Study Skills for Mathematics
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Notes

The material in these Lessons is adapted primarily from three sources:

Lesson 1  Attitudes and Goals

Factors Affecting Success

There are many factors that contribute to success in mathematics, just as there are in achieving any goal. Researchers have classified these factors into three broad groups:

<table>
<thead>
<tr>
<th>Factors Affecting Success in Mathematics</th>
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<tr>
<td>1. <strong>Cognitive Entry Skills</strong> (account for 50% of your course grade)</td>
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<tr>
<td>Your knowledge of prerequisite mathematics, your mastery of basic skills, and your ability to learn, including effective study skills</td>
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<tr>
<td>2. <strong>Quality of Instruction</strong> (accounts for 25% of your course grade)</td>
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<tr>
<td>The skill and dedication of your teacher, and the construction of the curriculum</td>
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<tr>
<td>3. <strong>Student Attitudes</strong> (account for 25% of your course grade)</td>
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<tr>
<td>Including self-concept, motivation, locus of control, and study habits</td>
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You can control the first two factors by making sure the course you take is at the right level for you,¹ and by choosing a teacher whose teaching style is compatible with your learning style. But once you are enrolled in a course, you have direct control only over the last factor, your attitudes and study habits.

Building a Plan for Success

The first step in creating a mindset for success is to have a clearly defined goal. “Goals are like anchors to the future we desire. We must toss them out in front of us and then use them to pull ourselves along. In this way, you take control of your math future. Your math success will happen by your design and not by chance. You can have the math success you want!”²

In the Exercise for this Lesson, you will find compelling reasons to dedicate yourself to your math course. Here are some examples of reasons to succeed in your math course:

- I want to progress through my math courses at a reasonable pace over the next 2 years.
- I want to master the math I need to succeed in my science courses.
- I want to complete my requirements for graduation.
- I need specific math skills to advance in my job or career.
- I need mathematical ability to complete my major and enter the profession of my choice.

It's important for you to be specific about the goal you want to achieve, and to pursue it without alternatives. The less conflicted you are about achieving your goal, the greater the possibility of your accomplishing it!
Exercise 1  Plan for Math Success

1. List one realistic math success goal you wish to achieve. State your goal in specific, positive, measurable terms, expressing exactly what you want.

2. Set a realistic target date for achieving your goal. You may wish to set three dates:
   - Optimistic target date:
   - Realistic target date:
   - Latest acceptable date:

3. List as many benefits and potential satisfactions you will earn by achieving your goal as you can.

4. List some barriers or obstacles you may face, and the steps you will take to overcome them.
   - **Barriers**
   - **Steps to Overcome Barriers**
5. List the positive abilities and strengths you possess to help you meet your goal.

6. List several people who can help you meet your goal.
   
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<tr>
<th>Name</th>
<th>Type of Help They Can Give</th>
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7. List the significant Action Steps you will take to meet your math success goal.
   
<table>
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<tr>
<th>Action Steps</th>
<th>Frequency or Target Date</th>
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8. Describe how you will reward yourself for meeting your math goal.

In the Notes, you can read the Success Plan written by one student.
Lesson 2  Maintaining a Positive Attitude

The most important quality that will affect your success in a math course is your attitude. Now that you have identified your goals for the course, you can best work toward those goals with a positive attitude. No matter what your experiences were in previous math courses, you can build your own success starting now.

“Educators have known for centuries, for a student to achieve academic success, it takes more than innate ability, competence, or the desire to learn. The key element in this process is having a positive attitude. A positive attitude becomes the catalyst, propelling you along the road to your math goal.”

You are in control of how much time you devote to your course, and how you use that time. Regardless of any past obstacles or troubles, your chances of success are greatly increased if you make consistent, intelligent efforts toward pursuing that success. In the coming Lessons, you will learn techniques for using your study time efficiently and effectively.

Overcome obstacles in your math courses with attention to detail and a persistent, never-quit attitude.

Forget about the reasons why you haven't been successful in the past. Do not use these as excuses for not doing well now! Take responsibility for your own education. Make up your mind that you will do whatever it takes to master the course without making excuses for your lack of success.

There is nothing a teacher can do that will make up for what a student won't do.

Your positive attitude can affect your teacher as well. Your teacher will be more enthusiastic about preparing interesting lessons, and more willing to spend extra time with you, if you are making an effort and taking advantage of his or her expertise. If you are not interested in learning the subject, your teacher will have less interest in helping you.

To have a positive approach to your math course, make four decisions now.

Attitudes for Success
1. Recognize that you have control over how well you do in the course.
2. Decide now that you will make an honest effort to do well in the course.
3. Decide now that you will work not merely to pass the course, but to do much better than pass.
4. Decide now that you will persist in working hard in the course until the end, regardless of any setbacks that might occur along the way.
Exercise 2 How to Have a Positive Attitude

A. Formulate your own answers to these questions before consulting the suggested responses below.

1. What is the most significant controllable quality that influences my success in a math course?
2. How can I stay motivated to do well in a math course?
3. How can I overcome poor past performance in math courses?
4. How can I overcome a poor math background or a large time gap since my last math course?
5. How can I decrease my math anxiety?
6. How should I respond to any setbacks?
7. What should I do if I don't feel I have control over my success in the course, or am not enjoying it?
8. What strategy should I pursue for the first few weeks of a math course?

Suggested Responses
1. It is my attitude in the course.
2. I should review my Plan for Success.
3. I can overcome obstacles with attention to detail and a persistent, never-quit attitude.
4. I can overcome a poor math background by patching up any weaknesses as soon as I encounter them.
5. I can decrease my anxiety by mastering the material.
6. I should respond to setbacks by persisting in working hard.
7. I should act as if I have control and am enjoying myself. Eventually, my habit of pretending and my resulting success will cause my feelings to match my behavior!
8. I should be overdedicated for the first two or three weeks in the course.

B. Check the top five changes you plan to make in your attitude and approach.

   ___ 1. I will find reasons to dedicate myself to the course.
   ___ 2. I will make an exceptional effort right from the beginning of the course.
   ___ 3. I will have a persistent, never-quit attitude.
   ___ 4. I will patch up my weaknesses in the course as soon as I encounter them.
   ___ 5. I will act as if I have control over my own success.
   ___ 6. I will work not just to pass, but to earn the highest possible grade.
   ___ 7. I will persist until the end, regardless of any setbacks that might occur.
   ___ 8. Other:

Write out your five objectives and post them in your study area.
Lesson 3  Math Study Skills

Learning mathematics is not like learning history or psychology, and study techniques that work in those courses won't necessarily help you with math. However, there are specific study strategies you can learn to help you be successful in your math courses. We'll first identify areas where your skills are strong, and where they can be improved.

Exercise 3 Study Skills Survey

Choose how often each statement applies to you, and enter your points in the correct column.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Usually (3 points)</th>
<th>Sometimes (2 points)</th>
<th>Rarely (1 point)</th>
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<tbody>
<tr>
<td>1. I attend all my math classes.</td>
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<td>2. I always get to class on time.</td>
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<td>3. I read the lesson for the day before coming to class.</td>
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<td>4. In class, I try to follow all explanations and to understand the concepts.</td>
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<td>5. If I don't understand something, I ask the teacher to explain it again.</td>
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<td>6. I participate and contribute to group classwork.</td>
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<td>7. I review my class notes as soon after class as possible.</td>
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<td>8. I study math at least 2 hours a day, at least 5 days a week.</td>
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<td>9. I study math before my other subjects and when I am most alert.</td>
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<td>10. I take small breaks every 20 to 40 minutes when I study math.</td>
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<td>11. I work to complete difficult assignments in several small blocks of time.</td>
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<td>12. I complete all assignments and keep up with my class.</td>
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<td>13. I read the lesson before tackling the homework problems.</td>
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</table>
15. When I read, I say aloud or write out important points. 
16. I underline, outline, or label key procedures, concepts, and formulas in my text. 
17. I work to understand formulas and principles before memorizing them. 
18. I take notes on my text and review them often. 
19. I work on at least 10 new problems and 5 review problems during each study session. 
20. If I have questions on the homework, I ask my teacher, a tutor, or another student. 
21. I reward myself for studying and completing assignments. 
22. I work to “overlearn” and thoroughly master the material. 
23. I do weekly and monthly reviews of all my class and textbook notes. 
24. When reviewing, I use a variety of methods: reciting aloud, writing formulas from memory, making lists, outlines, or diagrams. 
25. I follow an organized study plan specifically for test preparation.

**Column Totals**

**Grand Total**

**Scoring**
If your score is above 68 points, you have excellent math study skills.
If your score is between 54 and 68 points, you have fair math study skills, but you need to improve.
If your score is below 54 points, you have poor math study skills, and you need help fast!

**Action**
Circle at least five Study Skills that you can improve right away. Write those skills in large letters on a sheet of paper, and post it somewhere you will see it often during your study time.
Lesson 4  Scheduling Your Time

You cannot expect to pass your math course unless you are able to devote a good deal of time to it. There is a reason that 15 units is considered a full-time load: for each hour you spend in a college classroom, you should spend 2 hours outside of class learning the material. That makes a total of 45 hours a week, or more than a full-time job. One of the main reasons students fail their math classes is because they have overcommitted their time.

As you plan your schedule, keep these points in mind:

1. **Successful math students study math for at least 2 hours every day throughout the semester.**
2. **It is not a good idea to take math with other hard courses or with a heavy work load.**
3. **Try to schedule your study time for when you are most alert and able to learn.**
4. **Schedule part of your study time during the hour immediately following your math class -- you forget more than half of what you just learned within one hour if you don’t review the material.**

**Exercise 4  Planning Your Study Schedule**

1. **Shade** all the time spaces for your class meeting times.
2. Write a \(\mathbb{W}\) in all the time spaces when you work. (If your work schedule is not the same every week, fill in a typical week.) Include commuting time if it is more than 15 minutes each way.
3. Put \(\times\)'s in any time spaces when you are usually asleep. (If you are up earlier or later than shown, add a row to the top or bottom of the table.)
4. Write an \(\mathbb{E}\) in the time spaces when you eat your meals.
5. **Estimate how many hours per week you spend on cleaning.** This includes house-cleaning, taking care of your clothes, personal hygiene, etc. Put \(\mathbb{C}\)'s in enough time spaces to account for cleaning.
6. Write an \(\mathbb{O}\) for “Other” in all the time spaces where you have other commitments or obligations, such as meetings, lessons, sports, or family responsibilities.
7. **You will need two hours of study time per day for your math class, and at least one hour per day for your other academic classes.** Write an \(\mathbb{S}\) in at least two time spaces per day.
8. **Do you have time left in your schedule for social activities and relaxation time?**

If you don't have time on your schedule for all of your activities, you are setting yourself up for failure! Decide now where you can make more room in your life: take fewer classes, or cut back on your work hours. Do not deceive yourself -- if you want to pass math this semester, give yourself a chance.
## Weekly Study Schedule

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Lesson 5  Creating a Study Environment

Studying mathematics is like learning to play a musical instrument or to speak a foreign language; progress requires practice and dedication. You cannot learn mathematics by watching your teacher work problems, any more than you can learn to play the piano by listening to other people play.

Mathematics is not a Spectator Sport!

You must be an active participant in your mathematics education. We will pursue a strategy that uses four Key Steps.

Four Key Steps for Success
1. Listen. Try your best to follow and record what the teacher explains in the classroom.
2. Read. Master both the class notes and the assigned textbook material.
3. Practice. Solve homework problems and immediately get help when you need it.
4. Review. Follow an organized study plan specifically for taking tests.

In college, most of your learning takes place outside of the classroom. Remember that in fifteen weeks you cover the same material that a high school course takes one year to teach. Your teacher can guide you and provide direction for your study, but learning the material is ultimately up to you. Therefore, it is vital that you have the resources to be an effective, independent learner.

Creating a positive study environment can significantly improve the quality of your studying. By studying at the same place each time, a conditioned response will be formed. When you sit down at your study place, your mind will automatically start thinking about studying. This conditioned response decreases the “warm-up” time until you actually begin studying.

Here are some factors to consider when creating your study environment.

1. Pick one chair, one desk or table as your study area. This area should be relatively free from distractions like the television or busy family life. If you cannot find a peaceful space at home, you might try the local or school library.

2. Choose an area where you can control the noise level. Most people prefer some mellow background music while doing routine chores like copying notes or practicing skills, but total silence is often best for tasks that require more concentration, like tackling demanding problems or grappling with difficult new concepts. Some students use small earplugs bought at the pharmacy to control noise levels.

3. How does lighting affect your ability to study and learn? Do you prefer natural light from the window, or a soft incandescent lamp? Some people prefer white fluorescent bulbs or a bright halogen lamp. Some students find that bright lights energize them and make
them more alert and attentive. In subdued light, they become distracted and drowsy. Bright lighting has the opposite affect on others; it makes them tense and uncomfortable.

4. **Do you prefer a cool or a moderately warm environment?** Try to adjust your clothing or the room temperature to your comfort level. For example, sit by a window if you like fresh air, or keep a sweater handy if you tend to get cold.

5. **How does food affect your studying?** A large heavy meal may make you feel sleepy and dull, and too much caffeine can make you jittery. On the other hand, a few ounces of protein eaten an hour or two before you study may help increase your alertness and motivation. If you tend to get the munchies while studying, an ounce or two of carbohydrates can calm you and increase your focus.

6. **The tools of the trade should be close at hand:** pencils, paper, notebook, textbook, calculator. Each time you have to get up to retrieve an item, it takes time -- not just to fetch the item, but to settle down and mentally warm up again.

7. **Surround your study environment with signs that tell you to study.** Your study schedule and any short-term goals should be prominently displayed. Post motivational sayings, or pictures of the career you plan to enter after graduation.

Now it's your turn to customize your study habitat.

**Exercise 5  Building Your Study Space**

1. Describe the location and arrangement of your study space.

2. What type of noise level do you prefer? How can you control the noise level?

3. What sort of lighting does your study space have?

4. How will you regulate the temperature in your study space?

5. What sort of snacks (if any) will you keep in your study space?

6. List and assemble the materials you need in your study space.

7. Gather and post some motivational materials for your study space.
Lesson 6 Class Time and Note Taking

Class time is valuable learning time. Now is your chance to interact with your instructor and your classmates, to see the direction and organization of the material you need to learn, and to get your questions answered. You should learn as much as possible during class time itself, and leave class with the clearest possible notes. The more diligently you do this, the easier it will be for you to do the homework and keep up with the pace of the course. Here are some strategies for getting the most out of your class time.

1. **Attend all class meetings.** The easiest way to get behind in your math class is to skip class. Skipping even one class can immediately put you behind by at least two classes.\(^7\)

2. **Sit in the front of the class.** The best place to sit is as close to the front and center as you can. You will be able to see and hear the teacher better, and have fewer obstacles between you and the black board. Also, you will have fewer distractions and be able to concentrate better and be more involved in the lesson.

3. **Arrive early in class so that you can get settled and “warm up.”** Briefly review yesterday’s lesson and the reading for today. Being aware of the topic will help you understand the discussion right from the start.

4. **Be an active listener.** Focus on the discussion and try to grasp how each step of the demonstration follows from the previous one. Remember that you will have to work similar problems on your own for homework. Ask yourself if you will be able to do so! Another way to keep your mind focused is to volunteer an answer when the teacher asks the class a question.

5. **Don’t be afraid to ask questions.** Class time is the best time to get any misunderstandings cleared up -- the teacher won’t be there when you get home. If you feel hesitant about asking a question, think of three things:
   a. The teacher is there to help you understand the material.
   b. Probably five other students have the same question you do.
   c. The instructor needs feedback on the lesson.

   Try to make your question as specific as possible. It will only annoy your instructor if you throw out something like “Yo. I don't get any of this stuff. Can you start over?” If you are lost and cannot frame a specific question, ask the teacher to go back to the last step you understood and explain how to get the next step. If it’s not possible to ask your question immediately, write it down to ask later.

6. **Take notes.** Even if you feel that you understand the lesson, it is natural to forget details very soon after leaving class. Besides giving you a record to study later on, note-taking helps focus your attention and keeps your mind from wandering during class. In the Exercise for this Lesson, we’ll consider some note-taking techniques.

   When is the best time to review your class notes and reflect on today’s lesson? Immediately after class! Here is what one authority has to say:
I have found the most important study skill math students can learn is to review immediately after learning and then again 8 hours later. This review directly after math class is critical and need only last 10 or 15 minutes.

Let me explain to you why it is so important to review immediately after learning. Almost immediately, you lose information you first learn in math class or from reading a math book. The German psychologist Hermann Ebbinghaus was the first person to do research on the rate of forgetting. He found that, after 20 minutes, nearly half of what had been learned was forgotten, and after 1 day, nearly two-thirds was lost.

A classic study by H. F. Spitzer showed that students who reviewed the material immediately after learning and then did periodic reviews were able to retain almost 80% of the material after 2 months!

If at all possible, arrange to have a break in your schedule immediately following your math class, so that you can review the lesson. If that is not possible, find a 10 or 15 minute time-slot as soon after math class as you can, and do a quick review.

Review your class notes immediately after your math lesson, or as soon as you can.

When reviewing your class notes, you can follow four steps, as explained in the Exercise below.

Finally, if you must miss a class, here is what you must do before the next class:

If you miss a class:
1. Get an accurate copy of the notes, the homework assignment, and any handouts from the class.
2. Read the notes and the corresponding section of the textbook, and make a serious attempt to do the homework.

Exercise 6A How to Take Class Notes

Good note-taking is a skill that takes practice. You must learn to analyze what you hear and see in class, and summarize the content in a way that you will understand when you read your notes after class or next week. Note-taking is a great way to become an effective listener and is the first step in retaining what you learn.

Guidelines
1. Write the date and the topic of the lesson at the top of the page.

2. Listen carefully to the teacher's introduction. This is where he or she describes the purpose of today's topic and how it fits in with material you have already studied. Try to summarize this introduction as best you can; these ideas will help you when you are reviewing for the test or trying to understand the big picture.
3. Write down what the teacher says, not just what he or she writes on the board. Be alert for helpful comments about how or why a procedure works, or how to identify the correct procedure for a given problem.

4. Write on one side of your paper only, and leave space in the margins and between entries. This extra space will allow you to add comments or questions later when you review your notes.

5. Develop your own shorthand or system of abbreviations and notations. For example, you might write “eqn” for equation, or put a star beside material the teacher emphasizes.

6. Try not to skip any steps shown in a problem solution or the development of a formula. If you miss something, leave a space in your notes and ask the teacher to help you fill in the gaps before you leave class.

**Action**

1. Take notes in your next math class, keeping the guidelines above in mind.
2. Compare your notes with one or more of your classmates. Are there ways in which your note-taking could be improved?
3. Keep practicing your listening and note-taking skills. You will find over time that it gets easier to decide what are the most important points to include in your notes. As your skill improves, so will your confidence and your understanding of the material!

**Exercise 6B  How to Revise Class Notes**

In order to retain what you learned in class, it is vital that you review your class notes immediately after class. You may need to get help from your teacher or a classmate with the first two guidelines; make a note to yourself to get help at the next opportunity.

**Guidelines**

1. Rewrite anything you won’t understand later. If you find a passage that is illegible due to rushing or misunderstanding during the lecture, rewrite the passage more clearly.
2. Fill in any gaps. It is almost impossible to write down everything during a lecture. Fill in any missing steps or explanations in your notes.
3. Add your own annotations that will help you later: key words, or cross-referencing, or highlight points that you found particularly enlightening.
4. Summarize and synthesize. Review the major points of the lesson in your mind. Write a short list, outline, or summary of the day’s lesson at the end of your notes. Write down any thoughts combining previous knowledge with the new material, or any ways in which the new material clarifies previous concepts or skills.

**Action**

1. Designate a time to review your class notes, as soon after class as possible.
2. Review the class notes you took in Part A of this Exercise, keeping in mind the guidelines above.
3. Compare your revised notes with one or more of your classmates. Are there ways in which your revision could be improved?
Lesson 7  Reading the Textbook

Your textbook is your primary resource for your math course. Not your teacher, not your tutor, not your classmates. The textbook offers complete explanations of concepts, skills and procedures, and is always available, even when your teacher and friends are not. Learning to read and extract information from a textbook is an important skill in itself, one you will need throughout your academic life and in your career as well.

The first thing you should do is familiarize yourself with the structure and organization of your book.

Familiarize yourself with your textbook.
1. Look over the Table of Contents. How many sections are in a chapter, on average? Which chapters and sections does your course include?
2. How is each chapter organized? Most math chapters are divided into sections, with a set of homework problems at the end of each section. What other features do the chapters in your book have? Is there a Chapter Review?
3. Now look closely at one section of a chapter. How is the material presented? Is it divided into subsections or topics? Is there an Example and/or an Exercise to illustrate each topic? What other study features does the section include?
4. Locate the Index of the text, the Answer Section, and the Glossary, if there is one. Are there other features that might be helpful, such as an Appendix or Skills Review?

Reading a math book is not like reading a novel, or even a history textbook. You cannot skim over a math book and get the gist of the meaning -- every word is important. In fact, you should read your math assignment three times.

Read Three Times
1. **Survey** for an Overview
2. **Study** In Depth for Understanding
3. **Read Again** to Organize and Retain Knowledge

1. **Survey.** Before class, survey the reading assignment for the lesson. Look briefly through the assignment to see what the lesson is about. Read the title of each subsection and the starting sentence in each. Read any definitions, boxed or highlighted material, lists, and summaries. Ask yourself questions about the material:
   a. How is this lesson related to previous lessons?
   b. What is the goal of the lesson?
   c. What are the main topics of the lesson?
You will understand the lesson better if you have some idea of where you are headed.

2. **Study.** After class, sit down to read the assignment slowly and carefully. Read one subsection at a time. Don't rush. Work on grasping each concept before going on. You may have to read a difficult passage two or three times before it begins to make sense. Some people find it helpful to read such parts out loud.
   a. Read with a pencil (not a highlighter!) in hand to make notes to yourself directly in your text. Develop your own system of notations to personalize your book. Use stars, brackets, or underlining to mark important information, or comments that you find
particularly helpful. Circle any unknown words you need to look up. Put question marks in the margin beside parts you find unclear or don't understand.

b. Pay particular attention to any definitions, rules, theorems, or procedures. After reading them carefully, close your eyes and try to restate the material in your own words. Then check to see if you got all the details right. Keep testing and retesting your understanding and retention of each topic as you read.

c. Examples are an integral part of a math lesson. Read through each Example step by step, and make sure you understand the reasoning behind each step. Then cover the page with a sheet of paper and reveal one step at a time. Can you reproduce the next step without looking?

It is very important that you become an active reader as well as an active listener! Memory retention studies show that we remember 10% of what we read, 20% of what we hear, but 90% of what we “do and say.” So be involved in your studying: Write out important points in your own words, or read them aloud. Look up the definitions of new terms and write them in the margin. Write down questions that occur to you during your reading. Explain concepts or procedures to a classmate, or any one who will listen. (Your pet dog or cat is usually a receptive and sympathetic listener.)

**Become an active reader as well as an active listener.**

3. **Read Again** When you get to the end of the section, go back and read straight through, trying to see the overall goal and major points of the lesson. Sometimes your initial questions or confusions are cleared up when you have carefully read the whole section. Can you eliminate any of your question marks at this time? Now take a moment and mentally review what you have read. Just as you did with your class notes, write a short list, outline, or summary of the material in the section. If there is a summary or reading questions at the end of the section, study that material, too.

**Exercise 7 Becoming an Active Reader**

1. If you didn't survey the reading assignment for today's lesson before class, do it now.
2. Using a pencil to make notes in the text, study the section, as described above.
3. Think about each new concept or principle, and study the examples to see how the principle works in action.
4. Write down or read aloud the main ideas of the section.
5. Make a list of questions to ask.
6. Read the section again, then write a short summary of the main points.

Like any other skill, becoming a good reader takes practice. You may find that your first attempt to read a math book is not as successful as you would like, but it will get easier the more you do it. And the more you read what successful math users write, the more you’ll begin to think like a successful math user yourself.
Lesson 8  Doing the Homework

College is not like high school, where you might spend several days on each topic. In college classes, each topic is covered just once, and the next class session takes up a new topic. Thus, it is vital that you do the assignments each and every night, because tomorrow you'll have another assignment!

Complete your homework assignment every night, and certainly before the next class.

If you are having trouble, get help now. That is the point of the assignment: these are the concepts and skills you are supposed to learn today. You cannot just say to yourself, “Well, I guess I didn't understand the lesson. I'll have to work on these problems later.” You are responsible for understanding the lesson, and for seeking help if you cannot make sense of your notes and the textbook on your own. Your instructor will assume that you have mastered today's material, and tomorrow will lecture on new material. And understanding tomorrow's lesson depends on mastering today's assignment!

So let's assume you are settled in your Study Space, with everything you need at hand. What should you do if you can't work the homework problems?

Checkpoint 1: Have you read the textbook section and reviewed your class notes for this lesson? If not, do the reading. All the answers are there, you just have to learn how to recognize them.

After you have read the textbook and reviewed your class notes, you are ready to start on the homework problems.

Checkpoint 2: Write out your homework problems neatly in a notebook.

Some students like to use a separate notebook or separate sections of their notebook for class notes and homework problems; others like to have their homework problems right after the class notes for the same lesson. In either case, you should write out the solutions neatly for two reasons:
1. So that you can read your solutions later, when you are reviewing for the test.
2. As practice for writing solutions to problems on the test itself.

Now, approach the first problem on your assignment.

Checkpoint 3: Think before jumping in!
1. Read the instructions. You will see similar instructions on the test, so you want to get used to the language.
2. Identify exactly what you have to find. No credit for finding something else!
3. Use scratch paper for experimentation, then write the solution in your notebook.

Okay, suppose you still can't do the problem. What now?
Checkpoint 4: Regroup.
1. Do not turn to the Answer section and attempt to “work backwards” from the answer. Remember that you won't have the answers to help you on the test!
2. Look back in the book for a similar example, or a discussion that includes the same concepts or words in the problem.
3. If you are still confused, do not give up! Write down the problem number on your list of questions to ask, and go on to the next problem. Just because you had trouble with one problem does not mean that you will have trouble with all of them.

After you have finished a problem or a group of problems, don't forget to check your answers. It won't help to practice a skill if you are doing it incorrectly!

Checkpoint 5: Check your answers.
1. If your answer looks different from the answer in the book, consider whether your answer is equivalent, but in another form.
2. If your answer really is incorrect, go back to the problem and look for your mistake. It may be a simple arithmetic or algebra error, or you may have a more substantial misunderstanding.
3. If you cannot find your mistake, put the problem on your list of questions to ask about.

It must be about time to take a break now.

Checkpoint 6: Take a break. After studying for 30 to 40 minutes, take a short 5 or 10 minute break. After 2 hours, take a longer break lasting 20 or 25 minutes. Get up, walk around, stretch, get a snack, think about something fun.

Soon, you should have a routine established.

Checkpoint 7: The goal of solving problems is to understand the mathematics.
1. Try to understand how the solution of each problem works. Don't memorize steps or look for “shortcuts” -- they may not apply to all situations.
2. Keep going back and forth between reading the book and working problems. You want to be able to see how each principle is used in applications.
3. Think of doing homework as practicing for the exam.

And finally, do your best to complete the assignment. Do not become upset or worried about the problems that you had trouble with -- you can get help tomorrow. Nobody learns math without persistence; it is a process of gradually improving skills and filling in gaps.

Checkpoint 8: Keep going until you have completed the lesson.
1. Do as many assigned homework problems as you can. Your goal is to feel completely confident, so that you can work similar problems efficiently on the test.
2. After completing the assignment, close the book and list the skills and concepts you learned. Then open the book and edit your list.
3. Prepare your list of questions to ask tomorrow. Include any problems you still can't work and any points that seem unclear to you.
Exercise 8  Do Your Homework!

Always study new material at the beginning of your study time, when you are fresh.

Step 1  Read and revise your class notes, if you have not already done so.

Step 2  Study the reading assignment for today's lesson. (This is the second, in-depth reading described in Lesson 7.)

Step 3  Start working the problems in your homework assignment.

Step 4  When you are stuck, go back to your notes and textbook and look for information that can help you.

Step 5  If you cannot get a certain problem, note down the problem number on your list of questions, then continue with the assignment.

Step 6  Take breaks periodically, but keep going until you finish the assignment!

Step 7  When you finish the assignment, make a list of the questions you need to ask and the problems you need help with. Discuss your questions with your study partner, and plan to get help tomorrow on any remaining questions.

Step 8  Make a short list of the skills and concepts you learned in the homework assignment.

When you have finished tonight's assignment, it is a good idea to review briefly the lessons from earlier in the chapter and think about how the new lesson fits in with earlier material.
Lesson 9  Getting Help

A wise man once said, “The bashful cannot learn, nor the irritable teach.” You must never hesitate to ask for help when you need it. Some students fear that their teacher will think they are slow if they ask questions, or that asking questions reveals ignorance. Nothing could be further from the truth!

The important thing is to get help fast, as soon as you encounter difficulty. One unanswered question today will cause more lack of understanding tomorrow, and before you know it you will be far behind. Take advantage of the resources that are available to help you.

1. Your Teacher.  Your teacher is your best resource for getting your questions answered. If you feel shy about visiting your teacher, go with a friend. Your teacher actually welcomes questions and will be happy to help you. Have a particular question or homework problem picked out to start with. Bring your notes with you, so that you can show the teacher your work. He or she will have a better chance of locating your difficulty if they can see how you attempted the problem.

2. A Tutor.  Most colleges have a tutoring center where you can get help for free. Try several tutors until you find one you feel comfortable with. A good tutor will not work problems for you, but will help you to work problems yourself. “When you go to a math tutor for help and the tutor explains the material to you, who is going to remember more, you or the tutor? The tutor, of course! If the tutor is “saying and doing,” the tutor's abilities are sharpened. So after the material is explained and shown to you, say, “Now let me explain it to you, and work out a different problem to see if I understand.”

3. Your Study Partner.  Every math student should have at least one study partner, some one in the same class that you can call if you have to miss class, or when you are stuck on homework problems. Sometimes a person struggling with the same concepts you are can explain the material in terms that “click” with you. And there is no better way to learn material yourself than to explain it to someone else!

4. A Study Group.  Some people find it useful to study in a group, while others do not. If you work with a study group, you should read your assignment and review your class notes before you meet with the group. In particular, when reviewing for a test, you will need to put in several study hours on your own before you can expect to gain anything from a group session. Allow a short time at the beginning of your session for socializing, but then get down to work. If you do not find that you get enough out of your study group to justify the time spent, try working with a smaller group.

Studying with a friend or in a group can be both fun and beneficial. It can help you identify your areas of weakness as well as give you emotional support and reduce the feeling of isolation when studying. Here are some guidelines for studying with others.

1. Choose a partner or friends who are serious about learning math.
2. Set a regular time each week to study, preferably at least twice a week for about 1 hour.
3. Study in an area where you will not be interrupted or distracted by others.
4. Have a chalkboard or a large pad available to work out problems.
5. Spend most of the time working out problems and explaining to your partners how you solved the problem.
6. Always be a critical thinker, carefully evaluating, analyzing, and critiquing your work together.
7. Be honest with your partner when you don't understand a concept.
8. When you are dealing with a difficult concept, make sure each of you can explain it to the others.
9. Don't allow yourselves to get stuck on any one problem. Mark it down to ask about later, and move on.
10. Stay positive and supportive of each other.  

Don't forget that no amount of outside help can compensate for the time and effort you must spend on your own to master the material. As a general rule, you should make an honest effort to understand the lesson by yourself before you seek help. Ultimately, every person constructs their own knowledge in their own way, and no one can do this for you.

Make an honest effort to understand the material on your own before seeking help from others.

This is what it's all about: training your brain to learn new ideas and solve problems -- your own brain, not relying on other people's brains!

**Exercise 9  Where I Can Get Help**

1. My teacher: ________________________________
   Office hours: ________________________________
   Best time for me to meet: ________________________________
   E-mail address: ________________________________

2. My tutors: ________________________________
   Their hours: ________________________________
   Best time for me to visit: ________________________________

3. My study partner: ________________________________
   Best time to phone: ________________________________

4. My study group: ________________________________
   Group meeting time: ________________________________
Lesson 10 Preparing for Tests

Most cases of “math anxiety” are not caused by math, but are actually the result of test-anxiety, due to inadequate study and test-preparation skills. Imagine how you would feel in one of these situations:

1. You are giving a piano recital, and you haven’t practiced the piece you have to play.
2. You are enrolled in Conversational German 3, but you never mastered the basics in German 1 and 2.
3. You are competing in a relay race, but you have let yourself get out of training.

You would probably feel the same anxiety you might feel when confronted with a math problem you weren’t prepared to solve. Anxiety during a test can cause the dreaded “mental block.” A mental block occurs during a test when there is inadequate preparation before the test. The trick to avoiding mental blocks is to prepare for the test so thoroughly and comprehensively that you build your confidence to a high level, based on a high level of knowledge.

The number one goal of test preparation is simple.

Always aim for 100%.
You need to aim for 100% when you study for a test because:
1. The higher the grade you aim for on the test, the higher the grade you are likely to get.
2. Aiming for 100% helps ensure against having a “mental block” during the test.

You can read more about mental blocks and their causes in the Notes.11

Have you ever been in a situation like this:

“I studied 19 hours for my math test and only got a 37 on it.”

If you receive a low grade on a test after putting in a lot of time studying, it usually indicates that you have used ineffective study methods to prepare for the test. You will get better results if you use your time wisely and efficiently.

Guidelines for Test Preparation
1. Begin studying specifically for the test one week before the test.
2. Determine the rules and scope of the test. What material does the test cover? What types of problems and questions can be expected? Are calculators, notes, etc. allowed?
3. Test preparation should be review, not learning new material. In particular, do not try to learn any new topics on the night before the test.
4. Memorize as little as possible; instead, try to understand as much as possible. When you emphasize memorization in your test preparation, you are probably not thinking about the concepts. This can only lower your chance of success on the test.
5. Remember the fourth Key Step for Success: Follow an organized study plan specifically for taking tests.
Math Test Study Plan

1. Write out a list of all the topics the test will cover. Make your list as specific as possible. Phrase your list by describing actions to be performed, such as “Find the equation of a line through two points,” or “Solve mixture problems.”

2. Use your textbook, notes, or old quizzes to find several problems of each kind on your list, and write the problem location next to its topic. For example, you might have

   Solve a system of equations by elimination: p. 238 #9-15 odd

   a. Make your list long enough to provide sufficient practice on each topic.
   b. Make it complete enough to include all the types of problems in that topic.
   c. Include both problems of moderate difficulty and challenging problems.

3. Now work on mastering each topic by working problems on that topic. You must get to the point where you can work out the entire solution to the problem without consulting your notes or book.

   It is critical that you work on one topic at a time. It is not enough to get a general idea of how the problems work; you must develop total confidence in your ability to work problems on each topic.

   Do not expect to be able to work problems on the test if you have not practiced the problems ahead of time.

4. After mastering all the topics on your list, proceed to the Review step: Review your notes and the textbook sections that deal with the topics on your list. Pay particular attention to any questions you wrote in the margins of your notes or text. By the time of the test, you must get all of these questions cleared up.

   Most of your study time should be spent writing out and thinking about the concepts. Only a small fraction of your studying should be reading your notes and the textbook.

Write out a list of important facts, formulas, and definitions that you will need on the test. Make sure that you can write any formulas from memory.

5. Finally, you must learn to recognize types of problems presented in random order. Problems seem more difficult on tests because you don't have the usual cues to help you out. When you do homework, there are clues about how to start a problem, such as knowing which section of the text it comes from or what topic you studied today. On the test, you won't have these clues. As you are studying, pay close attention to the instructions that come with each type of problem. These will be valuable tips for how to proceed on the test! Think of ways to distinguish each type of problem on your list. Visualize how they are similar and how they are different. Write down hints to help you identify each type of problem.
6. Once you have completed steps 1 through 5, you are ready to take a practice test.

To guarantee success, you must master all the topics on your list before you work on any practice tests.

Obtain or make for yourself a practice test including problems from all the topics on your list. If you study with a partner and a group, make and exchange practice tests. Now write out the solutions to your practice test under test conditions: no notes, no books, and no help! Your practice test will be probably be longer than an actual test, because you have included all possible problem types. Nonetheless, estimate a reasonable time deadline for your practice test so that you will get used to working under time pressure. It will also help if you can simulate the physical conditions of the testing room as well.

Get your practice test corrected, and work on any remaining weaknesses in your list of problems.

Final Preparation Tips
1. Do not try to learn new material the night before the test.
2. Group study sessions can be very valuable, but do not let them substitute for your own individual study time.
3. Get a good night's sleep the night before the test.
4. Eat a healthy breakfast on the morning of the test.

Exercise 10  Making A Topic List for the Test

Start your topic list one week before the test. Your instructor may not have covered all the material on the test yet, but you can add new topics to your list throughout the week.

1. Look at each section of your textbook and list the topics covered in that section. Use the subheads of the section as an outline to get you started. Leave space below each subhead to add specific problem types.
2. Go through the homework assignment for each section of the text, and under each of the topics from step 1, write down the instructions for each type of problem that was assigned.
3. Choose several problems from each group of assigned problems you identified in step 2, and note them down by the topics in your list.
4. Make a list of all the skills you encounter in the problem instructions, such as “Factor completely,” or “Solve for the indicated variable.” Check that each type of skill is included in your topic list.
5. If there were any other skills or concepts included in your class notes besides the ones in your textbook, add those to your topic list.
6. Become familiar with your topic list, so that during the test you can identify any problems that look unfamiliar. If it's on the test, it has to be one of the problem types on your list!
Lesson 11  Test-Taking Skills

Now that you are fully prepared for the test, there are still steps you can take to maximize your performance.

Taking the Test

Always arrive a little early for a test. Leave yourself time to get settled and get your materials together. Arriving late will only make you flustered and make it hard for you to concentrate.

1. **Memory dump.** As soon as you receive the test, write down all the formulas or other information you think you might forget.

2. **Preview the test.** Look through the entire test quickly and briefly to see the kinds of problems and their point values.

3. **Second memory dump.** Write down anything else that was jarred from your memory while doing the preview.

4. **Strategy.** Decide upon the best way to get the most points in the least amount of time. Do the easiest problems first and save the hard ones for last. Make sure you tackle problems with high point value.

5. **Start working** through the test as fast as you can while still being accurate. Review your answers to make sure they make sense.

6. Clearly **write down each step** in the problems in order to get partial credit.

7. Do not spend too much time on any one problem. If you find a problem you don't know how to work, automatically **skip it and go on** to the next one. When you come to the end of the test, **go back** to the problems you skipped. Run through your mental topic list to identify the type of problem and how to begin.

8. **Guess** at any remaining problems or do as much work on them as you can.

9. **Review** the test for careless errors.

10. **Use all the allotted test time.** If you have time left, check the solution to each problem, or rework the problem on a separate sheet of paper. Remember: There is no prize for handing in your test first!

Six Common Test-Taking Errors

1. Misunderstanding or not following the directions.

2. Careless arithmetic or algebra errors.

3. Concept errors. These are errors made when you don't understand the properties or principles needed to work the problem. If not corrected, concept errors will follow you from test to test, causing you to lose points. Students who have too many concept errors will fail the course. It is not enough to find out how to work that particular problem -- you must learn why you missed that problem, and get help as soon as possible.

4. Application errors occur when you “know” the concept but cannot apply it. Being able to state a rule or formula is not enough to be able to use it! To reduce application errors, you must practice the type of problem before the test.

5. Strategy errors in test-taking itself. Some examples are:
   a. Not completing problems to their last step.
   b. Spending too much time on one problem.
   c. Making careless errors on easy problems.
   d. Leaving answers blank.

Everyone makes some of these errors occasionally, but if you consistently make one or more of these mistakes, you should make a conscious effort to avoid doing so in the future.
6. Study errors. Not spending enough time on certain topics or studying the wrong material, or using ineffective study techniques. Do not fall into old bad habits when studying math!

**Learning From Your Returned Test**

You can learn a lot by going over your test when it is returned. If you are still hazy about some of the material on this test, it will make it difficult or impossible to master the material on the next test. In any case, you'll see it all again on the final exam.

1. Locate all your errors and write corrections on the test in a different color.
2. Identify any careless errors and analyze why you might have made them. Were you working too fast? Did you forget to check your work?
3. If there are some problems you still don't understand, get help from your teacher or tutor.
4. If there are some problems or topics that caught you by surprise on the test, mark those areas in your notes and study them again.
5. Look for any strategy errors you might have made and be aware of them on future tests.
6. Try to form an overview of the test and see how the instructor views the material. What topics did he or she emphasize? What kinds of problems? What kinds of errors lost the most points, and which were “minor” errors? This should help you predict what the next test will be like and help you study for it.

Save your returned tests (along with quizzes, homework, etc.) to help you study for the final.

**Exercise 11 Learning from a Returned Test**

1. When you get your test back, try to correct your mistakes, using a different color pen or pencil.
2. Identify each mistake as a conceptual error, an application error, or a careless error.
3. After correcting your errors, try to write out the solution to each problem you missed without looking at your notes or text.
4. For each problem that you missed on the test, find at least one similar problem in the textbook and practice solving that type of problem.
5. Put stars by each of the topics on your test topic list that actually appeared on the test.
Lesson 12  Taking Control

Have you heard other students use any of these excuses, or perhaps used them yourself?

1. I can do all the homework problems, but on the test I freeze up.
2. I understand the material, but not the way the teacher does it.
3. I can't understand the textbook, but I know how to do the problems.
4. I really know this stuff, I just forget some of the steps.
5. I can do the problems as long as they tell me how to start.
6. The tests never look the same as the problems we did in class.
7. I've had all this before, but you're not teaching it the way I learned it.
8. I didn't know what you wanted.

These statements are examples of creative self-deception, and they all indicate that the speaker's study techniques need improvement!

Now that we've practiced some proven study skills especially designed for math, you must have the dedication and courage to use them honestly and consistently. It is unlikely that you will become a math whiz overnight, but you will see steady progress in your abilities and your understanding, thus increasing your self-confidence. Who knows: you may even end up enjoying math!

As you pursue your math goals on the road to success, there are three particular stumbling blocks to avoid:

1. Making Excuses
2. Procrastination
3. Negative Thinking

Let's take a closer look at each of these hobgoblins.

Making Excuses

Your locus of control is where you believe control of your life is located; in other words, who or what you feel controls your behavior and success or failure. “Students who feel that conditions beyond their control prevent them from getting good grades have an external locus of control. These students blame instructors, home conditions, and money problems for their poor grades and feel they can do nothing about their problems. In essence, external students feel their lives are controlled by outside forces such as fate or the power of other people.

“Other students feel they have the power to control their situation and this power comes from within. These internal students take responsibility for their success, while external students reject responsibility. Internal students believe they can overcome most situations, since results depend on their behavior or personal characteristics.”

Most people have a little bit of both outlooks, both internal and external, and circumstances can cause them to temporarily favor one philosophy over the other. How can you acquire and maintain an internal locus of control? You can take more responsibility for your success by developing and accomplishing short-term and long-term goals.

In Lesson 1 you defined your long-term goal for mathematics success, but along the way we need short-term goals to work towards. A short-term goal might be “I want to be able to solve quadratic equations,” or “I want to be thoroughly prepared for the midterm next week.” Not even small, short-term goals will occur on their own; they must be actively pursued. You should set a
realistic time-frame for accomplishing the goal, and schedule time for working towards the goal. It may be helpful to list the steps or activities that will lead to your goal, and make a schedule for those activities.

<table>
<thead>
<tr>
<th>Goal:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date for accomplishing goal:</td>
</tr>
<tr>
<td><strong>Schedule</strong></td>
</tr>
<tr>
<td>Date and Time Block</td>
</tr>
<tr>
<td>--------------------------------------------</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>My reward for accomplishing my goal:</td>
</tr>
</tbody>
</table>

Post your schedule in your study area as a reminder to work on your goal. Check off each step as you finish it, and don't forget to reward yourself when you reach the goal. You can see a sample schedule in the Notes.14

**Procrastination**

People procrastinate for a variety of reasons. Some students who fear failure procrastinate to avoid any real assessment of their true ability. By waiting too long to begin work on a paper or study for a test, their real ability is never measured. Others may be “closet perfectionists.” Perfectionists usually expect more from themselves than can possibly be attained.

Another cause of procrastination is a desire to rebel against authority. Students may believe that by handing in their homework late or by missing the test they can get back at their instructor. These students usually lack self-esteem and would rather blame the instructor for their poor grades than take responsibility for completing their homework on time. Rebelling against the instructor gives them a false sense of control over their lives. They discover, often too late, that they are only hurting themselves.

Here are some strategies for dealing with procrastination.

1. **Divide and conquer**
   Many students procrastinate because their math assignments seem too large, overwhelming, or complicated. You can deal with large assignments by dissecting the task into small “bite-size” subtasks. For example, you might read your assignment in small sections, then separate it into different topics or skills and practice each separately.
   Work on one subtask at a time. Arrange it so that each subtask takes only a short time to accomplish. Take breaks between tasks, or spread them out over more than one study session. Finishing even part of your assignment is good incentive to keep going!

2. **The timer trick**
   If you have trouble sitting down to concentrate, try setting a kitchen timer for 20 minutes or a half-hour, and put the timer in a different room from where you are studying. Now tell
yourself. “I only have to study for this period of time. When the timer goes off, I’ll decide whether to set it for another small block of time.” This puts you totally in control of your studying, and also forces you to take small breaks.

3. Challenging your inner dialogue
Many procrastinators get stuck in negative, self-defeating thoughts. Get in the habit of answering back to that negative inner voice. Add your own favorite rationalizations and action responses.

<table>
<thead>
<tr>
<th>Procrastination Talk</th>
<th>Action Talk</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I don't know where to start.</td>
<td>1. I'll divide my assignment into small chunks and work on one chunk at a time.</td>
</tr>
<tr>
<td>2. I don't know how to do it.</td>
<td>2. I'll look in my textbook and notes for an explanation, or ask for help.</td>
</tr>
<tr>
<td>3. I'll leave this until I can ask the teacher.</td>
<td>3. I'll work on some of it now, and then I'll know what to ask.</td>
</tr>
<tr>
<td>4. I'm not in the mood to do it.</td>
<td>4. Do it now! Just do it!</td>
</tr>
<tr>
<td>5. I still have time; I can wait until later.</td>
<td>5. Time flies; I'll feel better when it's done.</td>
</tr>
<tr>
<td>6. There's just too much to do.</td>
<td>6. One step at a time -- Rome wasn't built in a day.</td>
</tr>
<tr>
<td>7.</td>
<td>7.</td>
</tr>
<tr>
<td>8.</td>
<td>8.</td>
</tr>
</tbody>
</table>

Negative Thinking
Whenever possible, surround yourself with positive math thinkers, people who like math and are succeeding in it. Protect yourself from people who put math down and who feed into your own uncertainties and insecurities about math. If all the people around you did poorly on the test, maybe it’s because you are sitting with the poor students. Build a support group of positive math thinkers!

1. Don't forget you already have resources at your fingertips: your teacher, counselors, and other faculty are all there to help you. Don't hesitate to use their services.
2. Seek out the best tutors at your school’s math lab, and visit them frequently. The better they get to know your math skills, the better they can help you.
3. Make friends with the serious students in your class. Ask if you can join their group if your class uses group work. In return, be generous with help for classmates; the best way to learn something is to teach it to someone else.
4. Find a study partner and ask him or her for advice on homework or points you missed in class.
5. Do you have any users of math or science among your relatives or older friends? Make those people your mentors. Ask them how math helps them in their careers, and rely on them for support and advice.

Identify at least six people in your life who could be part of your positive math thinkers support group. List people who enjoy math, who are encouraging your progress on the road to success in math, and who think it's great that you are working on overcoming your math fears. Make them an active and involved part of your math support group.
My Math Support Group

1. _____________________________________________
2. _____________________________________________
3. _____________________________________________
4. _____________________________________________
5. _____________________________________________
6. _____________________________________________
7. _____________________________________________
8. _____________________________________________

Negative thinking often comes in the form of Math Myths, or things that “everybody knows” about math. Here are some examples; feel free to add some of your own.

**Wishful Thinking**
1. Some people have math minds.
2. Math is mainly a lot of memorization.
3. It doesn't matter how much you study math; either you get it or you don't.
4. If you understand what the teacher is doing at the board, then you are okay, you don't need to work a lot of problems.
5. If you can't work a problem on the first try, you won't be able to get it without help.
6. Since nobody else is asking questions, they must all understand everything.
7. Everyone will think I'm dumb if I ask this question.
8. I don't need to read the book; the tests will only cover what we do in class.
9. If I get behind I can catch up later: I'll get a tutor to show me the quick way to do this.
10. It probably won't be on the test.

**Realistic Thinking**
1. Some people work more, but everybody works at math.
2. The more you understand, the less you have to memorize.
3. Understanding math is a slow process; it takes work and practice.
4. Math is learned by doing, not by watching.
5. You often learn the most from your mistakes and false starts.
6. Or else they haven't done the assignment yet!
7. If you have the question, probably five other people have the same question.
8. The teacher assumes you have read the book; class discussions are designed to supplement the text, not replace it.
9. “There is no royal road to mathematics.”
10. To avoid a mental block, you need to learn all the material for the test.
Notes
1. “...research on thousands of students who have either convinced their instructors to place them in higher level math courses or who have placed themselves in higher level math courses [shows that] these students failed their math courses many times before realizing they didn't possess the prerequisite cognitive entry skills needed to pass the course.

To be successful in a math course, you must have the prerequisite cognitive entry skills... Even if you do [earn] a D or a C, research indicates you will most likely fail the next higher level math course.

It is better to be conservative and pass a lower level math course with an A or B instead of making a C or D in a higher level math course and failing the next math course.

This is evident by the many students who repeat a higher level math course up to five times before repeating the lower level math course... After repeating the lower level math course with an A or B, these students passed their higher level math course easily.”

Paul Nolting, Winning at Math

2. Cynthia Arem, Conquering Math Anxiety

3. Adapted from Cynthia Arem, Conquering Math Anxiety

Sample Plan for Math Success
1. List one realistic math success goal you wish to achieve. State your goal in specific, positive, measurable terms, expressing exactly what you want.

   I want to pass intermediate algebra this semester with at least a C grade, with the help of my teacher, my counselors, the tutors, my support system, and my willingness to do it!

2. Set a realistic target date for achieving your goal. You may wish to set three dates:

   Optimistic target date:
   Realistic target date: the end of this semester
   Latest acceptable date:

3. List as many benefits and potential satisfactions you will earn by achieving your goal as you can.

   1. Learning math would enable me to meet my career goal of becoming a doctor.
   2. I would be able to get higher paying jobs.
   3. I would be able to help my friends and kid brother with math homework.
   4. It would help me to be successful in my science courses.
   5. I would have more confidence to take college algebra and calculus.
   6. I would have improved self-esteem.
   7. I would feel good about my accomplishment.
   8. I would be more relaxed dealing with math in daily life.
   9. I would prove to myself that I can be successful as a pre-med major.
4. List some barriers or obstacles you may face, and the steps you will take to overcome them.

<table>
<thead>
<tr>
<th>Barriers</th>
<th>Steps to Overcome Barriers</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. fear or panic</td>
<td>a. breathing exercises or self-talk to calm my nerves</td>
</tr>
<tr>
<td>b. memories of my parents telling me I don’t have to do well in math since my mother didn’t</td>
<td>b. telling myself I need to know and do well because I am not my mom</td>
</tr>
<tr>
<td>c. being a perfectionist</td>
<td>c. emotionally accepting what I already know intellectually: Nothing in life is perfect.</td>
</tr>
<tr>
<td>d. perceived lack of time</td>
<td>d. I must set aside specific blocks of time to study math</td>
</tr>
</tbody>
</table>

5. List the positive abilities and strengths you possess to help you meet your goal.

My willingness and desire to learn math.
I’m not afraid to raise my hand and ask questions in class.
I have perseverance and patience.
Like the mountain climber — once I set out, I am determined and I don’t give up until I get where I want to go.

6. List several people who can help you meet your goal.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type of Help They Can Give</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ms. Collins, my math teacher</td>
<td>She can clarify topics I’m confused about</td>
</tr>
<tr>
<td>Mr. Soto, my counselor</td>
<td>He offers me emotional support</td>
</tr>
<tr>
<td>Iliana, Hiro, and Sasha, the math lab tutors</td>
<td>They can review my math step by step.</td>
</tr>
</tbody>
</table>

7. List the significant Action Steps you will take to meet your math success goal.

<table>
<thead>
<tr>
<th>Action Steps</th>
<th>Frequency or Target Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Do all my homework as soon as I leave class</td>
<td>every day</td>
</tr>
<tr>
<td>b. Ask my teacher for extra help</td>
<td>whenever needed</td>
</tr>
<tr>
<td>c. Go to the tutors regularly</td>
<td>twice weekly</td>
</tr>
<tr>
<td>d. Arrange a quiet time to study math</td>
<td>every day</td>
</tr>
<tr>
<td>e. Ask my older sister for emotional support</td>
<td>by Sept. 20</td>
</tr>
<tr>
<td>f. Make up practice tests for myself</td>
<td>once a week</td>
</tr>
<tr>
<td>g. Do relaxation and visualization before my exam</td>
<td>Sept. 21, 22, 23</td>
</tr>
</tbody>
</table>

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8. Describe how you will reward yourself for meeting your math goal.

   I will take a trip and visit my best friend in Los Angeles and we will go to Disneyland.

4. Adapted from Richard Manning Smith, *Mastering Mathematics*
5. Cynthia Arem, *Conquering Math Anxiety*
6. Adapted from Cynthia Arem, *Conquering Math Anxiety*
7. “Suppose you miss one of your math classes. Then, between that class and the next class, you do not bother to contact another student to learn what material was covered and what homework was assigned. At the beginning of [the next] class, some students are asking questions. Since you did not get the notes or do the homework, the students' questions and the teacher's answers do not make much sense to you and you feel lost.

   “After the questions are dealt with, the teacher begins to teach new material. While presenting this material, the teacher assumes you have read the previous notes and have completed all the assigned homework. Since you have neither done the homework nor mastered the notes, the teacher is moving too fast for you. . . . By the end of the class, you have understood very little. You will now be behind not just one class, but two classes.”

   Richard Manning Smith, *Mastering Mathematics*

8. Cynthia Arem, *Conquering Math Anxiety*
9. Cynthia Arem, *Conquering Math Anxiety*
10. Cynthia Arem, *Conquering Math Anxiety*
11. “Even if you allow yourself to be weak on only one topic, you are likely to worry during the test about that topic appearing. While approaching any given problem, you may very well be distracted by the possibility that knowledge of that weak topic will be tested somewhere in the problem. In this way, you run the risk of losing all confidence that you can succeed on the test. This loss of confidence can result in a nervousness that can make you unable to recall mush of the knowledge that you do have. Students often label this lack of recall knowledge during a test a “mental block.”

   “Consider the case of Steven, who thought he had studied very hard for his algebra test. However, Steven still felt weak on one topic in one of the chapters. Because the teacher had discussed this topic only briefly, Steven thought, “It probably won't be on the test.” During the test, Steven begins to get nervous, worrying that his omitted topic will appear on the test. At one point, he gives up on a problem, since he thinks it might require knowledge of the omitted topic. In giving up on the problem, he becomes more nervous and insecure, and begins to forget some of the material he had been confident about just a few minutes before the test.

   “When Steven does poorly on the test, he says, “I really knew the material; I just had a mental block during the test.” But Steven was wrong in thinking that the mental block originated during the test, and that he had no control over it. His mental block was caused by his lack of confidence resulting from his omitting one topic from his studying.

   “Another possible cause of a mental block occurs when you have “studied” all the topics but have only a “general idea” about some of them. This lack of a thorough knowledge of one or more topics will likely cause you to be unable to answer questions on these topics, which in turn may result in the feeling that you have a mental block.”

   Richard Manning Smith, *Mastering Mathematics*
12. This section is adapted from Paul Nolting, *Winning at Math*
13. Sample short-term goal schedule.

| Goal: Prepare thoroughly for my math midterm. |
| Date for accomplishing goal: Next Wednesday (one week from today) |

<table>
<thead>
<tr>
<th>Schedule</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Date and Time Block</td>
<td>Description of Activity</td>
</tr>
<tr>
<td>Thursday, 6-8 pm</td>
<td>Make a topic list for the test</td>
</tr>
<tr>
<td>Friday and Sat, 3-5 pm</td>
<td>Master the topic list</td>
</tr>
<tr>
<td>Sunday, 4-5 pm</td>
<td>Review textbook and notes</td>
</tr>
<tr>
<td>Monday, 3-4:30 pm</td>
<td>Take practice test</td>
</tr>
<tr>
<td>Tuesday, 10-11 am</td>
<td>Get any remaining questions answered</td>
</tr>
</tbody>
</table>

My reward for accomplishing my goal:
Suggestions for Other Lessons:
  Relaxation and Anxiety Reducing Techniques
  Improving Memory
  The Language of Mathematics
  Group Work
Proposed Lessons for PD40

1. Attitudes and Goals
2. Scheduling Your Time
3. Successful Student Behavior
4. Creating a Study Environment
5. Learning Style and Autobiography
6. Getting Help
7. Maintaining a Positive Attitude
8. Memorization Techniques and Learning Theory
9. Test Stress Reduction
10. Taking Control

Proposed Lessons for the Math Course

1. Syllabus Search and Keeping a Notebook
2. What Makes Math Different and Math Anxiety
3. Listening and Classroom Skills
4. Reading a Math Textbook
5. Doing the Homework
6. Note Cards and Review Sheets
7. Preparing for Tests
8. Test-Taking Skills
9. Post-Test Analysis
10. Mid-semester Check-up
11. The Final Exam
Syllabus Search

Name ________________________________

Group Members: 1. ________________________________
Group Members: 2. ________________________________
Group Members: 3. ________________________________

Each group member should fill out a worksheet and turn it in. Use your class syllabus to find the following information.

My instructor’s name is ________________________________

I can contact my instructor by:

Phone: __________________________ E-mail: __________________________

My instructor’s office is located in Room __________________________

My instructor’s office hours are __________________________

The website for this class is ________________________________

The required textbook is titled ________________________________

Other materials I need for this class are ________________________________

The three elements of participation are ________________________________

Students who are not participating ________________________________

Course Grading Policy

I plan to earn a(n)  A  B  C in this course.  (Circle one.)

What must I do before my assignments will be graded? ________________________________

My course grade will be based on my scores on four types of assignments:

________________________________________________________________________

The grading scale is: A ________  B ________  C ________  D ________

What is the policy on make-up tests? ___________________________________________

The date of the Final Exam is __________________________

(over → )
**College Etiquette**

What should I turn off before coming to class?

What should I do if I have to leave class early?

When should I talk to my instructor about my individual situation?

What should I not do if I leave a test early?

**Resources for this Course**

The name of my current study partner is ____________________________

If I have to miss class, I should ____________________________

In college, where does most learning take place?

What is the key to learning skills?

If I have trouble with an assignment, when should I seek help?

If I need help in this course, I can use the following resources:

1. ____________________________
2. ____________________________
3. ____________________________
4. ____________________________

A good time for me to meet with a study group is ____________________________

If I need accommodation due to a disability, I should contact ____________________________

Questions for my instructor about course policies:
Strategies for Success: Getting Off to a Good Start

Attitudes and Goals
The most important quality that will affect your success in a math course is your attitude. You can best work toward your goals if you maintain a positive attitude. No matter what your experiences were in previous math courses, you can build your own success starting now.

“Educators have known for centuries, for a student to achieve academic success, it takes more than innate ability, competence, or the desire to learn. The key element in this process is having a positive attitude. A positive attitude becomes the catalyst, propelling you along the road to your math goal.”

The first step in creating a mindset for success is to have a clearly defined goal. “Goals are like anchors to the future we desire. We must toss them out in front of us and then use them to pull ourselves along. In this way, you take control of your math future. Your math success will happen by your design and not by chance.”

You are in control of how much time you devote to your course, and how you use that time. Regardless of any past obstacles or troubles, your chances of success are greatly increased if you make consistent, intelligent efforts toward pursuing that success. You can learn techniques for using your study time efficiently and effectively.

Forget about the reasons why you haven’t been successful in the past. Do not use these as excuses for not doing well now! Take responsibility for your own education. Make up your mind that you will do whatever it takes to master the course without making excuses for your lack of success.

There is nothing a teacher can do that will make up for what a student won't do.

Taking Care of Business
Are there any “holes” or weaknesses in your math background that could affect your success in this course? You must patch them up as soon as you encounter them! Now is the time to seek help with any difficulties you might have let slide in the past. You will probably find that those troublesome topics are not as difficult as you feared.

Do you suffer from “math anxiety?” Most cases of math anxiety are actually caused by test anxiety, due to inadequate preparation or poor test-taking skills. The key to conquering test anxiety is building the self-confidence that comes with mastering the material. You can build this confidence, one topic at a time!

What if you encounter setbacks along the way? Everybody does! Learning math (or any other subject) is not a straight-line process; it is more like fitting together the pieces of a jigsaw puzzle. But successful students know that persistence and hard work, even in the face of setbacks, will pay off in the end. Even if you don't feel that you have control over your success, you should act as if you do, continuing to build your knowledge and your skills.

Overcome obstacles in your math courses with attention to detail and a persistent, never-quit attitude.
Hit the Ground Running

The first few days and weeks of a math course are crucial. Now is when you form your own study habits, and when you become accustomed to your teacher's expectations. Now is when you dust off your academic skills and become reacquainted with mathematical thinking. Besides, the material at the start of the course is the easiest, and a lot of it may be review. Getting a few good grades under your belt now can provide a cushion when you encounter the harder material at the end of the course!

Your positive attitude can affect your teacher as well. Your teacher will be more enthusiastic about preparing interesting lessons and more willing to spend extra time with you if you are making an effort to learn. If you are not interested in learning the subject, your teacher will have less interest in helping you.

To have a positive approach to your math course, make four decisions now.

<table>
<thead>
<tr>
<th>Attitudes for Success</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Recognize that you have control over how well you do in the course.</td>
</tr>
<tr>
<td>2. Decide now that you will make an honest effort to do well in the course.</td>
</tr>
<tr>
<td>3. Decide now that you will work not merely to pass the course, but to do much better than pass.</td>
</tr>
<tr>
<td>4. Decide now that you will persist in working hard in the course until the end, regardless of any setbacks that might occur along the way.</td>
</tr>
</tbody>
</table>
Strategies for Success: Getting Off to a Good Start

A. Answer the questions based on the reading assignment.

1. What is the most significant controllable quality that influences my success in a math course?

2. How can I stay motivated to do well in my math course?

3. How can I reverse poor past performance in math courses?

4. How can I overcome a poor math background or a large time gap since my last math course?

5. How can I decrease my math anxiety?

6. How should I respond to any setbacks?

7. What should I do if I don't feel I have control over my success in the course, or am not enjoying it?

8. What strategy should I pursue for the first few weeks of a math course?

B. Check the top five changes you plan to make in your attitude and approach.

   ____ 1. I will find reasons to dedicate myself to the course.
   ____ 2. I will make an exceptional effort right from the beginning of the course.
   ____ 3. I will have a persistent, never-quit attitude.
   ____ 4. I will patch up my weaknesses in the course as soon as I encounter them.
   ____ 5. I will act as if I have control over my own success.
   ____ 6. I will work not just to pass, but to earn the highest possible grade.
   ____ 7. I will persist until the end, regardless of any setbacks that might occur.
   ____ 8. Other:

Write out your five objectives and post them in your study area.
Why Is Math Different?

1. Describe you long-term academic and career goals. Why is success in your math class important to your goals?

2. List several reasons why learning math is different from learning other subjects.

3. List several ways in which college courses are different from high-school courses.