

SUCCESS IN MATHEMATICS (and Physics)

Study Skills

Active Study vs. Passive Study

Be actively involved in managing the learning process and your study time:

- Take responsibility for studying, recognizing what you do and don't know and make sure you get your teacher to help you with what you don't understand.
- Attend class every day and take complete notes. Teachers formulate test questions based on material and examples covered in class as well as on those in the text.
- Be an active participant in the classroom. That means you must concentrate on what is going on. Think of questions relevant to the material being discussed.
- Ask questions in class! There are usually other students wanting to know the answers to the same questions you have.
- Good and consistent study habits throughout the term make it easier to study for tests.
- Try to understand what you are doing as opposed to memorizing steps. Memorizing often leads to anxiety over being able to remember so many steps. If you understand what you are doing it is much easier to recall what you need to do for each question.

Studying Math (and Physics) is Different from Studying Other Subjects

- Math (and Physics ... ok you get the point, last time I'll say that!) are learned by **doing** problems. Do the homework. The problems help you learn the formulas and techniques you do need to know, as well as improve your problem-solving prowess.
- A word of warning: Each class builds on the previous ones, all term long. You must keep up with the teacher: attend class, read the text and do homework every day. Falling a day behind puts you at a disadvantage. Falling a week behind puts you in deep trouble.

A word of encouragement: Each class builds on the previous ones, all term long. You're always reviewing previous material as you do new material. Many of the ideas hang together. Identifying and learning the key concepts means you don't have to memorize as much.

Study Time

You may already know a rule of thumb about study: *at least 1/2 hour of study time per class hour*. But this may not be enough!

- Take as much time as you need to do all the homework and to get complete understanding of the material.
- Form a study group. Meet once or twice a week (also use the phone). Go over problems you've had trouble with. Either someone else in the group will help you, or you will discover you're all stuck on the same problems. Then it's time to get help from your teacher.
- The more challenging the material, the more time you should spend on it.
- You should have a quiet place at home at which you can study. All distractions should be removed and all materials needed should be available.

Studying for a Math Test

Everyday Study is a Big Part of Test Preparation

Good study habits throughout the semester make it easier to study for tests.

- Do the homework when it is assigned. You cannot hope to cram 2 or 3 weeks worth of learning into a couple of days of study. The night before is definitely too late.
- On tests you have to solve problems; homework problems are the only way to get practice. As you do homework, make lists of formulas and techniques to use later when you study for tests.

Ask your teacher questions as they arise; don't wait until a day or two before a test. The questions you ask right before a test should be to clear up minor details.

Studying for a Test

- Start by going over each section, reviewing your notes and checking that you can still do the homework problems (actually work the problems again without looking at the solution). Students often glance at a question and say that is easy but on the test they can not reproduce the work. Don't let that be you! Use the worked examples in the text and the notes given in class. Cover up the solutions and work the problems yourself. Check your work against the solutions given.
- **You're not ready yet!** In the book each problem appears at the end of the section in which you learned how to do that problem; on a test the problems from different sections are all together.
- Step back and ask yourself what kind of problems you have learned how to solve, what techniques of solution you have learned, and how to tell which techniques go with which problems.
- Try to explain out loud, in your own words, how each solution strategy is used (e.g. how to solve a quadratic equation or calculate the acceleration of a body down an inclined plane).
- Put yourself in a test-like situation: work problems from review sections at the end of chapters, and work old tests if you can find some. It's important to keep working problems the whole time you're studying.

Also:

- Start studying early. Several days before the test (longer for the final), begin to allot time in your schedule to reviewing for the test.
- Get lots of sleep the night before the test. Tests are easier when you are mentally sharp.
- Make sure you have had a good meal. Thinking on an empty stomach is distracting.
- On getting your test back make sure you learn from your mistakes. There are students that on receiving a poor grade throw out their test yet keep the ones they get A marks on. Keep all your tests, but especially the ones you did poorly on. If you do not learn from your mistakes you are doomed to repeat them.
- When studying give yourself little rewards for all the learning you're doing.

Getting Assistance

When

Get help as soon as you need it. Don't wait until a test is near. The new material builds on the previous sections, so anything you don't understand now will make future material difficult to understand.

How

When going for help you need to be prepared. You should have questions ready that you are having problems with. A not too helpful comment is: "I don't understand this section." It is much better to have looked things over and have specific content to discuss or specific questions.

- Okay question: "How do you do #7?"
- Better question: "Can you show me how to set up #7?" (the teacher can let you try to finish the problem on your own), or "This is how I tried to do #7. What went wrong?" The focus of attention is on your thought process.
- Right after you get help with a problem, work another similar problem by yourself. Then do yet another similar question that evening and the next day.

Taking a Math Test

Test-Taking Strategy Matters

Just as it is important to think about how you spend your study time (in addition to actually doing the studying), it is important to think about what strategies you will use when you take a test (in addition to actually doing the problems on the test). Good test-taking strategies can make a big difference to your grade!

- First **look over** the entire test. You'll get a sense of its length. Try to identify those problems you definitely know how to do right away, and those you expect to have to think about.
- Do the problems in the order that suits you! Start with the problems that you know for sure you can do. This builds confidence and means you don't miss any sure points just because you run out of time. Then try the problems you think you can figure out; then finally try the ones you are least sure about.
- **Time** is of the essence - work as **quickly** and **continuously as** you can while still writing legibly and showing all your work. If you get stuck on a problem, move on to another one - you can come back later.
- **Work by the clock.** On a 50 minute, 100 point test, you have about 5 minutes for a 10 point question. Starting with the easy questions will probably put you ahead of the clock. When you work on a harder problem, spend the allotted time (e.g., 5 minutes) on that question, and if you have not almost finished it, go on to another problem. Do not spend 2-3 minutes on a problem which will yield few or no points when there are other problems still to try.
- Show **all** your work: make it as easy as possible for the Instructor to see how much you do know. Try to write a well-reasoned solution. If your answer is incorrect, the Instructor will assign partial credit based on the work you show.
- **Never** waste time erasing! Just draw a line through the work you want ignored and move on. Not only does erasing waste precious time, but you may discover later that you erased something useful (and/or maybe worth partial credit if you cannot complete the problem).

In a multiple-step problem outline the steps before actually working the problem.

- **Don't** give up on a several-part problem just because you can't do the first part. Attempt the other part(s) - if the actual solution depends on the first part, at least explain how you **would** do it.
- Make sure you **read** the questions **carefully**, and do **all** parts of each problem.
- Verify your answers - does each answer make sense given the context of the problem?
- Do not change a multiple choice answer unless you are absolutely positive you got it wrong the first time.
- If you finish early, **check** every problem (that means rework everything from scratch).

Government Exams

Get Organized

Gather up all exams, tests, quizzes, notes, etc. at least a week or two before the exam. Look through what you have gathered up. Based on this make a list of the topics you are going to study.

Relearn (focus on trouble areas)

- Now look through your tests and write down all the problems you didn't get the majority of credits on. (i.e. problems that you didn't just make a silly mistake). Reword these problems. Look for similar problems and practice them.
- Go through the material chapter by chapter and work through problems. Don't just look at questions and say I can do that. Make sure you can. How? Work the problems without looking at notes or solutions. If you have to look you need to pick a similar question and try it. Check the next day to make sure you can still do the question.
- When you have gone through all the chapters it is time to go over old government exams. Questions should be worked through without reference to notes. Find out how to do questions you get wrong. Find similar questions to the ones you get wrong and try them. Understanding is better than memorizing.

Getting Help

- Make an appointment to see your teacher
- Form a study group
- Get a tutor, if needed

Test Yourself

Once you think you have everything set you should do several practice exams. You must not do anything during the practice exam that you would not be able to do during the actual exam. The results of these exams will let you know if there are any remaining weak areas. Focus on these weak areas as the exam date approaches.

Relax and do Your Best

Easy enough said but it is very important that you do not allow stress to destroy your mark on the test. It is extremely common to get the exam, look at the questions, and feel that you can't work a single problem. Panic sets in. You see everyone else working, and become certain you are doomed. Some students will sit for an hour in this condition, ashamed to turn in a blank exam and leave early, but unable to calm down and begin thinking about the questions. This initial panic is so common (believe it or not, most of the other students taking the exam are having the same experience), that it's just as well to *assume ahead of time* that this is what is going to happen. This gives you the same advantage as when the dentist alerts you that "this may hurt a little." Since you've been warned, there's far less tendency to have an uncontrollable panic reaction when it happens.

So say to yourself, "Well, I may as well relax because I expected this." Take a deep breath, let it out slowly. Do this a couple of times. Look for the question on the exam that most resembles what you know how to do, and begin poking it and prodding it and thinking about it to see what it is made of. Don't bother about the other students in the room - they've got their own problems. Before long your brain will begin to unclench a bit, and some things will occur to you. You're on, your way.

A note on cramming: You should not cram for an exam. You should do so only as a last resort, remembering that if you need to cram it is too late to learn everything! Instead, be selective. Cramming leaves little time to process ideas in depth so focus on a few chapters and learn them as well as you can. And, because time is very short, study first those ideas which you strongly expect to be covered on the exam. In addition, having a GOOD NIGHT'S SLEEP and PROPER FOOD is an advantage in the recall of information so don't stay up all night cramming.