

SERIOUSLY ADDICTIVE MATHEMATICS

How To Raise An
**INTELLIGENT
CHILD**



*Why early math exposure is important
for IQ and future success*

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- Worksheet reinforcement and incremental learning for mastery
- Learn, select and apply heuristics to solve word problems efficiently



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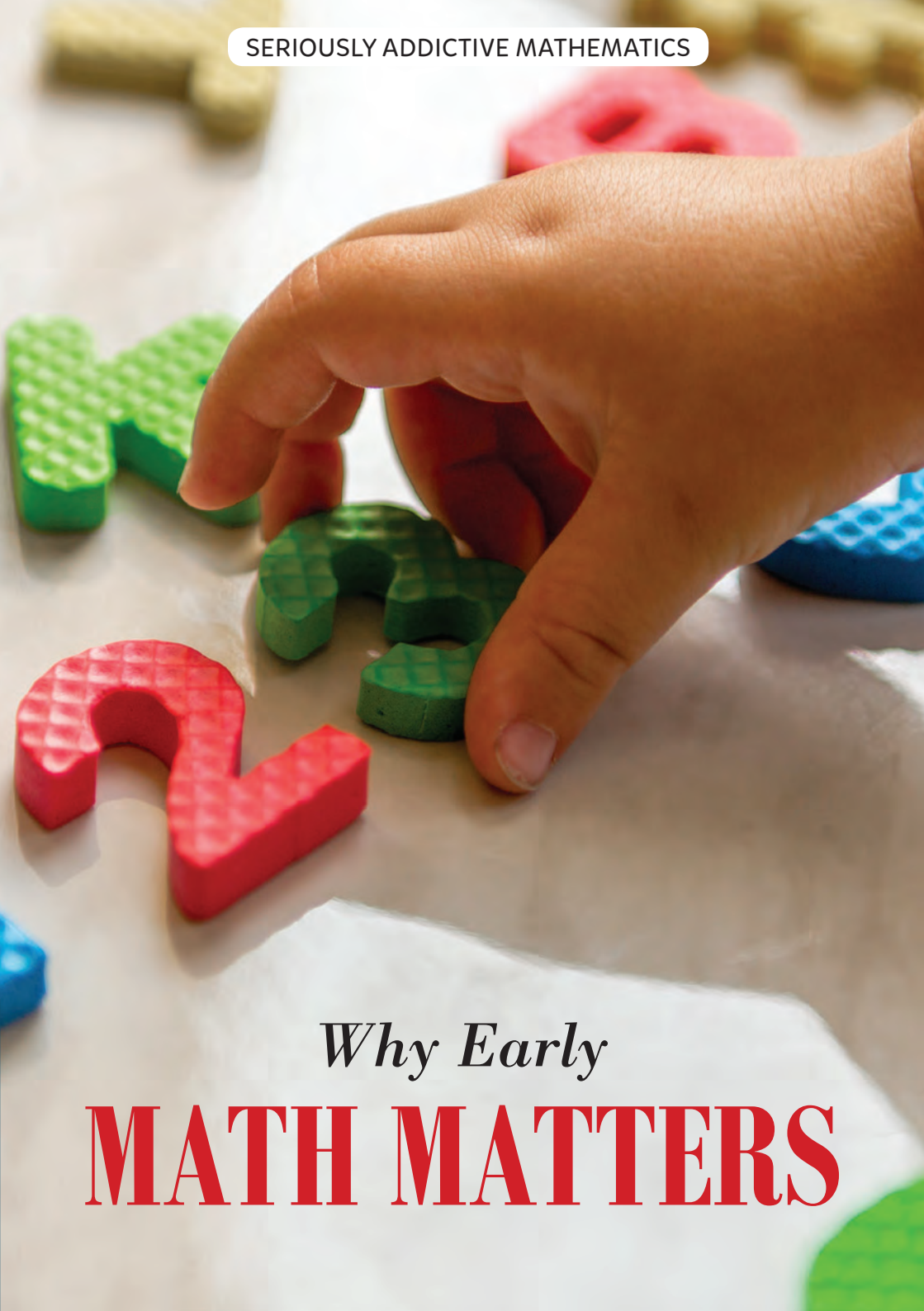
I see significant improvement in all my children's critical thinking and problem-solving skills. S.A.M makes learning math so much fun for them. I highly recommend S.A.M for all children.

Natalie
 Mother of 3 children

I went from being a girl who didn't like math to one that enjoys it. I actually got rewarded at school because the teacher noticed the progress I had made from P3 to P4, and I owe it to S.A.M!

Alexia
 P4 student

SERIOUSLY ADDICTIVE MATHEMATICS



Why Early

MATH MATTERS

Math is usually associated with science, technology and engineering. But beyond the numbers, equations and formulas, the skills and critical thinking required to solve math problems help children master other subjects as well. Math is not just the foundation for careers in science or engineering; it is the pillar of a well-rounded foundation for every child.



Strongest predictor for later success

Want to predict your child's success as they grow older? Your child's math skills will be the best gauge. In a 2007 study on 35,000 preschoolers across the US, Canada, and England, researchers found that early math skills were found to be the strongest predictive power for later success.

Children become better readers, writers and communicators

If you had to choose between literacy and math for your child to do well in school, which would you choose? This might come

as a surprise, but learning mathematics does not just help children to develop their confidence and basic foundation to succeed in math, it also supports the development of literacy.

When they are able to communicate effectively in and with mathematics, it deepens their mathematical understanding and develops their linguistic fluency such as oral language abilities, vocabulary, critical thinking and grammar complexity.

So if your child is exposed to math at a young age, chances are they will be likely to excel in their language too.

How to ensure that children have a good understanding of math connects and skills at a young age

- **Give them exposure**

Mathematical concepts are built one upon another in a logical, step-by-step progression. When your child is being pushed to learn addition and multiplication before understanding the relationships between numerals and quantities, they may end up memorising math facts.

But when they are exposed to activities according to their ability and developmental level, they can move naturally from one level to the next. They flourish best in linguistically rich and culturally meaningful mathematical activities.

- **Provide them with the right support**

When children are placed in rich learning environments with proper stimulation, guidance and feedback, they are better able to exercise their knowledge and skills. This support can come from yourself, from high-quality early math programs or motivated teachers.

• **Start early**

Can you recall a time when your baby was able to tell apart two sets of objects with varying numbers? Or how they were able to locate objects within a designated space? Even at infancy, babies are able to display core mathematical abilities.

You don't have to be an expert at math to infuse math into your child's life. Here are some suggestions.

Infancy to Toddlerhood

Introduce your child to numbers and counting through reading storybooks, or look out for shapes together around the neighbourhood.

Preschool level

Introduce math-related phrases such as 'more than', 'less than' and 'equal to' by doing activities that involve counting, adding and subtraction. Use toys or objects for these activities. Even if they may not be able to write or recite numbers,

they may begin to understand the concept of numbers as early as three years of age.

Primary School level

Show your child that you value math, and when they do well, acknowledge their math achievement. Help them to foster an attitude that being good at math is not about being born smart, but by working smart consistently.

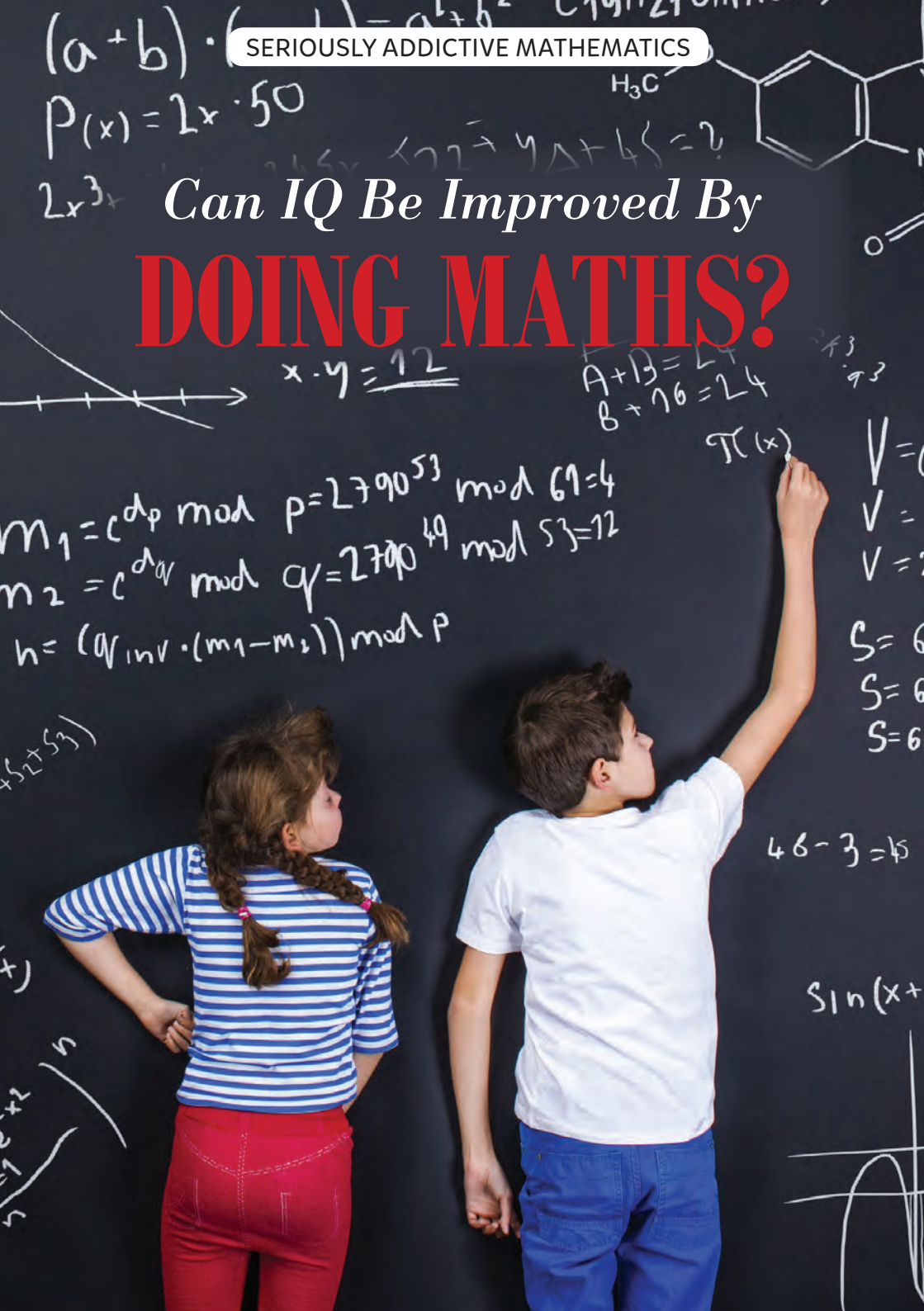
A study conducted by the University of Missouri (USA) revealed that children who do not grasp the meaning and function of numerals before they enter first grade fall behind their peers in math, and most do not catch up. Most of them remained at heightened risk for low scores on math problems through the seventh grade.

All children have the ability and potential to learn and excel in math.

Give them the opportunity to do so today.



Can IQ Be Improved By
DOING MATHS?



$$(a+b) \cdot$$

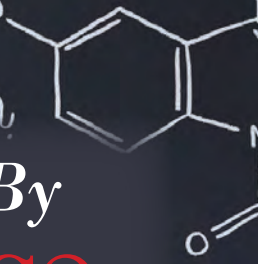
$$P(x) = 2x \cdot 50$$

$$2x^3$$

SERIOUSLY ADDICTIVE MATHEMATICS

Can IQ Be Improved By

DOING MATHS?



$$x \cdot y = 12$$

$$A+B=24$$

$$B+76=24$$

$$m_1 = c^{d_p} \pmod p = 27^{90} \pmod{61} = 4$$

$$m_2 = c^{d_q} \pmod q = 27^{90} \pmod{49} = 12$$

$$h = (d_q \cdot \text{inv} \cdot (m_1 - m_2)) \pmod p$$

$$\pi(x)$$

$$V =$$

$$V =$$

$$V =$$

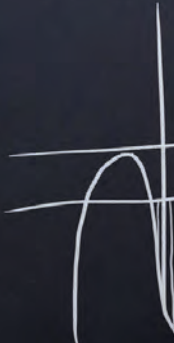
$$S = 6$$

$$S = 6$$

$$S = 6$$

$$46 - 3 = 45$$

$$\sin(x)$$



Intelligence quotient, or IQ for short, is the relationship between a person's potential and the statistical normal of all possible results.

How is IQ measured?

They are tested based on a person's concrete and abstract reasoning in subject ways, based on age and development norms.

It usually consists of a number of tasks measuring various measures of intelligence. These include short-term memory, analytical thinking, mathematical ability and spatial recognition. However, the purpose of an IQ test is not an attempt to measure the amount of information one has learned, but rather it attempts to measure their capacity to learn.

Not fixed at birth

IQ was initially considered to be genetic and fixed. However, a study at Michigan University revealed that at least one aspect of IQ

measure can be improved. The researchers found that fluid intelligence, which is the ability to solve abstract problems without depending on previous knowledge, skills or experience, can be improved with specific and targeted training of working memory.

Understanding and dealing with a wide variety of abstract relationships between concepts, objects and things in our environment – also referred to as relational skill – is necessary for children and adults to function and perform at school, at work and in our daily lives. In academics, relational skills are necessary for math and language skills to emerge. The concept of more than or less than is one example of relational skill needed to understand mathematics.

How can we help our children have better relational skills?

Doing math will help because it develops their ability to notice relationships between numbers. A strong co-relation has



also been found between a child's relational skills and IQ scores. Through math practice, your child not only sharpens their relational skills, they also sharpen their own learning process and capacity to learn.

Building up on intelligence and IQ

A study by Stanford University School of Medicine found that personalised-tutoring, coupled with arithmetic practice helped children to remember better. The findings also suggest that when children are able to solve basic arithmetic problems from memory, their brain is more prepared to tackle more complex questions.

How can we ensure that our children start off with the right foundation?

Find an approach that combines the benefits of personalised training with the discipline of self-learning and self-discovery; an approach that is designed to introduce new concepts in incremental

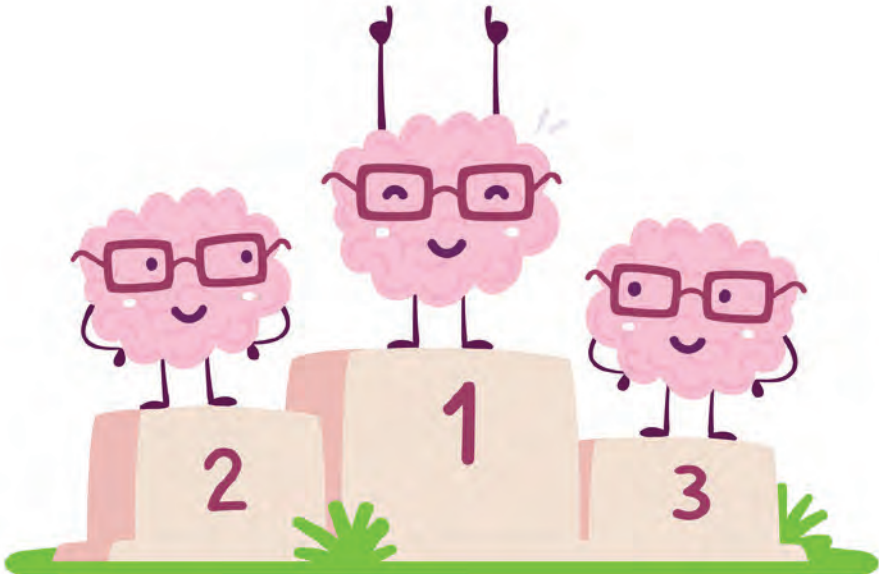
steps to make learning math easier.

However, practice alone is not enough, and practice with little understanding of the concepts can be ineffective. It is the brain storming process; the understanding of concepts, problem solving, critical thinking and logical reasoning, on top of personalised training and practice that deepens and improves their understanding.

Are these processes fostered in your child? Are they engaged in dialogue and encouraged to exercise problem solving, critical thinking and logical reasoning?

If your child has a low or average IQ score, don't be disheartened. It does not mean the scores will remain the same. It simply means there is potential for them to do better.

IQ can be improved. All you need is to exercise your brain. And early exposure to math can go a long way.





How To Improve Your
CHILD'S IQ

Contrary to popular thinking, developing a child's IQ is not about getting them to do tons of IQ questions or assessment books. Neither is it about improving their memory.

It is the everyday activities of what parents do and you say that matters. Here are 5 things you can do to improve your child's intelligence.

1 Read To Improve Verbal and Linguistic Intelligence

Linguistic intelligence is the ability to process information using words and language.

Compared to processing images or speech, reading is more challenging as parts of our brain are making connections. When we read, we are also required to construct and imagine. Reading not only helps to improve language, which is necessary for communication and to get on with tasks of everyday life, it also keeps our mind sharp.

Starting to read early may not only help in the growth of your child's literacy, but it may also benefit a wider range of cognitive abilities that are crucial later in their life.

Early start in reading is important in predicting a lifetime of literacy experience. In a study done by Professors Cunningham and Stanovich, they found that students who had a quick start in reading were more likely to read more over the years. The results also revealed that reading volume had a significant contribution to vocabulary, general knowledge, verbal fluency and spelling. In a nutshell, reading does make you smarter!

If you have young children just starting to speak and read, read with them daily to expand their vocabulary. When you read with them, explicitly bring attention to certain

words. For older children, introduce concept stories to expand their vocabulary and encourage imagination. This helps them to have better grasp of more abstract concepts.

2 Play with Blocks To Improve Spatial Intelligence

Puzzles, blocks, memory games, crafts, toys figurines – these are tools every child should grow up with. Give your children ample time and space to play with these tools when they are in preschool. Block and construction play is particularly important and beneficial as it gives your child multiple learning opportunities.

When building structures or engaging in block play, children discover spatial awareness and develop their spatial intelligence. Spatial intelligence is the ability to imagine pictures in your mind. When deciding how to stack blocks, under, above or perpendicular – children are engaged in using their spatial intelligence.

Studies have shown that developing spatial skills support later learning in science, technology, engineer and math. Young children who are better at visualising spatial relationships have also been found to develop stronger arithmetic abilities in primary school.



3 Do Math and Physical Exercise To Improve Fluid Intelligence

To think abstractly, reason and identify patterns, solve problems and discern relationships without using your prior knowledge – this is known as fluid intelligence. Generally, we use our fluid intelligence when we encounter a new situation.

Can fluid intelligence be taught? For young children, you can start by using concrete examples to show the relationship between objects.

If you are teaching your child the difference between a square and a rectangle, show them real square and rectangular objects around the house. Get them to see and touch the objects to feel the difference.

Instead of simply writing or showing the number '2' to a child, show them real objects by using blocks or toys. To demonstrate the concept of '3 more than 4', place 4 bears on the table in a line, then add 3 more bears slowly.

Besides early exposure to Math, research also suggests that physical activity can also improve fluid intelligence. It was found that certain hormones were released during physical activity, and these hormones are beneficial to the hippocampus, a region of the brain linked to learning and memory. So take your children out to run, play and tumble around!

4 Believe in them

Whether your child is truly smart or smarter than average, does not matter or make a difference if you do not express it. A study was done where elementary school teachers told a group of randomly selected students they were smart. There was no special test done to single out these children as 'smart', and nothing was added or changed in the classroom.

Yet by the end of the school year, the children who were told they were 'smart' by the teachers gained a higher average IQ score than the rest of their classmates. It is your words and your belief in them that will impact them for life.





5 Praise Their Efforts To Develop A Growth-Mindset

Praise is most effective when it is focused on the process and commitment, not the end result. Your child's learning process and effort should be the main emphasis of your praise.

Carol Dweck, a Professor at Stanford University, came up with two views of intelligence learners might have. One view is the "fixed-mind set" that has the belief that intelligence is a fixed trait. The other view is the "growth-mind set", where process is focused rather than talent or intelligence.

In a study she conducted, it was found that praise focused on intelligence encouraged a fixed mind-set compared to students who were praised for their process. When she and her researchers asked a group of fifth graders questions from a nonverbal IQ test,

they found that students who were praised for their intelligence shied away from a challenging assignment far more than the students who were praised for their process.

How can you communicate a praise that encourages a "growth-mind set"? Instead of praising them for their results, "Wow, you scored full marks, you're so smart!" say this instead, "I saw that you really put in the time and effort to do your homework. I like the way you tried a lot of different methods on that math question until you finally got it. I'm really proud that you stuck through it and didn't give up!" It pays to be specific in your praise as well. Real learning is active. Real learning is emotional.

Children need a good dose of encouragement to spur their learning. As a parent, you have a huge influence over your child's learning.



4 Things To Do At Home To
ENHANCE YOUR
CHILD'S IQ

Can we enhance our child's IQ through a stimulating environment at home? Research shows it is possible to create a highly conducive environment for cognitive and emotional growth.

A child surrounded by books and educational toys will leave positive imprint on their brain, which will follow through into their late teens.

Improving your child's intelligence requires organising and streamlining your child's thought process to suit and match a stimulating setting.

How can you do so? Through math and unstructured play activities. Such experiences will help develop their fluid intelligence, sharpen their creativity and capacity to learn.

Here are more ideas on how you can create a stimulating home to boost your child's IQ.

1. Open their world to maths through stories

Be expressive and use gestures while telling the story, and encourage your kids to gesture and do the actions. Studies show children are more likely to remember words, numbers and events when they gesture with their hands. Mimicking actions will also help them learn techniques such as facial recognition, anticipation, analysing and evaluating.

A simple yet effective way to pique your child's interest in math is picture books. Picture books are great tools to help young children learn math concepts and language. There are many great math

picture books out there to read to your preschoolers. Here are recommended books for children aged 4 - 6.

COUNTING

■ **Ten Black Dots** by Donald Crews. What can you do with ten black dots? This counting book shows your child the many unique ways that dots can make.

■ **12 Ways to Get to 11** by Eve Merriam. This book takes readers on a counting adventure as they demonstrate twelve witty and imaginative ways to get to eleven.

SHAPES

■ **My Very First Book of Shapes** by Eric Carle. This book allows children to identify, find and match pairs together.

■ **The Shape of Me and Other Stuff: Dr. Seuss's Surprising Word Book** by Dr. Seuss. This book encourages children to ponder on shapes they may never have considered before through the whimsical rhymes and pictures of Dr. Seuss.



PATTERNS

■ **Rosie's Walk** by Pat Hutchins. This book has great pictures and uses humour to complement a simple storyline of a fox and hen to show readers the concept of patterning.

■ **Teddy Bear Patterns** by Barbara Barbieri McGrath. This book uses rhyming verse and brightly coloured teddies to teach sorting and patterning.

2. *Create a construction or art corner at home*

Set aside an area where your child can build, stack, draw, paint, or sculpt. You can part of their room into a craft and construction corner, well-stocked with paint, paper, blocks, clay, cardboard and other recycled materials. Let this be your child's safe space to take apart and put together things and get all messy!

Let them have time to play or create freely, because play helps in a child's brain development. As they draw, paint, mould and build, they are working on their imagination, creativity, and spatial skills. Spatial skills have been shown to rely on neuronal networks partially linked with mathematics.

3. *Reinvent everyday objects*

There is no one correct way to play. A cardboard box can be a fort to your 3-year-old. A plastic water bottle can be a rocket ship to your daughter. Finding creative uses for everyday objects allows children to be more flexible, stimulating their brain growth. It exercises their brain's flexibility, and teaches them to engage without preconceptions.

4. *Weave maths into your conversations*

Demonstrate concepts of numbers such as "You have three candies, I'll give you two more, now you'll have five" or "Dinner will be ready in five minutes". Not only does this train their cognitive skills, it also builds your child's problem-solving and language skills.

According to psychologist John Protzko, kids that get early exposure to educational resources will gain higher level of IQ and give them a leg up on their peers. The idea is to have early exposure to maths and make learning fun and memorable. Having a good maths program can engage children with dialogue, probing questions, props, games and a healthy dose of encouragement.



SERIOUSLY ADDICTIVE MATHEMATICS

Besides IQ:

IMPORTANT QUALITIES EVERY CHILD NEEDS



Studies have shown that IQ results can be a strong predictor of a child's future life outcomes, such as academic achievement, income and health.

Besides IQ, research also reveals other factors involved in determining a child's success later in life. Here are two big qualities that will complement a child's IQ.

1. **Love For Learning**

Having a positive attitude towards learning plays a huge part in future success. Children begin exploring their bodies and their capabilities at a very early age. They may not know that this is "learning" but it is exactly what they are doing when they see, hear, taste and touch anything they come in contact with. Here's what you can do to nurture their love for learning:

- **Foster their interest**

If your child loves cars and trucks, read stories to them on cars and trucks. Take

them to a car show. When you teach them how to count or spell, weave their favourite cars or trucks in. A University of Chicago study found that the common trait among exceptionally high-achieving athletes and artists was having parents who recognised their interest and provided support during their early years.

- **Make it relevant to everyday life**

Learning is not just teaching our children to reach certain academic standards. It is a process, a series of "Oh I see!" moments. For example, if you want your child to learn about maths, show them how math ties to real life. Help them understand that two \$10 Lego figurines cost \$20 (two sets of ten rather than just memorising the multiplication table (10 x 2)).

- **Never shoot down their ideas**

Create a safe environment to allow children to develop their ideas, express their





feelings, take risks, and make choices. As parents, we wear many hats in this process. As an observer, we listen and watch. As a supporter, we accept and encourage. As a facilitator, we assist and inspire. As a role model, we demonstrate and surprise.

2. **Motivation**

A study revealed effective studying techniques and those who were self-driven that had the most improved math skill.

So how can parents help children build internal motivation? According to Edward Deci and Richard Ryan at the University of Rochester, addressing these needs can help to build children's intrinsic motivation.

- **Competence**

Being able to master a skill is extremely motivating. When children are bad at

doing something, they feel embarrassed and tend to avoid these activities. Isn't this the same for adults too?

The solution? Focus on effort and strategy. Praise children for their effort. Remind them and point out their progress of how they struggled initially and then succeed. You could say, "You used to have trouble with these kinds of problems, but now you really get them!" A simple sentence like this can empower children to feel more capable.

Next, equip them with study strategies to address skills gaps. For instance, if they always get a certain math sum wrong, find out what is the cause of the mistake instead of quickly prescribing them to more math practice. It could be a misunderstanding of a certain concept that they might need to relearn.

If your child tends to make careless mistakes or jump in without reading the instructions, show them how to circle or underline key instructions.

• **Autonomy**

When children feel that they are being restrained, their motivation is thrown out the window. We cannot offer children total freedom, but we can minimise resistance by offering choices. Don't overwhelm them with too many alternatives. Keep your options to just two or three.

Sometimes, children don't understand the reason why they need to do certain things. Providing a rationale that makes sense and relates to their life might help.

For instance, if your child laments the purpose behind learning "stuff" that he's never going to use later in his life, you can reply, "It may not seem relevant or important to you now, but it gives you a chance to practice skills that will be useful in your life in the future. For example, getting your work done on time,

building your memory skills so you can learn to remember more important things."

• **Connection**

A powerful source of motivation is relationships. Children are motivated to do things that bring them closer to parents or peers. When they are low in motivation, there could be underlying negative emotions. It could be feelings of being judged unfairly by an adult, or having feelings being left out in a social setting.

Having a role model can help children with their motivation too. It can be parents, or a beloved teacher. It could also be being part of a team or a peer group that inspires them to try hard.

It takes time and growth to muster intrinsic motivation, especially for mundane and tasks that are less fun. Always exercise patience, reasonable expectations and shower children with encouragement. Who knows, your child might just surprise you one day.

