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Is your child struggling with maths? Here's why

When it comes to mathematics, many parents and children feel anxious and frustrated. This is especially true when a child's struggling with maths despite already getting help in the form of tutoring, extra classes or maths programmes. Dalena van der Westhuizen, cognitive development specialist, master brain coach and co-founder and MD of BrainAbility, shares some insights

Maths. You either love it or hate it.

For most people, their maths anxiety began quite early on during their academic journey. For some, the problems started when having to work at speed, such as during a test or exam. They knew the answers, but their brains froze when up when working against the clock. For others, not understanding the logic in a maths formula was confusing.

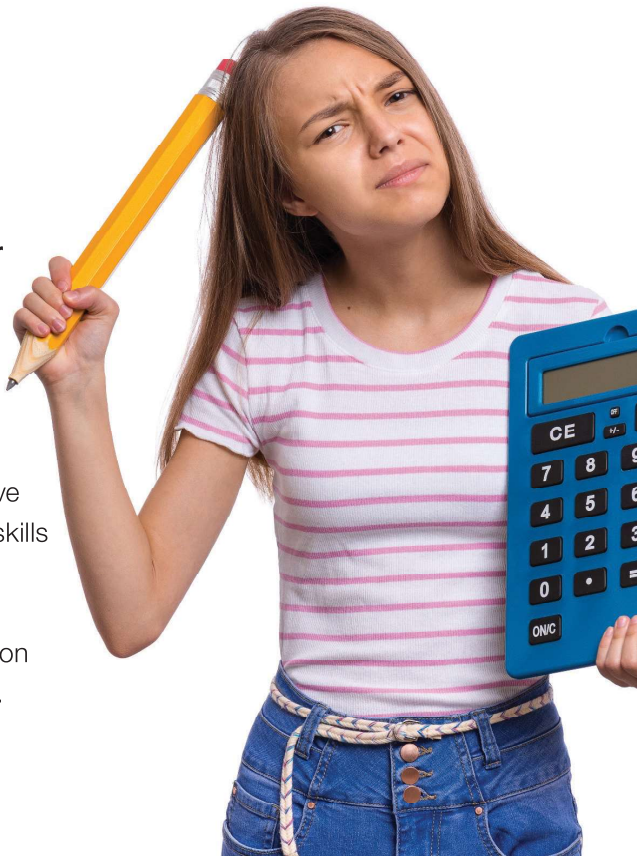
Very quickly, they labelled themselves as "not a maths person". That's usually also when maths anxiety silently becomes an add-on to the label.

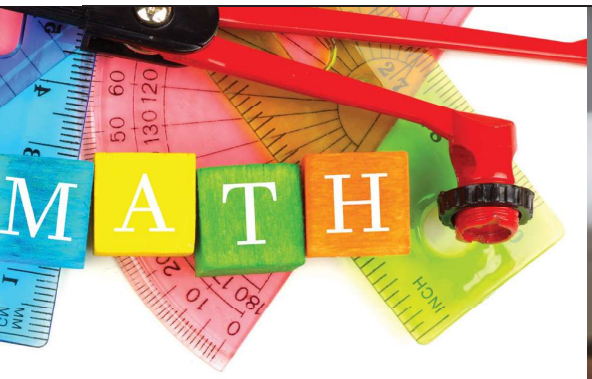
Unfortunately, children who experience maths anxiety often grow up without ever understanding the reason for their maths struggles and carry that anxiety with them for the rest of their lives. As a parent, they feel helpless when their own child brings home maths homework, asks them a question about it or battles with it just as they did themselves.

Parents' math anxiety and frustration are passed on to their children and so the cycle continues.

Why is maths so difficult for some people? The answer to this question usually lies within the strengths and weaknesses in our individual cognitive profiles. Each of us has strong and weaker cognitive skills – those underlying brain skills essential for learning, reading, reasoning, paying attention, following instructions, thinking on our feet and, yes, doing maths.

Strong cognitive skills are a prerequisite for learning maths. If one or a combination of cognitive skills are weak, they must be strengthened before a child can understand and apply maths.





The connection between cognitive skills and maths

As the foundation for learning, cognitive skills are essential across any academic curriculum.

What, then, are the important underlying cognitive processes that support or impair our learning of maths? According to scientific and educational researchers, mathematical skills can be grouped into the following categories:

> "The best place to start is with a professional cognitive assessment to pinpoint cognitive strengths, weaknesses and individual learning needs."

COGNITIVE PROCESSES LINKED TO MATHS

Spatial Representations	Counting and Operation	Logical Problem-Solving
Spatial Memory, Visualisation, Directionality	Working Memory, Sequential Processing, Selective Attention	Planning, Working Memory, Reasoning

Spatial representation

The relationship of maths success to visual-spatial abilities is strongly supported by research and the correlation appears to increase as the complexity of the maths task increases.

The important aspect of visual-spatial processing is not just remembering the shape, size, colour and number of objects, but their relationship to each other in space. It turns out that visual memory by itself (what things are) is somewhat error-prone, but spatial memory (where things are) is associated with correct answers and is thus an important aspect of mathematical problem-solving.

Within visual-spatial processing, we can distinguish cognitive skills such as the following:

- **Spatial memory:** Our ability to remember where we are in space and how we're related to other objects in space. This understanding provides the foundation on which

problems (changes in the space) can be solved.

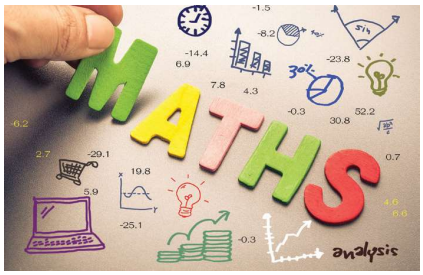
- **Visualisation:** Our ability to visualise a problem we need to solve or to visualise alternative solutions contributes substantially to our understanding of the problem.

- **Directionality:** The ability to distinguish between left and right, of course, is more than just about maths. It's essential for everyday tasks like tying shoelaces, reading a map, driving and playing sport.

Counting and operations

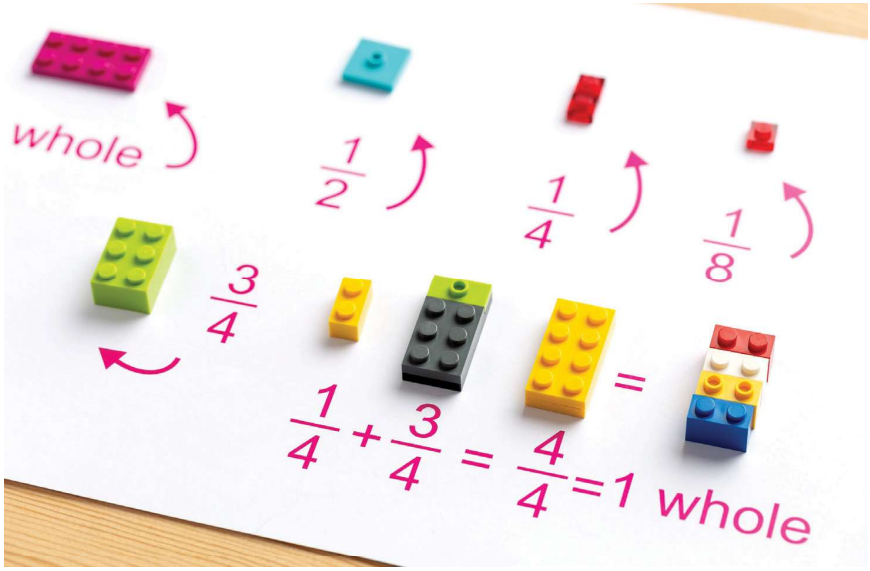
When it comes to counting and numerical operations, we're again dependent for maths success on some foundational cognitive skills:

- **Working memory:** Our ability to hold information in our minds while we manipulate it. Working memory capacity is highly correlated with reading comprehension, maths performance and many other



academic and non-academic outcomes.

- **Sequential processing:** Counting is all about sequences, so once again, cognitive skills contribute crucially at even the most elementary stages of maths. As we start to manipulate and calculate, the sequence of steps to solve a problem must be observed.



- **Selective attention:** When we have good selective attention skills, it's easier for us to screen out the irrelevant parts of a complex problem and isolate the relevant facts on which we need to concentrate.

Logical problem-solving

Undoubtedly, maths is problem-solving. There are, of course, other types of problem-solving, but problems with numbers almost always call for mathematical thinking and logic to be applied.

Higher-order cognitive processes are often required to be successful in maths. These include:

- **Planning:** Good planning is when we consider alternative approaches to a problem, map out the sequence of steps in advance and then carry them out efficiently and accurately.
- **Working memory:** Consider the example of a child who's always struggling to finish her maths classwork, tests or homework. She might understand the core concepts of what she has to do, but she has limited working memory capacity. When she has to copy a problem from her maths book into her homework book (eg 267 x 3), she has to copy each number by itself: first the 2, then the 6, etc. She can't remember 267, much less the entire maths problem. Working memory is essential to hold the elements of any maths problem in mind, consider different approaches and keep track of where we are in a sequence of steps to solve a multi-step mathematical problem.
- **Logic and reasoning:** As we learn about mathematical theories or explain how we draw conclusions, we have to recognise patterns, analyse cause and effect, test hypotheses and determine whether to include or exclude items from sets. For all of these, we rely heavily on our logic and reasoning ability.

As we acknowledge how critical cognitive skills are to maths and learning, it raises the question of how we can support our children in developing these skills so that they can be effective students. The best place to start is with a professional cognitive assessment to pinpoint cognitive strengths, weaknesses and individual learning needs.

"Children who experience maths anxiety often grow up without ever understanding the reason for their maths struggles and carry that anxiety with them for the rest of their lives."