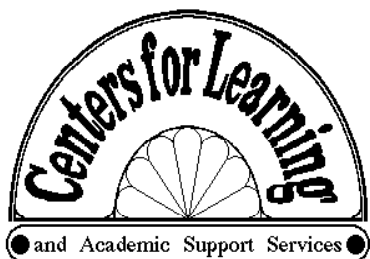
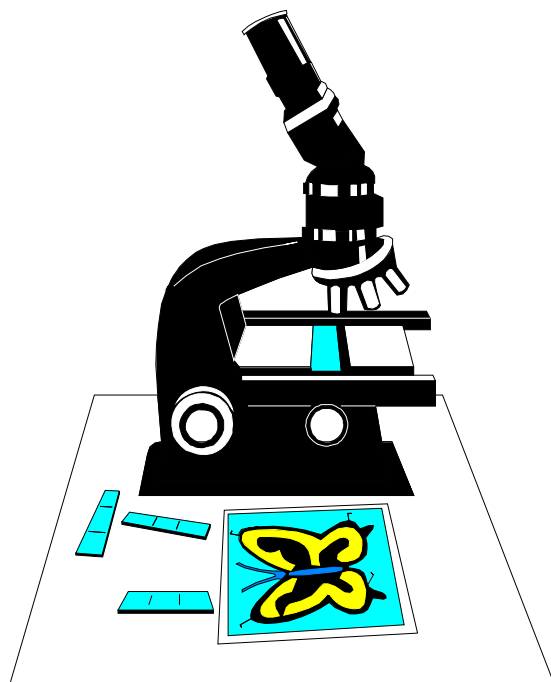
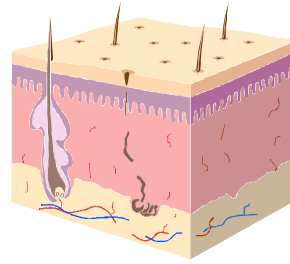


Study Strategies for Math & Science Courses



Presented by The Advising Center
Southwick 308, x2936 &
O'Leary 3rd floor, x2948

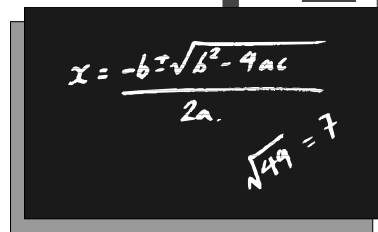
WHAT'S SO DIFFERENT ABOUT MATH AND SCIENCE?



For most students, mathematics and science seem to be the most difficult types of courses they will encounter during their college careers. Highly technical, they require us to learn seldom used terms and even think in ways we're not accustomed to. Aside from the technical nature, there are two big differences which make the study of math and science unique.

Linear Learning - In a History class, if you missed the reading assignment for the Revolutionary War, you can probably still read about and understand nearly every aspect of the Civil War. In mathematics courses and many science courses, this isn't possible because all the material is sequential; in other words, it progresses in a linear pattern. The material in each chapter builds on the chapter before it, so that you must learn the material in that order. Math formulas are often combinations of smaller formulas learned before, and science courses rely on previously taught terms and concepts for their understanding of larger concepts.

It's a Foreign Language - Do you ever look at a blackboard full of symbols, lines and numbers and feel like you're looking at Greek or Arabic? Well you are! Besides using symbols from these languages, math is like a separate language all itself. And like any language, we can only become comfortable with it by constantly practicing it until it becomes second nature. Practicing math means doing problems repeatedly until it feels comfortable. Getting comfortable with science involves visualizing concepts many different ways until we can see them in our mind without any aids.



ADAPTING TO SCIENCE AND MATHEMATICS AT THE COLLEGE LEVEL

What's different about the college level? - In college courses, instructors cover more material in less time than in high school. These classes meet for only 3 hours a week yet cover more than twice the amount of material than in a typical week in high school. Because class time is lessened, students must spend more time learning material on their own. Most of the learning is your responsibility!

A word about summer sessions and intersessions! - Sessions that run during the winter break and during the summer are even more intensive in the way material is presented and the amount of time necessary for reading and exam preparation. The typical summer session, for example, requires you to learn the same amount of material in 6 weeks that would normally be covered in 15 weeks during a Fall or Spring semester. Intersessions squeeze the same material into a 3 week session. If you take a math or science course during one of these sessions, you should be prepared for ultra-intensive study.

COMBATING MATH ANXIETY

Math test anxiety is a learned response that can be unlearned.

There are several forms of math test anxiety which can vary from negative attitudes to feelings of mental disorganization to feelings of panic and helplessness.

Some students who do very well in other subjects and study very hard in math nevertheless do poorly on math exams due to test-taking anxiety. Researchers and counselors have reported that one third to one half of the students they talk to have felt some anxiety during math exams.

Reducing Math Anxiety Through Relaxation and Self-Talk (Self-Hypnosis)



- **Changing Negative Self-Talk** - Students will sometimes create anxiety by giving themselves negative self-talk. Phrases like "There's no way I can do this" or "I know I'm going to choke on this test" are self-fulfilling prophecies that will likely come true if you say them to yourself.
- **Positive Self-Talk** - Take a realistic view of your potential, and encourage yourself with positive self-talk - "I've done problems like this before" and "this can't be too difficult if I think it out a little longer" are strong motivators for success.

Try These Relaxation Techniques!

Practice doing these exercises while you prepare for your exams and then put them to use while you're waiting to begin your exams.

• **Muscle Relaxation:** While sitting, grasp the seat of your chair by your hips and, with your feet flat on the floor, pull up on the chair while you press down with your lower body. Hold this position for five seconds, then let all your muscles relax. Close your eyes, breathe deeply and slowly while doing this, repeating the alternate clenching and relaxing three times.

• **Visualization:** Picture a relaxing and quiet place in your mind and imagine that you're there right now, with no cares or worries. Breathe deeply and slowly and imagine yourself completely relaxed in this special place.



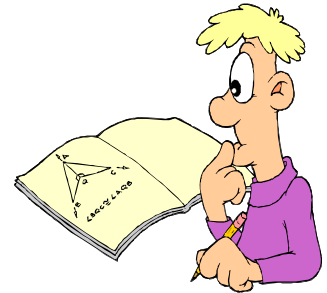
As mentioned before, math is a distinct and separate language, and much of the math test-taking anxiety that students experience comes from the difficulty in translating from their native language into the language of math...BUT! Most math test anxiety happens because of a lack of basic study skills, knowledge gaps, test preparation and test-taking skills. The best way to **prevent** math test anxiety is through developing good fundamental study skills and giving yourself adequate time to learn material.

Math Success = Confidence + Ability - Anxiety (!)

JUST DO IT!
(Your homework, that is!)

Helpful Homework Hints:

- **Preview the Text** - Carefully go over the text and the exercises before you begin doing the problems. If you need to, write out the exercises in the text so you can see how they're worked out.
- **Review Your Notes** - Use lecture notes along with your text to get more than one way to apply the formula to your problems. Sometimes your lecture notes will show shortcuts.
- **Neatness Counts!** - Use all the space you need and take your time so your problem is written out neatly. This makes it easier for your instructor or a tutor to help you with your problems because it makes it easier to find your mistakes.
- **Write Down Every Step** - Textbooks often skip intermediate steps to save space - you may need to continue doing every step so that you can visualize completely how the problem progresses. Writing out every step also makes it possible to find simple computing errors.
- **Don't Just Memorize** - It does **no** good to simply memorize the formulas or the problems - you should know the reasons behind the formulas - the laws and properties associated with the formulas.
- **Don't Quit When You Get Stuck** - If you can't do a problem, go back and do another problem you know you can tackle - end your study session on a positive note!
- **Make Flash Cards** - This is a good tool for exam prep - so make note cards with hard-to-remember formulas or concepts. These cards will provide an excellent way to review later.
- **Don't Get Behind** - Remember: the material in your course is in sequential form (linear learning). If you get behind, you must take extra time to get caught up on what you don't understand before you can start learning the current material.



If You Get Behind, Don't Panic!
There Are Many Ways You Can Get Back On Track!

- **Meet With Your Instructor** - Find out your instructor's available office hours and make an appointment. He or she will best be able to show you how to get back on track.
- **Review Textbook and Lecture Notes** - Take the time to go over material again, starting from the last chapter you clearly understood.
- **Investigate Other Resources** - A similar textbook, math study software, videos, and study guides are available through libraries, bookstores, computer labs and media centers.
- **Meet With a Peer Tutor** - Tutors are ready, willing and able to give you all the assistance they can to help you get on track.
- **Get Together With a Study Buddy** - helping others learn material is good for both the person helping and the person being helped - it can help both people become more comfortable with the material.



THE SCIENCES - WHAT MAKES THEM DIFFERENT?

Science is the way we answer questions about the physical universe.

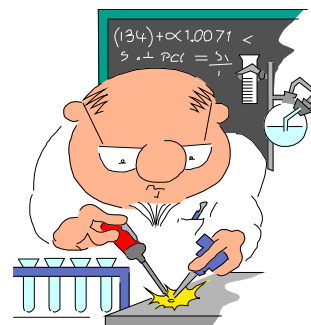
All University students are required to take at least three science courses during their college career. Science courses delve into complicated concepts, require extensive note taking and usually have an accompanying lab section with its own text, notes and exams.

Science is an essential part of everything around us - it is a process for discovery as well as a process for bettering our lives. Science is at the root of engineering as well as health, psychology, sociology, physics, chemistry, geology, astronomy and many other studies. Every field that involves any form of investigation uses science in some way.

THE SCIENTIFIC METHOD

There is a method that every scientist or science student uses to answer questions about *why* things are. The scientific method is a series of steps that we use to make a logical and objective investigation of what we want to know. Here are the steps:

- **Observations** - are made by simply using the senses to investigate what is happening without any manipulation. Observations are very common in astronomy for example, where experimentation is impossible.
- **Synthesis** - is a statement that includes a summary of observations. A synthesis can be made in verbal or mathematical notation, for example: Distance = constant x (Time).
- **Hypothesis** - the synthesis is used to form a hypothesis or theory about how we've guessed that something works.
- **Predictions** - are what we say we will test for to see if the hypothesis can be supported. If our hypothesis is that objects fall to the ground, our prediction is that a particular object, when released, will always fall to the ground.
- **Observations & Experiments** - are done to test the predictions. Observations can lead to new hypotheses, which contribute to a never-ending cycle in operation.



WHY LABS?

WHY DO I NEED A LAB WHEN I CAN GET EVERYTHING I NEED IN LECTURE?



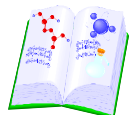
Your lab section is designed to let you get your hands on the concepts you've learned in a lecture. Using the scientific method, you will use all your senses to see science in action, and by doing so get some early clinical experience, giving you an idea of what a career in that field would be like. Although science lectures give you valuable material, your lab section will support the lecture material by encouraging you to put that material to practical use.



GENERAL TIPS FOR MATH AND SCIENCE STUDY

For Learning From Text:

- **Time Management** - Math and Science texts are technical in nature; they cannot be skimmed over. You'll need to make enough time available to understand the concepts and absorb the material.
- **Don't Burn Out** - Study math and science intensively for no more than an hour at a time, then take a break and study something unrelated, like history or literature, before going back to science or math.
- **Prepare Questions** - If the text seems ambiguous about a particular concept, write out a specific question about it to ask your instructor during lecture.
- **For Math Texts** - Fill in the blanks - To save space, textbook authors often skip repetitive steps in sample exercises. To get a better grasp of how the problem progresses, it's better to write out all the steps. *Do not try to memorize the problems themselves!!!* The important thing is to know the concept used in the problem and the formula for its solution.



- **For Science Texts** - While you concentrate on the details, keep your focus on the concepts. Think about the "why" of what you're reading. In a chemical reaction for example: you need to know what ingredients are reacting and what is taking place, but also **why** it is happening.

For Learning In Class:

- **Attend Every Class** - This should go without saying. Lectures are intensive and there is much more learning that takes place than what you'll get from copying someone's notes.
- **Arrive Early** - Review your notes and homework with classmates and organize your materials, including any questions for your instructor.
- **Sit in the Front and Center** - You'll see and hear better and have fewer distractions. Your instructor will notice your willingness to interact which will help you learn more actively.
- **Attend Other Sections** - Hearing a lecture on the same material by the same or a different instructor gives you a great opportunity to reinforce your learning.
- **Ask Questions** - Read a prepared question from your text notes or clarify a concept that seems complicated or vague. Don't wait until after you've gone on to something else.
- **Answer Questions** - When the instructor directs a question to the class he or she is trying to stimulate them to learn actively. Don't be afraid to offer an answer and don't worry if you're not sure of the answer. You'll get immediate feedback which will be valuable later.



MORE GENERAL TIPS CONTINUED...

For Exam Preparation:

• **Study Buddies and Groups** - Study partners can test each other and provide valuable interactive learning not possible when you study alone. Groups are even better because they provide different forms of feedback.

• **CLASS Services** - The Centers for Learning's tutors can give you tips on what to expect on an exam, and can give you valuable assistance. They also have practice tests and test taking software available for many courses. See a peer advisor at The Advising Center for other workshops in *Memory Strategies*, *Exam Prep*, and *Finals Prep*.



• **Recitation** - Use all of your senses to recite what you've learned. Test yourself by reciting aloud the facts you're trying to remember.

• **Mnemonic Devices** - There are several very effective memory strategies, including gimmicks to help you remember the order of terms. Students trying to remember the order of operations for multiplying two binomials remember that the acronym **FOIL** stands for the terms: **F**irst, **O**utside, **I**nside and **L**ast.

• **Mind Mapping** - is a general term for any graph, chart, or picture which shows relationships between related terms or concepts. For exam prep, write out the map and then visualize it in your mind to learn it.

• **Get a Good Night's Sleep** - Sometimes cramming is unavoidable, but all-night cramming is counter-productive. You'll need plenty of sleep to give you the mental energy necessary to perform at your best on your exam.

At Exam Time*:

• **Relax** - Keep in mind the relaxation and deep breathing exercises mentioned earlier and give yourself confidence with some positive self-talk.

• **Preview the Test** - Read all the questions and the point values assigned for them before answering the questions. Concentrate on the questions with the highest point value.

• **Keep Track of Time** - Knock off the easy problems first, so you can devote more time to the most difficult questions.

• **Estimate the Right Answer** - Before plugging in all the numbers, do a rough estimate of the answer. This won't give you the correct answer, but it will tell you whether or not you did the computations correctly.

• **Write Out Everything** - Instructors will often give partial credit for wrong solutions if the right formula was used. Only by writing out everything can the instructor indicate where you went wrong.

• **Take All the Time Allowed** - Go over the exam and check your answers carefully before you hand it in.

*For math students - Often, your first exam contains material from the previous semester's course. While this first exam requires the least preparation, with a little more preparation, you can come out with an excellent grade. Very often, exams count for the same percentage, so doing well at the start can really boost your grade!

LAB NOTES:

Your lab is a very different environment from the lecture hall, but it is a classroom! In this classroom you're on your own and will need to use different strategies to get the most from your lab section.

• **Give Yourself Time To Learn** - Lab sections are designed to run a long time, typically 3 to 4 hours long. You'll need plenty of time to go over procedures, compile data and analyze the results; it simply can't be rushed. Check to see what times the labs are open so that if you don't have time to complete the procedures, you can get in later to finish.

• **Form Pairs and Groups** - Find other serious students with whom you work well and join up with them. Do procedures together, dividing the labor and sharing the results. Partners should take time to explain to each other what they did and how they came to their conclusions. Your lab partners can also be great study partners away from lab to go over material and help prepare for exams.



• **Safety First** - The Occupational Safety and Health Administration requires the University to inform you of all procedures you must follow for your own safety. If you are required to wear protective clothing or gear, consider purchasing them to make sure you have them available. There are many hazards present in the lab which can become dangers for persons not wearing the proper safety gear and following safety procedures. Take your time and protect yourself!

• **Preview Procedures** - Carefully read and highlight the procedures and steps of your laboratory testing and observation before coming to lab. This saves valuable time and helps you to make sure the procedures are done correctly.

• **Keep a Neat Notebook** - Writing good lab reports depends on accurate recording which is neat and well organized. Make sure all the necessary information is written down.

