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How to Fall in Love with Math

by Math Guru – Sunny Tan

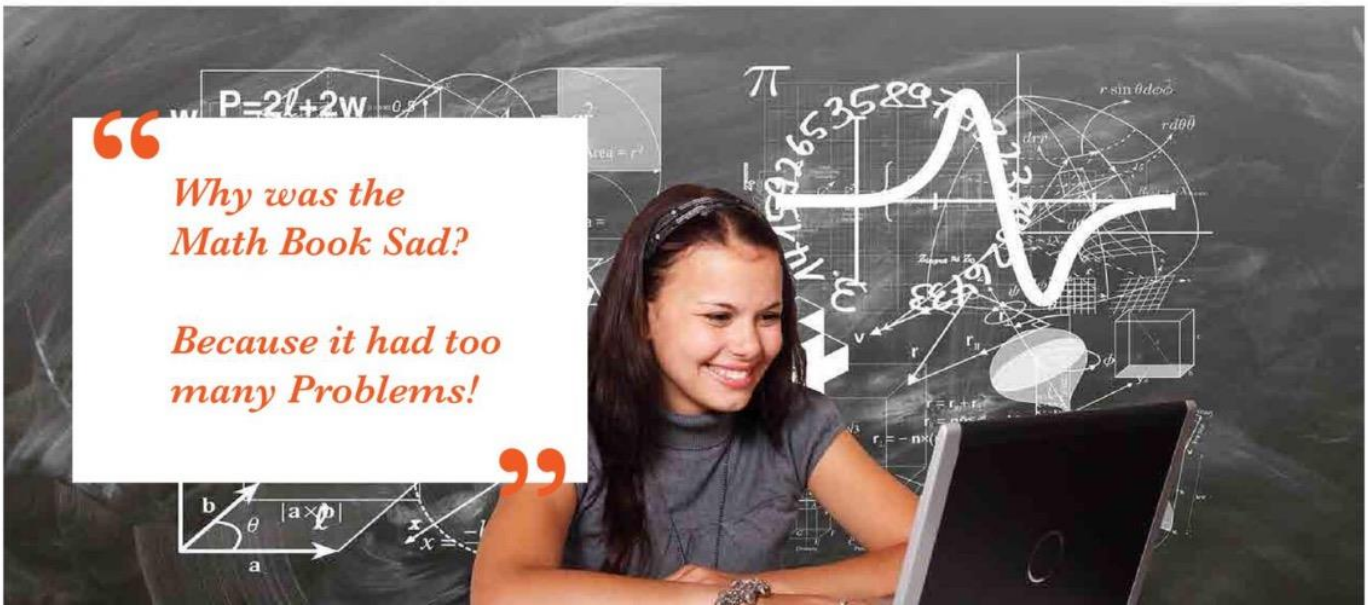
Foreword by Selina Seah

I'm not sure about most of you, but as far as I can remember my academic days, Mathematics is a subject I had to endure rather than enjoy. Interestingly, my eleven-year old daughter seemed to have more of my creative and artistic genes rather than having the affinity for solving math problems.

Solving mathematic problems is no simple affair, there are many times I feel the same anxiety and fear my daughter has when she comes to me with a 'impossible to solve' math question. **I think, the reason why mathematics can be fearful is because once you put down your answer, you are in a realm of either being right or wrong. We all try to avoid being wrong and not wanting to mess up.**

Do you face the same problems with Math Problems?

This issue we ask Math Guru – Sunny Tan, founder and pioneer of Math Heuristics- an educational company specialise in the research of mathematics teaching methodologies for primary children aged 9-12 on how can one fall in love with Mathematics. Sunny has authored and published his own books "Mastering Heuristics Series", indirectly teaches primary students via parents.



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Selina Seah's Interview with Sunny Tan

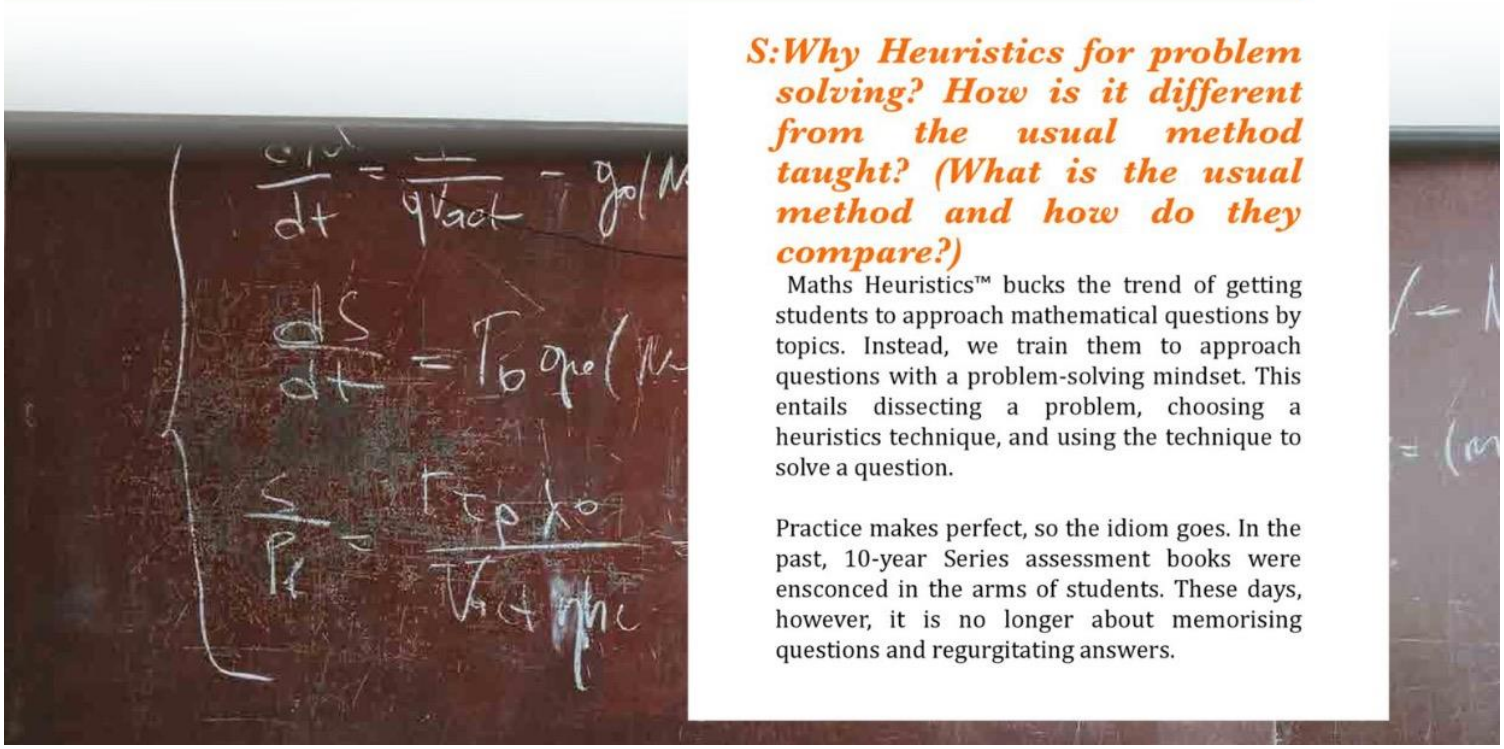
Sunny Tan

S:You founded 'Math Heuristics', can you tell us more about what Heuristics is?

Heuristics are strategies designed to solve challenging and non-routine mathematical problems.

Singapore's Ministry of Education advocates the following heuristics. The first 11 are recommended for primary school mathematics syllabus. The final two are for secondary school.

1.	Diagrams / Models	6.	Working Backwards	PRIMARY
2.	Using Before-&-After Scenarios	7.	Guessing & Checking	
3.	Acting it Out	8.	Simplifing the Problem	
4.	Systematic Listing	9.	Making Supposition	
5.	Looking for Patterns	10.	Solving Part of the Problem	
		11.	Paraphrasing the Problem	
		12.	Riding on a Related Problem	SECONDARY
		13.	Using Equation	



S:Why Heuristics for problem solving? How is it different from the usual method taught? (What is the usual method and how do they compare?)

Maths Heuristics™ bucks the trend of getting students to approach mathematical questions by topics. Instead, we train them to approach questions with a problem-solving mindset. This entails dissecting a problem, choosing a heuristics technique, and using the technique to solve a question.

Practice makes perfect, so the idiom goes. In the past, 10-year Series assessment books were ensconced in the arms of students. These days, however, it is no longer about memorising questions and regurgitating answers.

There's no such thing as a math brain. In fact, all kids can learn math when taught effectively.

Example, students who learned math the traditional way often push back against visual representations of math. That kind of thinking represents a deep misunderstanding.

When you think visually (Model Approach) about anything, different brain pathways light up than when we think numerically. The more brain pathways a student engages on the same problem, the stronger the learning.

Most students can improve when they change their beliefs that they aren't a math person to believing they are a math person. These students often look forward to math and sees math as a creative subject.

S:Did you love Mathematics from the start?

Ironically, I was relatively "weak" in mathematics during my primary school days although I love the subject. Maths is the only subject to score full marks, unlike other subjects like language... nobody ever score full marks for composition or oral, right?

However, it was during secondary one, when a "miracle" suddenly happened and I aced Maths till university days.

S:Do you think excellence in Math is Nature or Nurture?

There are two standard strategies training a child to do mathematical problem-solving.
The indirect strategy is to expect the child to pick up the skills in the course of their maths learning journey. In general, the indirect approach does work but the process is slow.

The direct approach is to teach the kids problem solving heuristics, specific ways to reason and solve problems. These attempts to accelerate the process by teaching heuristics directly. Problem-solving is the content as well as the intended outcome, and one would naturally expect to see hefty gains in this approach.

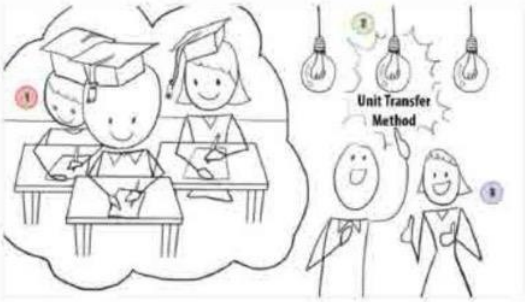
S:How did you journey into being a professional in Mathematics?

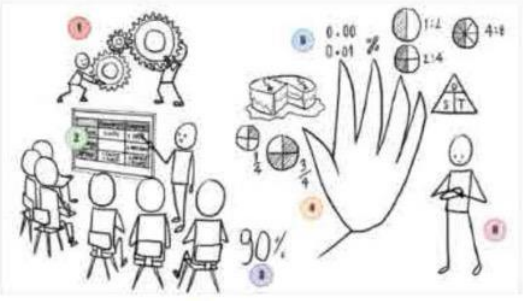
While a former teacher, I observed how the current primary school Mathematics syllabus – different from what today's parents and teachers were raised on – left many stumped. Mathematical Heuristics has been directly incorporated into the Mathematics syllabus.

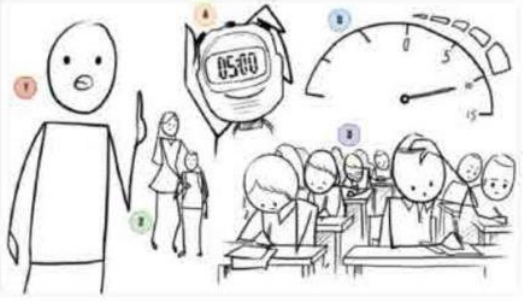
Many educators are not specifically trained to teach Mathematical Heuristics. Worse still, not neatly self-contained makes Mathematical Heuristics difficult to single out, learn and teach.

Consequently, many parents depend on tuition agencies or private tutors for their children's Mathematics performance, not realising that most tutors were also raised on the same Mathematics syllabus as themselves, that is sans Mathematical Heuristics.

Unit Transfer Method developed by Sunny Tan



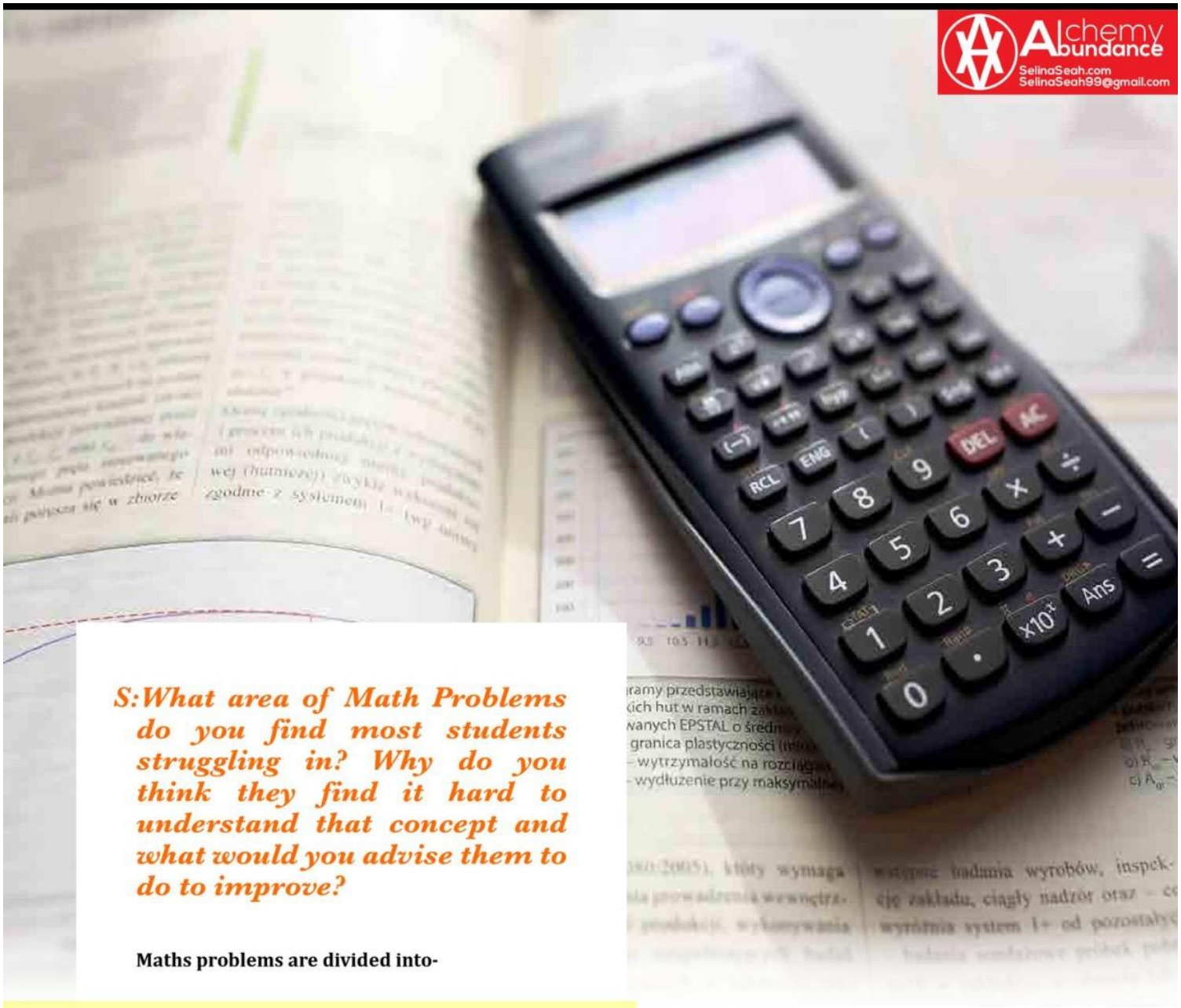




The more hands-on parents rely on Mathematics syllabus guidebooks to equip themselves to personally guide their children. However, there are no books on the market that specifically teaches Mathematical Heuristics. Where a guidebook comes close to it, its title merely allude to Mathematical strategies (not Mathematical Heuristics), making such books difficult to identify. Once acquired, parents often find themselves second guessing the author's explanations, and how the author got from one step to another.

With the aim of closing this gap, I emerged with techniques that simplified the application of Mathematical Heuristics. With that as a spring board, I established the Maths Heuristics Programme, and the Mastering Heuristics Series in 2009.

Maths Heuristics™ was set up to help students achieve breakthroughs in their study of mathematics. For that to happen, students need all-round support. Today, we offer a total learning experience with its suite of learning tools – classes, guidebooks, mobile app, web videos and virtual classrooms. By embracing technology, we give students, parents and educators 24/7 access to our expertise.



S:What area of Math Problems do you find most students struggling in? Why do you think they find it hard to understand that concept and what would you advise them to do to improve?

Maths problems are divided into-

- ***Routine Problems***
  These are easily solved by the 4 operations, which are addition, subtraction, multiplication and division. It assess knowledge, basic skills, routine procedures and familiar word problems. Most students are competent in this.

- ***Non-Routine Problems***
  These require not only the four operations and also special strategies known as Problem Solving Heuristics.

Most students faces challenges in solving unfamilair problems,i.e. problem that have not seen or heard before. When a child is confronted with a problem, the child do not have a ready procedure to resolve a situation. Most of them get stumped by these questions.

Kids will benefit most when they are taught formal principles of mathematical heuristics and systematic thinking approach when encountered challenging unfamiliar problems.

In brief, the problem solving thinking process: Understand the Problem, Choose a plan, Carry Out the Plan and Reflection.

S:What are tips that you would give to parents to coach their child in Maths?

Many parents learnt Mathematics in the older curriculum where they were not taught problem solving heuristics skills. So mosts adults see Maths as Maths that they had learnt before, which focuses on computations and routine procedures.

However, kids in schools now learn much more. They can use calculator in primary 5 and 6. which no longer need for tedious computation. In fact, computation has been de-emphasized with the focus now on problem solving.

A handful of parents maybe able to teach their child Mathematics, but many of us can't, simply because they are not professionally trained teachers.

I see the role of parents not as second teachers, but providing the moral support and conducive environment where their kids can enjoy learning rather than trying to teach them the actual content.

For parents whom coach their child in mathematical problem solving, most make the mistake by telling the child how to do the problem. If a child is stuck with a procedural kind of problem like computation, telling the child the steps, the child will learn it.

However, when a child is stuck with problem solving or when a child cannot solve a Maths problem, do not tell the child the steps to do it. This is the least effective way. The child will understand you, but the child has not acquired any skills or problem-solving abilities at all. Instead, you should instead engage the child in the process of problem solving.

For example, let's say a child cannot do a story sum. You should say, "Oh can you read the story to me, tell me the story again...what can you remember about the story?" You are getting the child to understand the story and that's the first step in the process of problem solving.

You may ask the child then, "How do you want to solve the problem?"
The child may say, "I want to use the model method."

Then you ask, "Ok, can you draw the model?"
And some children at this point would get stuck. You then say, "Ok, which sentence in the question seems the most helpful in drawing the model?"

What I am implying is instead of telling the child what to do, ask them questions to lead them through the process.

"Mastering Heuristics Series"
by Sunny Tan

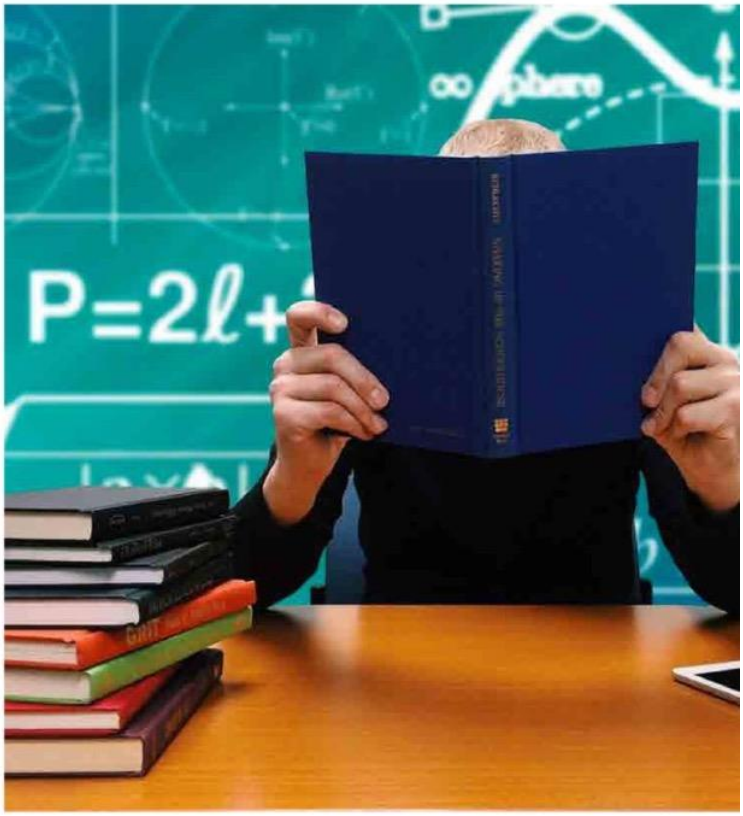
S:What advice would you give to students aged 11- 12 years old who are not making the grades in Maths so that they can feel confident to 'love' Math.

As every child's learning ability is different, there is no "one size fits all" approach that works for every student. Thus, there is a need to analyse and zoom into the child's weakness.

There are five basic skills that will be assess in the primary Maths syllabus; knowledge, basic computational skills, routine procedures (formulae application), familiar word problems and problem-solving.

If the child is facing challenges in the first four skills, this can be easily overcome by "memorisation", reinforce the concepts by consistent practice.

If the challenges is in the problem-solving, the child to be formally trained in heuristics thinking tools and techniques. As well as quality practice with close supervision from an expert tutor to provide the motivation and guidance, their problem-solving skills will improve.



Maths Heuristics®

About Sunny Tan

Sunny Tan, author of 'Mastering Heuristics Series' and founder of Maths Heuristics. Maths Heuristics is the first organisation in Singapore to offer a total Integrated learning platform for mastery of heuristics to educators, parents and children in Primary 3 and above.

It comprises a suite of learning tools including classes, guidebooks, virtual classroom, web videos, and a mobile app for interactive step-by-step learning for child and parent to work through together.

You can click here to find out more on Maths Heuristics