

Motivational Mathematics!



Tips, Techniques and Training to Take Any Math Student from Frustration to Freedom

Motivational Mathematics

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Preface - A Word from the Author

This book is dedicated to students who are taking classes in mathematics. Whether they are in high school or college, the principles and guidelines to achieve success are the purpose for this material. My reason for writing this book is to help those who may think that it is not possible to achieve success in mathematics.

The tips and techniques that are provided present useful guidelines, no matter what course you may be taking. From arithmetic, algebra, statistics and even calculus, these training styles can greatly benefit any student. My hope is that this will be of great value to you. Regardless of what your future aspirations may be, these guidelines should help you achieve success faster and with less frustration.

My story is one of a student who wanted to become a mathematician. I have a physical challenge (cerebral palsy), but I'm learning how to develop proper study techniques, test-taking skills, and utilizing services outside of the classroom to provide me with the tools necessary to overcome my disability. I received a bachelor's degree in mathematics from the University of Maryland at College Park. Regardless of what your situation may be and whatever your present and future goals are my hope is that this book will be of assistance to you.

With over 10 years of experience working for a learning center at a community college, I have encountered a vast array of students who are taking various mathematics courses. There have been students who succeeded in mathematics who thought that it was impossible to do so. The common denominator in these success stories is that all of these students applied a specific learning style which made them successful. They all acquired their own unique style of learning that was most beneficial to their personal needs. This book will give the reader many different options on how to study and learn math.

Mathematics is a wonderful subject and a tool that can unleash your ability to reason and think. Having a better grasp of this language can only increase the capacity for success in

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whatever endeavors you pursue. To achieve success you must develop structured, organized patterns and steps that will lead you to your goal. This book is designed to help you unleash your potential through developed and organized styles that will open the doors of success for you.

Set your goals high and never let limitations get in your way. The limitation that we place on ourselves is our inability to consider solutions to alleviate our problems. Always continue to strive for greatness.

In all that you do, I wish you happiness and success in mathematics!

Christopher E. Powell

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Chapter 1: Removing Mental Barriers to Gain Confidence

The first step in any achievement is the belief that whatever we set forth to do will be done. If we don't have the proper mindset, then whatever we attempt to accomplish will be very difficult, if not impossible to complete. Many times students have said to me, "I'm just not good in mathematics." I often reply, "What makes you say that? Why do you say that?" These statements are examples of math phobia or math anxiety, self-doubt or fear of failing in math.

There must have been some previous experience that led to this conclusion. It could have been a bad test score or difficulty completing homework assignments or not remembering important formulas or definitions.

With proper thinking this self-defeatist mindset can be overcome. Some students may need to take a mathematics course to complete a prerequisite for a major. Difficulty can arise in all areas of math courses. For example:

- A student in algebra may have difficulty with factoring
- Another student in pre-calculus may have difficulty with synthetic division
- Calculus students often detest related rates or optimization problems

These topics can be very intimidating to students. Feelings of doubt may surface when you're confronted with these concepts during the course of a semester. Without the proper tools to solve these concepts, a roadblock will always exist. All of these problems can be conquered with the right process or methodology. Certain procedures must be strictly followed in order to achieve ultimate success. Having the right mental approach along with the proper systematic approach, will help students turn failure into success.

Even before you engage in the actual work which your class demands, you must create a mental attitude that will allow you to become successful. One technique that you may want

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to use is visualization. For example many athletes, particularly in track and field, envision themselves crossing the finish line. When taking any class, particularly mathematics, it is very important to capture the end result. Just imagine your professor handing back your exam and you've received an A+. How would that make you feel? Wouldn't you be excited to see the results of all of your hard work paying off? This visualization must be practiced over and over again in your minds. This will stimulate you to achieve positive results.

Overcoming difficulty is something that we're primarily not fond of. One thing you may want to begin with is using positive language. For instance, it may be better to say that mathematics is difficult for me, but I will try my best. This particular sentence can change your outlook and possibly your results in class. When you outwardly express that you don't like something, it not only causes you to believe the truth of the statement, but also causes the person who is listening to believe you. Even if there is a feeling that this subject may be extremely difficult, try hard to minimize negative expressions.

Attaining confidence is not easy. It must be something that is consistently practiced and reinforced. If there is something that we have to learn or relearn, it takes effort and energy to change our attitudes and ultimately our results. Mathematics is not a passive subject. There are many stages that need to be worked on and completed over time to achieve positive results. This is why pencils come with erasers and keyboards have backspace buttons. We all want immediate success. Unfortunately, this rarely happens.

This process can take time and mistakes will occasionally occur. This can be discouraging, which is one of the many reasons why mathematics can seem so challenging. If you're not successful, you erect a barrier that causes you to believe this may not be for me or I cannot do this. Some of these experiences can be traumatizing. They can stunt your growth and sometimes cause you to fall short of your goals and aspirations in life.

As the old saying goes, "There's nothing more powerful than a made-up mind." There's nothing you can't accomplish with the proper mindset and with a positive support system. Be willing to ask for assistance. Teachers, classmates, learning centers, tutors and the

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internet are avenues you may wish to explore. Admitting deficiencies is not something to feel badly about, it will allow others to help you overcome them.

Confidence in mathematics can be compared to lifting weights. When you begin, you should start with light weights and repetitions. As more weights are added, the lifting becomes heavier and causes more resistance. This process can be applied to mathematics as well. A homework set begins with light, simple problems. Completing these problems successfully will help boost your confidence. You may feel mentally challenged by certain mathematical problems, and your confidence level may drop. Some students may want to retreat at this point. However, the guidelines offered in this textbook will help you to overcome impediments and achieve maximum success in your studies.

Whether solving written problems, finding common denominators, or applying formulas, this book will provide insights to help diminish your anxieties and fears.

Always believe that you are going to succeed. Realize that it may not be easy, but be willing to do whatever it takes to get the job done. Whether it takes studying an extra hour per week, working on extra problems to improve your skills, or finding outside assistance, a positive mental attitude along with the proper work ethic will greatly improve your ability to succeed.

Even though you are a student, you may want to consider your class as your job or business. Wouldn't you want your employer to be happy with your work? Wouldn't you do everything within your power to make that happen? If you approach your studies from this angle, you may see yourself in a more empowering light.

Although this is a three-month course, it will bring you much closer to your ultimate goal - passing the course, graduation and more time for other things. Three months is a very short time compared to what you are going to achieve. Give it everything that you have!

➡ **Reminder:** Never approach any class with a defeatist attitude.

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Chapter 2: Effectively Communicating With Your Instructor

Working with your instructor is very important to your success. Understanding what your teacher asks of you can certainly make your life a lot easier. A number of questions will be answered in the syllabus provided at the beginning of the class. If you have questions concerning anything in the syllabus, it is very important that you discuss them immediately. Having clarity will help you understand deadlines, expectations and policies.

Pay particular attention to things such as assigned homework. Although assignments may not be collected, that doesn't give you a free pass not to complete them. This is where self-discipline comes in. If you are disciplined enough to complete your assignments on time, then you will not feel the pressure of having to complete them at the last minute, because that may cause you to lose concentration and ultimately hurt your exam scores and final grade.

It is most important that you attend every class. Success is about having a routine and following that routine. You should not only attend every class, but become involved by participating. Ask questions. You may feel that your question is unintelligent or stupid, but don't be afraid to speak up. The question that you're asking may be a question that your classmates are afraid to ask, and as the old saying goes, "The only stupid question is the one that is not asked." Also, try to answer questions. Develop a never-give-up attitude. Your participation and a positive attitude will greatly enhance not only your grades, but also your enjoyment.

Sometimes professors have to cover a lot of material in a short period of time when there is little time for asking questions. If you can't ask questions at the moment, jot down a reminder in your notes. When the lecture is completed you can pose your question. This is one way to get your question answered and relieve stress.

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One other dilemma you may have is asking about something presented in the lecture when you don't know how to phrase the question. When this occurs, organize your notes, think about something related to the lecture and your notes that you can combine into a question. Write these questions down and contact your professor during office hours or during the next lecture. This is another alternative to getting your questions answered.

Visit your professor's office regularly. Office hours should be posted on the syllabus. If you are unable to visit during office hours, consider sending an email and state that you have questions concerning class notes, assignments or exams. Whenever you receive grades that need clarification on what went wrong and how to improve, this is a golden opportunity for you to meet with your professor. Establish not only how problems can be corrected but also the proper methods to complete them.

For example, students who provide an answer but do not show how they arrived at that answer may receive a reduction in their score. The method used to reach a solution is often just as important as the solution itself. Make sure that you receive the correct solutions for incorrect answers. Revisit them frequently during the semester. They will resurface during the midterm and/or final exams. It is important to follow directions, even if you disagree with your professor's assessment of the solutions. This may be your opportunity for redemption and a wonderful way to receive points that you have missed in the past.

Remember you are responsible for adapting to the style which the instructor uses to teach. Try to be accommodating and patient when you're given advice or a critique. Make sure that you come prepared. Remember that your instructor has many other students to see and/or classes to attend. Maximize your time and your instructor's time. The instructor will ultimately determine your final grade but by becoming engaged in your coursework, you will demonstrate your concern and willingness to receive the best possible score.

A very important concept for students is to recognize deficiencies and learn how to correct them. For instance, a student taking algebra may have a deficiency in arithmetic skills such

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as decimals, fractions, or percentages. Another student taking pre-calculus may have a deficiency in algebra skills such as polynomials, linear equations and graphing. Often deficiencies may not manifest until the semester begins. It is crucial that they be corrected as soon as possible. You may choose to practice using worksheets to improve your skills or you may wish to spend time in a learning center working with a tutor to receive additional assistance. If not, the problems will linger and hinder your ability to become successful in your mathematics course.

➔ **Reminder:** If you experience difficulties early in the course, immediately discuss the problem with your instructor. Ask questions. Instructors want their students to succeed, but the student must be aggressive in his or her approach to achieve. Also, if you have a learning disability or if test-taking accommodations are required, they should be addressed during the first week of class. If you will be unable to attend a class or take an exam, let your instructor know as far in advance as possible.

Additional advice would be to inquire about extra credit assignments or projects to boost your grades. This is completely optional, but it may help you achieve an advantage in the end.

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Chapter 3: Proper Reading Methods to Achieve Maximum Results

From my experiences, I have heard many students say that they didn't understand anything in their class. My first question was, "What chapter or topic were you reading or discussing?" My next question was, "Have you read the material for that particular section?" If I received a blank stare, then the answer was likely no. At that point, I understood what they needed to do. Studying their textbooks or e-book would help solve the problem.

A number of students assume if they simply go to class, take a few notes or skim over the information in their textbooks, they will be prepared to complete assignments. When this fails, the old adage "I don't understand," comes into play. Reading your textbook before attempting to do homework is very important. This will create a more beneficial experience in helping you to complete assignments.

When you begin reading chapters in your mathematics book, be prepared to read any given chapter more than once. More often than not, it will take several readings for you to completely understand the material. Do not become discouraged. This is normal. For example, it may take three attempts to fully understand one section within a chapter. For every study session, you may only comprehend one-third of that topic. Take your time and comprehend each section. It will serve you well! Mathematics books are not your usual reading material. Not only will you have to read the content, but also digest definitions, theorems, or graphs. Going through examples is also very important in your study pattern. This will definitely establish a good foundation to help you with assignments. It will require additional time to absorb, but that's why time is so important in the study of mathematics.

Your mathematics textbook should always be within arm's reach. What I mean by this is that during the semester it should always be with you. Countless times, I have heard students say that they left their textbook at home. No matter what you may think of your textbook, it is there to help you. The only way it can be of any value to you is that you

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always have access to it. Make it a priority to always have it with you. Imagine, you would never leave home without your cell phone or remembering all of your user names and passwords for your social networking accounts. Just add one more thing to your list! If you say it is too heavy to carry, just imagine how heavy the burden will be on you mentally if you have to repeat the course.

You cannot solve a problem, until you know what you're trying to solve. The first step is to understand the chapter you're studying. The second step is to understand the topic that you are studying. As far as actual time, everyone's reading comprehension may be different. The important concept to remember is not time spent, but actual understanding of the concepts given in a particular section. There are ways to test whether your comprehension is accurate. With respect to time requirements, here are a few suggestions.

The length of time per section should be around 30 minutes or until you feel you can comfortably solve the problems within each section. Remember these key points:

- Know the section title
- Recall the particular definitions for the section title
- Analyze the specific directions in order to solve the problems for that particular section and lastly,
- Go through examples in your textbook with pencil and paper in hand before you attempt to do homework

Reading is not the only thing that is required. It takes practice in order to grasp certain concepts. In a mathematics textbook, you may find different formulas, postulates, and theorems. In addition, there usually will be a number of examples given for that particular chapter. In most cases, reading is not enough to grasp the subject matter. Often writing out the examples and practicing may help with greater understanding.

Another suggestion is to have index cards with definitions on them that relate to the subject matter. You may want to have the formulas on one side of the card and the name of the definition on the other. The Quadratic Formula in algebra or the Pythagoras Theorem in

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pre-calculus comes to mind when utilizing index cards. In addition, you can use a set of cards for trigonometry that could definitely benefit you in terms of identities or with use of the radian wheel.

These cards can be fun and can break up the monotony of carrying a textbook. This will lead to greater retention of material. For those of you who don't like carrying your textbook everywhere, these cards will lighten your load while enabling you to continuously refresh your memory on important topics. However, as I stated earlier, there is no substitute for your textbook.

Having a separate textbook from your regular book that relates to the same subject matter is also another wonderful idea. You may decide to keep this extra book in your home or photocopy examples to take with you while you're at the library or study center. The advantages of using a separate textbook to study are the following:

- Additional examples/problems that you can reference
- Presentation of different methodologies may enhance your understanding
- Ability to compare/contrast methodologies within your textbook
- Problems on future quizzes or exams could be covered in your additional textbook

A major suggestion I make to most students is read the material before class.

This will allow you to listen without worrying that you missed details. Second, it will provide an opportunity for you to hear what you've previously read. The more times that you review a subject, the better. Lastly, the confidence that you may have gained during your earlier reading will carry over into class.

I would not advise studying too far ahead. Until your professor reviews the material, you may not have a full understanding of the concepts.

➔ **Reminder:** If reading for long periods of time is problematic for you, consider shorter intervals. Some topics in mathematics can be lengthy. Therefore, breaking up your

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reading into two or more parts may be easier for comprehension. For example, if you desire to read a topic for 30 minutes, consider reading for two 15-minute segments of time with a short break in between. This will allow for greater comprehension and less fatigue.

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Chapter 4: Taking Notes to Improve Grades

Taking good notes can often lead to success. There are key strategies to having detailed and organized notes. There are obvious things that you may already know.

You should have a three-ring binder. Dividers and highlighters or sticky pads are also helpful in organizing and emphasizing major topics in your notes.

Another suggestion is to find the best seat possible, so that you can see the blackboard or screen. It's hard to take good notes when you are unable to see clearly. Strategic desk placement in your class will eliminate a lot of stress.

When taking notes, make sure you have enough paper so that you will not feel the pressured to cram everything on one page. Some professors may give lots of instructions with examples, where others may give fewer instructions with more lecture. Either way you need to be prepared. Have an additional pencil on hand. Come prepared for occasional inconveniences. Also carry a couple of markers with various colors to emphasize key points in the lecture. This is not of maximum importance, but something that you may want to have available.

When you write down definitions or formulas, highlight them in your notes to emphasize the importance. Examples of these formulas will often follow. Write clearly and legibly. Most importantly, copy examples the way the instructor writes them. You will have plenty of time after class to rewrite your notes for clarity.

When a professor emphasizes an item more than once, it is often an indicator that it may appear on future exams. Make a mental note of this. Any graphs or pictures should be copied in your notes. You may receive similar materials on a future exam.

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It may be a good idea to have a separate section in your notebook for class notes. Make sure your notes are dated. You also may want to use your syllabus and the dates for particular topics to help with your organization and study. Make good use of your syllabus. Pay very close attention to dates for quizzes or examinations.

Studying your notes is one way to prepare for an examination. One of the biggest mistakes you can make is jumping into homework without going over your notes. Before starting your homework, revisit the material that was discussed earlier. Examine those things that make sense and those that don't. This should be the second phase of your preparation. Once you have identified the problems that you don't understand, you can concentrate on those areas.

Study your notes for at least 30 minutes per class. If necessary, take more time. Try to maintain the same routine to assist your comprehension. It may not help you master the topic, but it will at least give you an idea of what your teacher has been discussing. This will eliminate the lost feeling that a lot of students have when they say, "I don't understand anything."

Allow at least three weeks to prepare for an exam. I realize this can be extremely difficult because of other obligations. This will allow you adequate time to prepare. Begin by reading all of the notes that your instructor provided regarding those particular sections that will be on the exam.

When you encounter definitions or graphs, make sure that you give them extra attention. Use your textbook as an additional reference. This will help you reinforce and reaffirm your command of the material. Once you have an understanding, you may want to review your notes again and work on practice problems.

- ➡ Reminder: Find a classmate to share and compare notes. See if there's anything missing from your notes that you can gain from the other person. If you miss a class, you can turn to them for reference. Review your notes immediately following class,

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even for a short time. This will help with your recall. Every time you review your material it will enhance your learning ability.

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Chapter 5: Following Directions Leads to Increased Understanding

Often difficulty in understanding mathematics comes down to knowing what is being asked of you. Students often try to solve problems when they don't understand what they're being asked to do. Simplify, solve, verify and factor are terms often used in mathematical directions, and they are frequently used in algebra. Differentiate or integrate are often used in calculus. In statistics, finding the probability of a normal distribution is a term that you will encounter.

As you can see, directions are very different for specific topics. Knowing how to execute directions can be vital to saving time. Although your math skills may be fine, not understanding directions may hurt your results. This is a serious impediment that must be dealt with immediately. The approach to avoiding confusion between these directions can be challenging. My recommendation is to use a two-step process.

1. The first step is to read examples from previous materials. As you read each example, carefully note what you're being asked to do. Look at the problem and look at the solution. The manner in which the answer is presented will give you a heads up on what you should do to solve the problem.
2. The second step is to follow the examples in your textbook. Now you must practice what is being simulated on your own. I suggest that you not look at your textbook while you are trying to solve problems. Refer to your textbook only when you feel that you have reached a point where you cannot continue.

Try to solve at least two to three problems this way. Your textbook will often provide step-by-step instructions. The answers in the back of your textbook will frequently provide solutions to your problems. This is great, but there may be things that you may

have missed in the middle of the problem that could cause confusion -- another wonderful reason why reading your textbook is so beneficial.

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Another common entity in any mathematics course is the use of a calculator. Whether you are taking algebra, statistics or calculus, you can rest assured that you will need the assistance of a calculator. Calculators can be a wonderful tool in your development if you know how to use them. Some calculator functions may be more difficult to comprehend than the course itself. Here are a few suggestions to make your experience more beneficial and successful.

- Your calculator should come with an instruction manual. If it doesn't, go to the company's website and download the instructions for your calculator. Also, many textbooks have examples explaining how to use the calculator. Going through the exercises with your calculator in hand should be helpful. Oftentimes, they are very sequential and will lead you step-by-step from the problem to the answer.
- Do not use your calculator as a crutch. It is a secondary means of assistance. The best calculator that you have is your brain. Practice addition and subtraction and (positive and negative integers) and multiplication tables without the use of your computer. This will speed up your learning curve and will instill confidence in your own ability. Use your calculator to confirm answers.
- Practice entering equations into your calculator. Have a textbook example handy to compare answers. Enter the question exactly as it's written in the text. Often mistakes are made when entering an equation by calculator because of keystroke errors. For example, the subtraction key and the negative key will give you entirely different results.

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Chapter 6 – The Importance of Your First Examination

All of your examinations are very crucial to help you determine if you are on the right track. Examinations are the only way to measure your success. Exams can be like riding a roller coaster, there will be ups and sometime downs. The important thing to remember is to wear your seatbelt and hang in there.

The two most important exams will be your first and your final exams. Everyone knows that a final exam carries a lot of weight with regard to your final grade. In my opinion, although it does not carry as much weight, your first examination can set a precedent for you. If you are successful, it can be a wonderful start.

The importance of preparing for your first examination cannot be overstated. This is your golden opportunity to get a great start. You may be coming from a summer vacation or a nice winter break and you are relaxed and rejuvenated. You must take advantage of this because it will probably be the only time during the semester when you will experience less stress. Use this time to hit the ground running. As the semester continues, you will encounter many assignments and deadlines.

Circle the dates on your syllabus for your first and final exams. I cannot stress enough the importance of completing all homework before it's due. The worst thing you can do is get behind in your assignments, especially during the first couple weeks of class. Although difficult, you must develop the habit of allowing yourself time. This will definitely reduce your stress level.

Completing your assignments early will give you a moment to breathe and go over your notes. It will also give you extra time to begin reviewing for your first exam. This will set a precedent that can be carried throughout the entire semester. It will also be an incentive for you to persevere.

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Chapter 7: Organization and Time Management Skills

Organization is extremely important to your success. Time management represents the effort employed by you to become successful. The following are imperative for your success:

- Read the assigned section in your textbook ahead of schedule
- Organize your notes by topics
- Read examples of homework before doing it
- Complete all assigned problems. Only refer to the answer key if it's absolutely necessary. This will help you to become acclimated for future examinations. Some professors take tests problems from your homework assignments.
- Review examples in your textbook for comprehension

My advice for time managements is as follows: You should devote an equal number of hours for each class. This is the minimum. Your study time should be double your class time. That means if you have a class that meets for one hour three times per week, your minimum study time should be three hours.

Study should involve three major points:

1. Reading your textbook both passively and actively
2. Taking legible and organized notes from your class
3. Completing all assigned problems without assistance from your answer key

It never hurts to ask your professor how many questions are going to be on your exam. This way you will have a mental idea of what to expect. In preparation, you may want to do a self-test on several questions that could be on your examination. You should allot the same amount of time that will be spent on your class exam. Take this test in a quiet room. Do not take any shortcuts. Try to finish all questions in the allotted time. You may want to do this more than once. This should put you in the test-taking mode and prepare you for

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the real thing.

Role playing will help you simulate actual test-taking experiences and lessen potential stress and discomfort that may occur when taking exams. It also may help you understand whether additional practice is needed. As the saying goes, "Practice makes perfect."

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Chapter 8: Minimizing Distractions for Maximum Effectiveness

Mathematics takes concentration. Focus, discipline and attention to detail are required for optimal performance. Any distraction or lapse in your class or study habits will impair your ability to excel. Here are a few suggestions that you should be aware of concerning distractions.

- Cell phones should be turned off during class or put on vibrate. This seems so obvious, but it needs to be stated. Class time is for you to listen and understand what your professor is illustrating to you. Any interference will only slow down your learning process. Of course, there are exceptions to the use of cell phones in class such as emergencies. Any other conversations must take place outside of class.
- Try to maintain your concentration throughout the entire class. Try not to let your mind drift and think about other things. This can be challenging, especially during the middle of a semester when so many things are going on. As a matter of fact, the better your concentration in class, the better comprehension you will have. You may want to exercise before class, have a meal or make sure that you are well rested -- whatever may work for you -- to insure that you are in your best mental state during class.
- Try to maintain the same timeframe when doing your homework in order to set a routine. Just as you establish other routines, you should have a study schedule. Once you become accustomed, this should create an environment in which tasks can be more easily completed.
- As previously mentioned, always have your textbook readily available, particularly if you're studying in a learning center. Never assume that the center will have a book available. Also, there are other students in the center, one of whom may be using a book that you need. Always come prepared, especially when you are in need of

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assistance from someone such as a student assistant or tutor.

- Never forget your calculator, it's like a mini-assistant. It can only help you. A lot of the assignments will require the use of a calculator. Not having your calculator on hand is almost as detrimental as not having your textbook. Once again, if you are receiving help from a learning center, don't assume that they will have a calculator available for your use.
- Find a quiet study place, whether a library, learning center or at home. This will allow quiet time for maximum concentration and focus. If there is conversation, it should be about your mathematics assignments.
- If you are studying online, try not to have multiple applications open simultaneously. This can be a major distraction. This is typical, and it happens to all of us. The availability of social networks, news, sports and other outlets are readily available to us in a matter of seconds. Remember your objective and try to focus on your assignments. You can always reward yourself at the end of your study session.

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Chapter 9: Note-Taking Outside of Class

It may sound tedious and monotonous, but it's a good idea to establish a practice of rewriting your notes. This will allow time to go over what was discussed in class at your own pace. Your professor may often move at a very fast pace, causing you to miss out on key words, phrases or equations.

Also, you may have used abbreviations while taking notes. Besides greater comprehension, rewriting your notes provides another opportunity for you to review class work.

Oftentimes, you will understand your notes much better. Make sure that your notes they are organized, dated and placed in a separate folder or binder. Try to keep at least three weeks' worth of notes together. This will give you the edge in preparation for homework, quizzes and exams.

Another technique that is now commonly used is what's called a whiteboard. Of course, the blackboard is used as a mechanism for writing notes in class. The whiteboard has a smoother surface and you can use a dry ink marker and eraser which are much neater than conventional chalk. There are many types of boards that can be purchased online or at stores like Staples. There are many advantages to using these whiteboards, especially when studying.

- I believe that there is a psychological effect when using these boards. It gives the student a feeling of empowerment and confidence. This form of study is good for what is termed the kinesthetic learner. A kinesthetic learner is more acclimated when the study requires something other than just sitting. Physical activity is definitely a part of this form of study.
- The student can assume the role of a teacher. Since teachers often lecture from these whiteboards, students have the ability to role-play as they solve their problems. Another advantage of the whiteboard is that it provides more space to analyze and solve problems. A number of mathematical mistakes could result from simply not

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spacing out work. Whiteboards provide students with more space and freedom to display their work.

- Active learning is very essential to a student's development. Having a study group of two or more students and using a whiteboard can provide confidence and training to all students. As one student does a problem on the whiteboard, the others can watch, learn and give suggestions to the writer. The writer not only gets practice but can also explain the problem to fellow students. Having to explain a problem to a fellow student can definitely create a better understanding for everyone. If possible, this should be done at least once a week.
- Another advantage is if one student does not understand a specific problem, chances are the other students will. Role-playing, teaching and observing allow a greater dimension in the students' comprehension and confidence. Lastly, student study is also very important in terms of correcting mistakes. It is much easier to accept a correction from a fellow student, than from a parent or teacher.

Parents or teachers may be looked upon as experts, and any attempt by them to make corrections can cause a student to feel frustrated. Students assisting students helps to develop bonds. It also creates an atmosphere in which each can learn from the other, without the intense pressures that may result from discussions with adults on the subject.


Another suggestion with regard to note-taking outside of class, is to take specific examples from either your textbook or solutions manual and write down problems that you feel are important, or may come up in an exam. There should be an emphasis on having as many solved problems at your disposal as possible. This will allow you to review examples that may not be included in your homework but could reflect a problem that may come up in a quiz or examination.

If you do not have a solutions manual, you may be able to purchase one. For example, picking up a Schaums Series book of solutions is a wonderful way to enhance your ability

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to grasp specific topics. There are countless numbers of problems in the Schaums Series of books for practically any mathematics course. Students can actually use this book as a pre-test. Working on the problems without looking at the solutions will provide practice and also help you to avoid mistakes early on.

Lastly, you may want to consider using a tape recorder to authenticate your personal notes, including key definitions and formulas.

 **Reminder:** While on the subject of tape-recording, it may be a good idea to ask your professors whether you are allowed to record their lectures. This will enable you to have a set of verbal notes which you can transfer into written notes if you missed any part of the lecture. A good idea is to take some time at the end of the day to listen to the lecture uninterrupted. This will increase your comprehension.

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Chapter 10: Homework: Prerequisites for an Exam

Homework is simply practice. You must practice in order to become successful at anything in life. Whether it's athletics, music or your favorite hobby, in order to be the best you must practice. Of course, mathematics is no different in this approach. Your syllabus usually has assigned homework problems. These problems are designed specifically to enhance your ability to successfully master required topics and skills.

Additionally, dates are given to let you know where you should be in regards to the class in a particular section. It is crucial that you always complete and submit your assignments on time; otherwise it will be extremely challenging to catch up.

Regardless of whether your homework is to be collected or not, it would be wise to complete your assignments in a neat and organized fashion. You may want to think of it as turning in a project. View homework as a major presentation that you are going to give to someone for review. Wouldn't you want it to be neat, precise, easy to read and easy to understand? This should be your mindset when completing assignments.

You should consistently schedule time for your homework. As mentioned before, routine is key. Treat your education like a business. Take it seriously. Minimize as many distractions as you can. Cell phones, friends, social networking websites should all be limited, if not avoided during this time. Concentration on your assignment is a priority.

One of the key elements to success in doing homework is clarity. My advice is not to skip steps when solving problems. When solving equations it can be very easy to get incorrect answers by omitting steps. Write each development line-by-line from start to finish. This will make it easier for you to see possible mistakes. Omitting steps should be avoided unless you feel that you have mastered the topic.

Another element necessary for your success is neatness. As previously stated, your work

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should look professional. The practice of neatness will also carry over to your examinations, which will enhance your chances for success.

Complete all assignments. Usually the problems that you are given have answer keys in the back of your book. My advice would be to solve problems without referring to the answer key. You may want to compare your answers to the solutions in your textbook. It's okay to work without referring to your answer key. Remember when it's exam time, there will be no solutions manual. Use the answer key only if you encounter problems. Once you have completed your homework, the solutions key will serve as a guide for you to gauge your progress.

➡ **Reminder:** When doing your homework, you will occasionally run into obstacles. The most important thing during this time is to remember that it is not the end of world. If you continue with a problem that is difficult for you, you may end up extremely fatigued and frustrated. Remember, this is a process. You can always come back to it later or ask your fellow classmates or your professor for assistance during the next lecture. The main objective to remember is to complete as many assignments as you possibly can.

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Chapter 11: The Benefits of Learning Centers, Tutors and the Internet

In every high school or community college learning centers or study halls are usually accessible to students. These centers normally have a director and staff consisting of teachers, student tutors and volunteers who are more than happy to provide assistance. Becoming familiar with these avenues of assistance can greatly benefit any student. Usually in addition to the staff, there may be computers with math integrated software, textbooks with solution manuals, and modules for particular topics that can help boost skills.

Spending time in these centers can provide an atmosphere that will enhance learning. They also provide a physical support system that can build a student's confidence and ability to learn. These centers should be used regularly. You may wish to establish a regular routine. This can mean working with a tutor, viewing videos, or using the center's solutions manual. Another wonderful aspect of a learning center is the possibility of working with a tutor one-on-one. Many centers have lists of tutors available. Become acquainted with the tutors who are available for your class. Ask if you can walk in or whether you should make an appointment. Inquire about time limits per session. This will be another opportunity to enhance your success.

If feasible, you may consider a private tutor. Your instructor or mathematics department may have a list of private tutors. There are companies such as Sylvan Learning Center and others that you can find online. The advantage of having a private tutor is that the allotted time is devoted to assist you only. A private tutor can be of benefit to you in developing a strategy that will help you quickly attain success. It's like having a personal teacher strictly for you. The tutor should be able to identify your weaknesses and develop study packets or practice sheets to help you strengthen those areas. If used on a regular basis, private tutors can definitely be advantageous to your growth.

The Internet has revolutionized the way that we learn. There are countless avenues of information that can assist us. Just doing a basic search can unlock thousands of links to

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any information we may be seeking. When used properly, the Internet can be of great value to our learning development. Google, YouTube, and other Internet sites will not only display y documentation, but also videos in other areas to help you use search engines such as www.wolfram-alpha.com.

Using these resources as a secondary means of learning will benefit you. When you need outside assistance, the Internet is always available. When trusted and proven sites are used properly, these tools will provide great assistance.

Social networking sites such as Facebook, Twitter, and MySpace can be used as community bulletin boards to discuss any topic. You may be able to develop communication with students all over the world who are taking or teaching the same course. This is a wonderful way to exchange questions or ideas with others who may be of assistance. Also, you may be of assistance to them by explaining what you know. If you are serious, these websites can be of great value in developing conversations about topics related to mathematics course work.

➔ **Reminder:** You should access these support services immediately when you are taking a class. Waiting until the mid-term or when you desperately need assistance, may be a disadvantage. You don't have to wait until you encounter a problem before seeking assistance. Visiting a learning center early on will familiarize you with the arrangement of the center and also allow you and the staff to become acquainted early in the semester.

If the learning center is not listed in your professor's syllabus, inquire about additional learning services that may be available.

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Chapter 12: Test-Taking Procedures

Taking a test or an examination can be one of the most intimidating things you'll ever do in your life. The pressure and stress one may feel during that time can cause panic due to the fact that there is no turning back at that moment. All of your time for preparation is now over. There is limited time to complete your work, which adds another level of stress to an already stressful situation.

Tests are barometers to gauge your comprehension and understanding. Use appropriate techniques to help you through exams.

The first technique you may want to use is to concentrate on one question at a time. Once you have quickly scanned through the exam for the number and types of questions, first try to select one question that you can accomplish with relative ease. Having a whole page of problems can definitely cause you to freeze up. Concentrating on one problem at a time will limit distractions from the other questions and can help you better focus on the question at hand.

You may want to conceal the questions that you will deal with later. This way it will seem as though you only have one question to deal with. You may wish to use the same process for the other questions. This technique will help you to break an exam into segments that will be easier to digest. Using this technique may help you relieve unnecessary stress and anxiety.

The second technique is to be sure that you have plenty of space to write down your steps. Instructors want to see the processes that you used to arrive at solutions. Give them every opportunity to see everything that you have written. Once again, do not omit steps. Also, do not worry about paper. Additional scratch paper will usually be available.

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Remember to be neat. Just think of it this way, if you can't follow your own steps on how you arrived at an answer, how will your teacher be able to understand them? Homework preparation should provide you with a solid foundation for taking exams.

Time is of the essence. You may want to occasionally look at the clock during your exam to see where you are in terms of completion. If you previously asked your professor how many questions would be on the exam, developing a time strategy for each question may be a good idea. You do not want to spend enormous amounts of time on one particular question when there are others that need to be completed. Each question may also have points attached.

In other words, some questions may hold more value than others. For example, word problems or deriving a formula will hold more weight. The quicker you can complete other questions, the more time you will have to devote to more challenging problems.

The idea is that you want to capture as many points as possible during this time. Finish as many problems as you can. Remember, not only should you occasionally glance at the clock, you should also use a mental clock to alert yourself that it may be time to move to the next question. Once you have completed your exam, if time permits, you may want to quickly review your answers.

Lastly, the final suggestion in completing your examination is never leave any question unanswered. Most instructors will give partial credit for partial answers. Even though you may not have the answer, you may be able to pick up some valuable points that could improve your grade.

➡ **Reminder:** A number of professors will allow students to drop their lowest exam score once during the semester. Students should not take this as a pass. You should consider all exams as carrying the same weight. Keep in mind during a final exam the material you may have missed previously will show up again.

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Chapter 13: Additional Techniques for Success

There are many different techniques you can apply to help you remember sequences. For example, PEMDAS(order of operations); SOA-CAH-TOA(trigonometry); ASTC(radian angles) are all used to help you remember processes in problem solving.

These mnemonics are often very useful. Memorizing them can ease the learning process and help you with problems. Anything that can be used to help you to become more successful is advantageous. If you encounter obstacles, always refer back to them.

Additional key principles for success in mathematics consist of the 5-P's.

1. Practice
2. Persistence
3. Perseverance
4. Patience
5. Performance

Applying these principles will keep you on the path to success. Whenever you become discouraged, you can always refer to them. They are reminders to keep you encouraged.

Practice is mandatory. If you want good results, you must put in the work. This is the only way to get better. As previously stated, it is best to practice homework problems for at least three hours per class. This may seem like a lot of time, but success will be your reward. Allowing plenty of time to practice is necessary and very beneficial.

Persistence with mathematics will help you create mental toughness. When difficulty arises, you will continue to work through your barriers, which is extremely important.

Being consistent in your study creates discipline. Through good times and bad, persistence will help you succeed.

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Perseverance creates mental strength in mathematics. Handling problems that give you a hard time can cause you to give up. Finding ways to overcome them will strengthen your resolve and give you reasons to continue. There's no greater feeling than when you are able to solve a problem. Finding the answer may take several attempts, however, you will find that there are no barriers that you cannot overcome.

Patience is necessary in mathematics. You may experience some frustration during the course of the semester. Unfortunately, this is part of the process. Concepts, definitions, and word problems take time to master. When managed properly, frustration will not get the best of you.

Performance is a compilation of the other four principles. After consistently applying these principles you should be performing at your best. Examinations should no longer be intimidating. Your dedication and sacrifice will pay off. Think of it as preparing to receive a reward for your hard work. Claim your prize.

➡ **Reminder:** There is one additional 'P' that will apply when you successfully complete your mathematics course. That is Power!

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Chapter 14: Preparation for Final Examinations

Final examination time can be very stressful. Trying to remember an entire semester's worth of work can be intimidating. Once again, organizing all of your materials can make the situation less daunting. My advice is to combine all of your previous examinations into one folder. Also, any previous quizzes should be combined into one folder as well.

If you don't have a solutions manual from your previous examinations, you may want to ask your professor if he/she has one. Go over any mistakes that you may have encountered on previous tests. Make sure that you correct them. You may want to highlight specific problem areas to indicate importance.

This is definitely not the time to cram. Going through previous exams should consist of a majority of your practice time. Trying to redo an entire semester can be fruitless. Review the major points in each chapter and work on a few practice problems from each. Go over important definitions and memorize the ones that you know will be on the exam.

Your professor may give a review session before your final exam. Attend this session. Ask once again how many and what type of questions will be on the exam. Your classmates may have a review session which could be advantageous for you. It may be good to have an individual to study with as well as a group study plan.

Another important aspect during final examination time is finding time to relax and unwind. Having time to relax will give you freshness and vitality. Engage in one of your favorite activities or hobbies and, for a moment, forget about mathematics and other pressures. This will reinvigorate you.

👉 **Reminder:** Meet with your professor prior to your final exam. Find out what your grade is prior to the final. Ask your professor how many points you need to achieve a

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particular grade, and ask about the area(s) where you need improvement. This meeting should take place at least one week before your final exam.

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Chapter 15: Advice for Online Students

A current trend in our society is online courses. Many schools and colleges offer online classes to meet the needs of students who are unable to attend classes because of work or other obligations. Students can sign up for a number of courses, including English, history and mathematics. Problem packets, software and even textbooks are all computerized for these courses. Students can login and immediately begin their coursework.

Instructors usually have an entire semester of work already uploaded into the system. Dates are given for homework, quizzes, and exams far in advance. Students can usually begin learning independently and do not have to wait for instructions. Having everything at your fingertips can replace commuting. There is no need to drive or walk to class with the possible exception of a midterm or final examination.

Students who take online classes must be disciplined because they are not physically sitting in a classroom with direct access to a professor or instructor. Students may have a false sense of security and think they have extra time to complete assignments simply because their computer is always available to them. This mentality can lead to disappointment and failure if you wait until the last minute. The same rule applies whether you're taking a class in person or online -- do not delay completing assignments. As matter of fact, online classes, even though more convenient, can be quite challenging if you don't exercise self-discipline.

Here are a few tips to consider when taking an online class.

- Stay in contact with your professor by email regarding any problems you may encounter. If there are projects that you need to send to your professor by email, communication is vital. Technology can be confusing at times and the only way to solve a problem is to let your professor know that you are having one. Be specific. This is not a classroom setting where you can interact in person. Use details when emailing your professor. This should bridge any communication gap that may occur

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with online classes.

- As with any math class, the first objective is to make sure that you complete all of your assignments on time, don't develop a false sense of security. Even though your professor is not physically present, he or she is aware of what you're turning in and whether it has been completed in a timely fashion. Avoid the 11:59 p.m. blues. A lot of online assignments are due at 11:59 p.m. Online classes are wonderful and very convenient, but occasionally technology will shut down when you least expect it. Finish your assignments before any of these inconveniences occur. There are many things that could go wrong. Power outages, Internet malfunctions, or your own computer difficulties can and often do arise during the semester. Be prepared and allow yourself plenty of time to complete assignments ahead of deadlines.
- When doing homework online, the software may provide you with multiple choice answers. This may seem great, but there are often pitfalls. Your examination will not give you multiple choices. You must use supreme concentration when doing your homework. Yes, you will have more choices than usual but do not let this give you a false sense of security. Pressure can often bring out the best or worst in us. Eventually your mastery of the material will be tested.
- If your math class requires additional word processing programs such as Microsoft Word or Excel, you may want to check guidebooks. Instructors may want you to turn in assignments using various processing applications. Finding a particular operation in these applications can be challenging. Inquire about the requirements needed for your class ahead of time. If you need programs like Excel, go to your local bookstore or search online for guidebooks to help you with courses such as statistics.
- Read the guidebooks in advance to save time. You won't have to go through additional stress of learning how to apply these methods. Google and YouTube also

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carry videos that can help with these applications. The videos should be screened carefully in order to insure that they will assist you. Many word processing programs also have built-in help buttons.

- Familiarize yourself with the pallet of various operations associated with your class. There are different operations that you will need to answer questions. You will use these keys quite often while doing your homework or examinations. They are similar to calculator keys and they serve the same function.
- When doing your homework online, every topic will have an example attached to each problem. Print out each example associated with your homework assignments. This will help you in three ways:
 - First, they are similar to homework problems and will serve as a guide for your assignments.
 - The second advantage of these examples is they can be used for present and future study. Print out all of the examples that are given for each topic or chapter. The reason for this is to accumulate solved problems to simplify your review process.
 - The last advantage that printing out examples will give you is practice in how your online class assignments should be organized or presented. Pay particular attention to the methodology and also the directions. Be very careful how you enter values, for example, round off two decimal places. These examples will show you what is expected.

Online learning in mathematics can be a wonderful experience provided you are disciplined, organized and use all of the advantages that are provided. Communicating with your professor, turning in assignments early and printing out examples from your online class, are great tools that will benefit your experiences with these types of classes.

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Chapter 16: Results That You Can Expect

Here are a few situations related to students taking a mathematics course. They are based upon class attendance, reading, homework, study skills, and test preparation. The results are atypical and are solely hypothetical.

Situation One:

Student “A” regularly attends math class. He also timely completes homework assignments. He regularly spends at least two hours outside of each class reading, doing homework and preparing for quizzes and tests. Student “A” also visits his professor’s office at least once a week. A student who follows the above example may typically be an A or B student.

Situation Two:

Student “B” regularly attends her math class and most of the time she completes her assignments by the due dates. She regularly spends at least one hour outside of each class reading, doing homework and preparing for quizzes and tests. Student “B” visits her professor’s office once every other week. A student who follows the above example may typically be a B or C student.

Situation Three:

Student “C” regularly misses at least one class every other week. Most of his time is spent catching up on previous homework assignments. He rarely visits his professors. A student who operates at this level may be a C or D student. The possibility of a failing the course is evident.

These situations may vary, but they should present a good idea of what you can expect. Taking a mathematics class is like signing a contract, and it will give you good results

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provided that you adhere to attendance, due dates and other requirements established by your professor.

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Study Patterns to Reach Maximum Results

The following chart is an example of a student who may attend Monday, Wednesday and Friday classes. All of these procedures do not have to be followed exactly, but they represent examples of what a student should be doing to receive excellent grades.

Weekday	Procedure
Monday	Read topic or section before class. After class, skim through your notes (10-15 minutes). Begin assigned homework.
Tuesday	Review previous class notes. If not completed, finish previous homework assignment.
Wednesday	Read topic or section before class. After class, skim through your notes (10-15 minutes). Begin next assigned homework.
Thursday	Review previous class notes. If not completed, finish previously assigned homework.
Friday	Read topic or section before class. After class, skim through your notes (10-15 minutes). Begin next assigned homework.
Saturday	Organize previous week's notes and combine them for review. If not completed, finish previously assigned homework.
Sunday	Reread text from prior weeks. Finish any assignments that have not been completed.