



# Math Maxim Manual

Math Maxims are nuggets of wisdom that, when memorized and applied, will help your performance, accuracy, and enjoyment of math.

Be  RUFF!



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It doesn't matter how  *fast* you are if you get it wrong! 

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*Twice done is well done!* 


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 Double CHECK  with a second TECH<sub>nique</sub>!

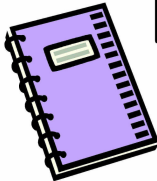
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**Estimate to trap mistakes!** 

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**RIGHT ANSWERS MATTER!** 

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KEEP A MATH LOG 

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# Be RUFF!

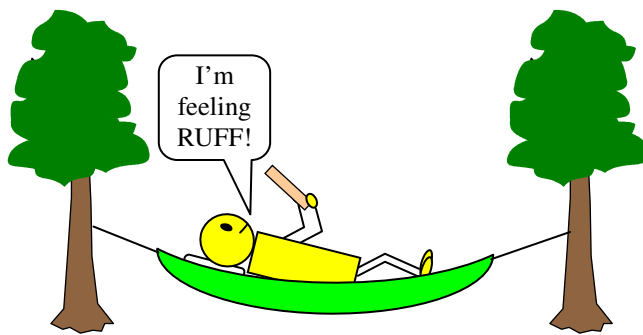
Have you ever had a school, work, or play session where everything just seemed to go right? Where thoughts or performance came easily and you were totally absorbed in what you were doing?

If so, you were feeling RUFF and in a Learning Frame of Mind.

RUFF is an acronym for Relaxed, Uncluttered, Focused, and Flowing.

**R**elaxed—breathing slowly and deeply.

**U**ncluttered—mind free of distracting thoughts.



**F**ocused—concentrating on current activity.

**F**lowing—absorbing knowledge easily.

When you're RUFF, it's like being in a hypnotic trance. You are so focused, you don't notice outside distractions or even time passing by. You're concentrating effortlessly. There is no room for self-doubt or mental blocks or physical error. Athletes call it "being in the zone!"

Like any activity, doing math takes concentration. So when you're tired and can't think straight, get some rest, and come back refreshed. What seemed to be unsolvable before may become easy when you're RUFF.

And when you get bogged down with a complex problem, get uncluttered by starting completely over with a fresh piece of scratch paper.

To succeed with math, and all life's endeavors, it helps to be RUFF!

# It doesn't matter how *fast* you are if you get it wrong!

In an effort to get students excited about math, some teachers use competitions. The theory is that if math is more like a sport with rewards for “winning,” it will be more fun.

This works for naturally competitive students, but the trouble is, the majority of students are not sports oriented. Unless it's a mandatory activity, only a select few of the entire student body of a school participate in sports competitions, and some of those don't really enjoy the pressure.



In fact, instead of generating excitement, math competitions can create performance anxiety and mental blocks, where students who know the math “freeze up” because they must be quick to win. The focus shifts from solving problems to fearing the embarrassment of losing in front of one's peers.

If a competition didn't depend on speed of response, it might not be as daunting, and would give thoughtful, deliberate students a chance to win. But most competitions are speed-oriented, and rushing any activity leads to more mistakes of carelessness or oversight.

If you feel rushed when doing math, realize that you'll get the answer more quickly if you're relaxed, uncluttered, focused, and flowing (RUFF). Ultimately, it's more important to be right than quick.

## Twice done is well done!



This maxim is derived from Benjamin Franklin's proverb, “Well done, is twice done,” that appeared in Poor Richard's Almanack, his collection of popular folk sayings and wisdom, many of which he created himself.

Applied to math, this maxim means that if you have time, especially on a test, solve each problem twice.



The tendency of most students, especially those who don't enjoy math, is to get a test or assignment over with as quickly as possible and go on to something else. The trouble with this attitude, even if you think the problems aren't hard, is that it's very easy to make simple arithmetic errors; for example, you calculate  $2 \times 3 = 5$  because you added instead of multiplied.

Then when the test or assignment comes back with missed items that you were sure you got correct, you feel bad and dislike math even more.

From now on, for every assignment, and if you have time on a test, cover the answers and re-solve each problem. If you get the same answer both times, you've more than likely done it correctly.

Success in math, as in everything, feels good, and can reinforce your desire to do well.

# Double Check with a Second Tech(nique)!



When following the previous “Twice Done Is Well Done” maxim, if you use the exact same technique and procedure to re-solve a problem, you’re likely to repeat any errors you made the first time.

Besides, using the same technique twice in a row can be a bit boring.



Fortunately, there is almost always more than one way to solve a problem. For example, if you added a column of numbers from the top down, try adding it from the bottom up the second time around.

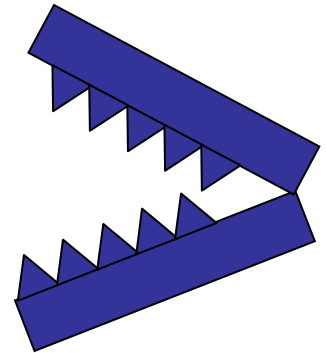
If you’re required to show your work, and your teacher insists on a particular method, of course use it—he or she determines your grade. But it’s a good idea to check your work on scratch paper using an alternate method. When you get the same answer using two different techniques, the answer is more likely correct.

## Estimate to Trap Mistakes!

Humans make mistakes all the time. Most are inconsequential, like dropping an empty plastic cup on a soft carpet. But some mistakes make a difference, like shattering a full glass of sticky grape juice on a hard kitchen floor.

Even the best mathematicians make mistakes, and they’re usually simple ones such as transposing numbers like 43 for 34, making arithmetic errors like  $9 + 3 = 13$ , overlooking a negative sign, or missing a decimal point.

But simple errors can have major consequences, like a space probe crashing into a planet instead of making a soft landing.



Expect to make errors, but also do what the best mathematicians do to minimize major ones: Estimate to Trap Mistakes.

For example, if you multiply  $22 \times 18$ , would the answer be in the hundreds or thousands?

If you round 22 down to 20, and round 18 up to 20, it’s easier to see that  $20 \times 20 = 400$ , so your answer would definitely be in the hundreds. (The exact answer is 396.)

This is sometimes called making a “Test of Reasonableness.”

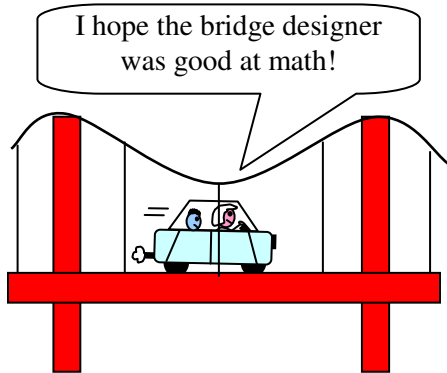
When solving problems, it’s easy to get lost in the math and assume you have the correct answer. Instead, when you finish a problem step back and ask yourself, “Is my answer reasonable, does it make sense?”

# Right Answers Matter!

Teachers may give credit for effort to encourage and reward students for trying in what is a difficult subject for most. But knowing they'll get credit regardless, many students learn to write down anything, with only halfhearted attempts to get the right answers.

Since most teachers have too many students to check each one's work thoroughly, the unfortunate outcome is that students can gather enough homework or "effort" points to pass the class without really knowing how to do the math being taught.

**Effort is admirable, but you still have to know how to do the math!**



In the real world, math depends on right answers; otherwise, what's the point? In some cases, it can be a matter of life or death.

If you're driving your car across a bridge, you want to know that the designer got the right answers when calculating its load-bearing capacity. If you're flying cross country, you want to know that the flight engineers got the right answers when calculating the course and amount of fuel needed to reach your destination.

Regardless of the grading policy, always strive to get the right answers. Your next teacher may not reward for mere effort, and standardized tests that you'll need to graduate or gain admission to your next school absolutely require correct answers.

## Keep A Math Log

With math, there are just too many rules, procedures, and definitions to remember. What to do? Get a notebook and label it **My Math Log** with your name and date on the cover.

Then write down in your Log every new math procedure, fact, and definition you encounter.

Like the captain of a ship, you'll want to "log" the dates and details of your math journey.

Writing things down will help you organize your thoughts and remember more. As time goes by and memory fades, your Math Log will be a great reference and review tool.

