

Square Ruth's Five Secrets of Mathematical Thinking

How to Think Like a Mathematician— The Five Secrets of How They Do It!

by

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1. Pay attention to detail. Focus tightly. Find a way to shut out all distractions, including negative emotions, painful memories, and worries. Be present with the problem. Block out negative self-talk. Sometimes the smarter you are, the more intensely you feel these emotions. You have to put them aside in order to do math, because your brain needs the thinking space.

You need to focus in order to be very very very fussy with the rules. Know the rules and follow them accurately. Know all the times tables by heart. If you are missing an arithmetic or algebra rule, find out what it is and learn how to use it. Use extra help, phone-a-friend, Khanacademy.com (a free math-help source)—whatever it takes. Practice the techniques so that you become comfortable with them. Concentrate. Write things down and don't do too much in your head. You need to save room in your brain's "working memory" and "executive function", and if you don't write things down it takes up too much thinking space.

Also, check your work constantly, as you go along. The smarter you are, the more you might be tempted to multi-task. This is how careless errors happen.

Your calculator is your friend. It is faster and more accurate than any human being could possibly be, and it makes sense to use it. If you forget a particular rule or procedure, or if you're under pressure or in a hurry, using your calculator can save you and enable you to think about strategies while it does the computing part of problem-solving. Just try not to get too dependent on your calculator. Math needs to happen holistically in your brain, not as just a sequence of key-strokes.

Whether being a fussy, detail-oriented "math machine" suits your personality or not, just act this way when you have some math to do. You can't just relax when you do math. You have to be "on" and alert. It's just a way of acting. Then you can relax and go back to being your real self afterwards!

2. Use both sides of your brain. You need your left side for the sequential steps of arithmetic and geometry and for deciphering geometry statements. You need your right side for maneuvering through geometry diagrams and for seeing what's going on in word problems. Your left brain cannot possibly handle the wording of a geometry statement unless your right brain is making a picture of it at the same time. Also, your hand needs to be sketching a diagram of what your right brain is picturing. If you allow either side of your brain to be weak, you will have trouble with math, so strengthen your weaker side. Both sides of your brain need to be strong in order for you to do math. You especially need your right side for visualizing all the details and relationships. Don't just use your left brain to think in words.

Use the right brain too. Draw sketches, see numbers interacting with each other. See the shapes of numbers and quantities. When doing a word problem, imagine that it is a little theatrical production. Picture it being acted out in your mind, step by step. Put yourself into the scene. Make it a happy one.

3. Use this when stuck: When you don't know what to do, write down something that is true, without even being sure it will

work. Every mathematician in the world does this. For example, write down a formula that may be related to the problem, and plug numbers in. Make a summary statement of the problem, using words, and translate that into an equation. "Tweak" what you have written, using steps that are mathematically legal, like changing a fraction to a decimal and seeing if that triggers an idea. Trust that this will lead you to the answer. Math is dependable.

4. Be creative. Take chances. Change the numbers in the problem to "easy numbers" to help yourself find a solution. Play with the problem. Play hunches and try new steps. Search your notes and your memory for anything that is similar and try applying it in the problem you are working on. Be sure that everything you try is mathematically legal, though.

5. Enjoy going blank. Mathematicians are used to going blank. They love to do problems that stump them. When mathematicians aren't stuck, they feel as if they are just doing busy work. Going blank is not a crisis, but rather a natural part of doing math. Think of your brain as just having a little too much

going on at the moment. Expect it to happen, and be ready to press your brain's "Restart button". Just take a deep breath. Clear your head. Start the problem again, or try another problem. Go over what you know about the problem. Go over a similar problem. Skip around. Believe that struggling is okay, and go from what you know to what you don't know. Be patient. Trust math.