TIPS ON HOW TO STUDY MATH (& fight math anxiety)

1. **Tips for succeeding in math:**
   - Choose an instructor you understand & feel comfortable with.
   - Choose a section that meets at a time when you are alert & relaxed.
   - Sit in or near the front row so as to optimize your attention.
   - When choosing a math course, be sure that it is the one required for your major and/or that it will transfer.
   - There is a natural progression in the study of math: each course builds on a previous course. You must master the foundation before moving on to the next course. **You are doing yourself a disservice, wasting effort, time & money, if you sign up for a course without having successfully met the prerequisites.**
   - There is nothing wrong with dropping a course in which you feel you may get a low grade or fail. It is better to retake a course later when there is a better chance to succeed.
   - Some students have a natural talent for math but most don’t. What you lack in talent you can make up for with hard work & study. Self-discipline, motivation & a sense of responsibility are essential for high achievement in math.
   - Aim for 100%, not merely a passing grade in a math course.
   - Try to stay ahead of the class instead of just keeping up. Once you get behind, the obstacles may become insurmountable.
   - Avoid large time gaps between math courses, or, at least, brush up well on material (prerequisites!) you need to know before signing up for a class.
   - Keep the notes & textbook from all your math courses until you are finished with the sequence- you may need to revisit them when taking a more advanced level course.
   - If you have been consistently failing the regular tests, it is very unlikely that you will offset this by acing the final. Over-optimism can be your worst enemy.
   - Learn to take responsibility & not make excuses or blame others. The grade you get is the grade you earn.

2. **How to study math:**
   - The "rule of 3": for each hour of class you should plan to study at least 3 solid hours per week by yourself, the actual time required depending on your abilities.
   - The following sequential approach has been proven effective:
     a. Get a head start: read from the textbook the next topic to be covered in class to gain familiarity with the subject.
     b. Attend all lectures & take careful notes. Never miss class! If you must miss a class, get the notes & homework from one of your classmates.
     c. Study from your notes & re-read the corresponding section from the text.
     d. Rework examples done in class & in the text.
     e. Attempt to do the homework problems, applying the approach, steps & notation presented in class & in the text.
     f. Check your answers with the answers given in the back of the text or in the solutions manual.
g. Make a list of the questions that you may still have.

- It may often happen that in class you feel you have a clear understanding of what your instructor says & does. This does not mean that you know it, let alone that you have been able to master it. Only doing it on your own & diligent practice will result in profound & lasting learning.
- When doing problems, ask yourself: does your answer make sense? Is it reasonable? If so, what does it all mean in the context of this particular problem? What are its implications?
- Ask questions: to your instructor (in class or during office hours), to your classmates, to your friends. When you visit your instructor during office hours, bring a list of specific questions. Don’t ask for answers. Ask for the explanation that justifies the answer; ask for the logical argument in the solution. You must leave the office convinced of the logic of the argument.
- Don’t ask your instructor: "Is this going to be on the test?" It is going to be on the test.
- Answer questions that your classmates may have. Helping or explaining to others lets you gain a better understanding of math concepts.
- Form a study group & discuss the homework problems in this group.
- You paid good money for the textbook. Use your book, read it & re-read it, work on the exercises, write in the margins, put question marks where needed.
- Use the supplements that come with the book. Solution manuals can be quite helpful. CD-ROM’s can be very effective learning tools.
- Take advantage of technology, like graphing calculators or computer software, to verify your results & get new insights, both graphically & numerically.
- Use the phone. Use e-mail. Use the Web.

The Math Dept. (http://www.nvcc.edu/alexandria/science/math/index.htm) has a home page that contains a list of links to sites that could assist you.

- Use the Math Computer Lab in AA 161.
- Try to earn extra points by doing bonus problems, problems of the month, participating in math contests, etc.

3. **Tips for taking tests:**

- Make up a plan of study & organize your time accordingly.
- Know the previous material well. Math is cumulative!
- Try to find the links connecting seemingly different topics; get the big picture. Ask yourself: why are we doing this? What makes this an important problem in math? Why does the answer matter?
- Practice makes perfect: what initially may seem difficult & alien, becomes very natural after much practice.
Know the examples! They are potential test questions. Chances are that problems appearing on exams won’t be very different from examples done in class. Know the examples!

Do not miss the class meeting before the exam: important review may take place.

Some of the test material may have to be memorized. Understanding it will surely make memorization easier. Moreover, math rules often point to a domain where numerical experimentation is possible. You should acquire the habit of, when in doubt, conduct the appropriate "experiment". For example: is \((a + b)^2 = a^2 + b^2\) ?

Well, the answer is \(\text{no}\), according to the following experiment:

let \(a = 1 & b = 3\). You can see that \((1+3)^2 \neq 1^2 + 3^2\)

The correct answer to a problem is a main goal. However, the logical steps & thought process that lead to the answer are equally important in math. Make the presentation of your solution as clear & comprehensible as possible. Show all the steps in a natural & coherent progression. Show all your work! Justify your answer! This has the additional benefit of allowing you to get partial credit. Try to be neat & well organized in writing your solution.

Use your math intuition & make an educated guess when all else fails.

At some point in the test preparation process, you may be able to predict the kinds of questions to be found on the exam. Your instructor’s practice test helps. So does the chapter test in the book. Make up your own exam & take it under exam conditions. This is also a great way of fighting the "mental block syndrome" of math anxiety.

After having successfully met all prerequisites, a careful & solid preparation of all topics is the best-known antidote for overcoming math anxiety.

When taking the exam:

a. arrive early
b. come well-equipped: pen, pencil, eraser, calculator, scratch paper, etc.
c. read the instructions & do exactly as directed.
d. read the problems carefully, maybe more than once, & relate them to other problems you know.
e. keep in mind that the order of the questions often corresponds to the order in which the topics were presented in class/ the text.
f. do the easy problems first; do not let yourself get bogged down.
g. always show all your work & do the problems the way they were done in class.
h. use every minute of available time- check & recheck.
i. if a question seems confusing to you, ask your instructor for clarification.
j. cheating, in any form, is ultimately self-defeating.

Go over the exam when it is returned to you. Examine the problems where you made mistakes & learn from them. Do this immediately & systematically.

Keep a folder with all your tests & quizzes; this will be invaluable when preparing for the final exam, which is often cumulative. The final will most likely have problems similar to those on regular exams from the semester. Know these problems!
Math has the potential for teaching you skills in the art of problem solving. It may allow you to develop the analytical tools and the mental discipline for a methodical approach to problem solving. These skills are essential in almost any other field and profession.

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