing their own. They'll have to come up with rules, test various strategies, and determine things like whether the starting player has an advantage.
4. The same kinds of thinking can also be applied to real-life goals. Does your kid like to go trick-or-treating? Give them a map of the neighborhood, challenge them to plan a route that will take them past the most houses in the least amount of time.

Why it works:

When your kid is playing a game, they've already decided to invest their emotions in it, to care about the result. When you use math and logic to find strategies to win those games, the math can inherit that existing motivation.

For most games, understanding how they work on a deep level will make playing them more interesting. Using math to gain that deeper understanding can help your kid see math as a way to get more out of the things they already love.

Pros and Cons:

^ If your kid already knows the rules of a game, it won't take long to get them started, and they can probably investigate without too much help.

^ In some cases, this involves more logic than numbers, so it won't scare away kids who don't have much confidence in math.

v Your kids will beat you at games.

Ready to Explore?

Of course you are! And your kids? They were *born* ready. As long as you keep it playful and follow your curiosity, you have everything you need to light a fire in their minds, (and your own.)

There are uncountable ways to approach learning and teaching math, and the options we've listed here are just a few ways to get started. Of course, *we* think you should start with Zometool. It's great for kids aged 6 and up, but it's also helped countless adults rekindle their curiosity and explore math more deeply than ever before.

Get your first kit at Zometool.com!

And if you want more math insights and project ideas, check out our newsletter or find us on your social medium of choice. There's a whole world of math, (and of Zome,) to discover.