

# Focus on Study Skills for Mathematics



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## **Focus on Study Skills of Mathematics**

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# Focus on Study Skills for Mathematics

Starting college and taking an Arithmetic/Algebra Course is a downer. The student is studying, one more time, material that was not learned before. That is discouraging, and the negative feelings of some students interfere greatly with opportunities for success.

Many students in these situations think something is inherently wrong with them. They tend to give up before they start and make statements like:

“I’ve never been good at math.”

“I don’t have a math mind.”

“I don’t like math.”

“My mother can’t do math either.”

All of these statements, and others like them, really mean that the student doesn’t believe he/she can be successful in a math course. Not surprisingly, once a student accepts that belief the likelihood of doing well in mathematics is slight indeed.

## Attitudes of Students Who Do Well in Mathematics

Students that do well in mathematics believe they will succeed and then do the common sense things needed to support that belief.

1. They attend class without fail.
2. They listen carefully and take good notes.
3. They always do all of their assignments.
4. They show all their work and they arrange it very neatly so they can refer to it later and read it easily.
5. They ask questions — lots of questions.
6. They work hard because nothing worthwhile is ever gained without a struggle.

## Attitudes of Students Who Don't Do Well in Mathematics

Students who expect to fail in mathematics don't believe they can succeed and frequently do such silly things that their belief comes true.

1. They frequently miss class and make little effort to find out what was missed.
2. They don't listen carefully and rarely take notes that would help them remember.
3. They give up on any assignment that is difficult and skip some problems because they seem easy.
4. They write far less than their teacher would and they write *so small* that hardly anyone could read it anyway.
5. They hardly ever ask questions and are usually afraid that they will ask a "stupid" question. There really is no such thing as a "stupid" question.
6. They believe they are destined to do poorly anyway so they don't work hard. What's the use??

## Today Is a New Day for You and Mathematics

The first objective you need to accomplish any mathematics course is to establish the belief that you can, and will, succeed. This is not an easy task. You need to carefully consider your past experiences in mathematics and make plans to change those behaviors which did not work for you in other courses. Today is a new day in your mathematics life, a chance to start over and do it right, and an opportunity to find the easy ways to study and learn mathematics.

We do not believe you are destined to fail. In fact, our many years experience with students like you have convinced us that there is nothing biologically or intellectually deficient about you. More commonly, our students have come to us with beliefs about mathematics and study habits in the subject which have made the subject very hard to learn. The aim of this section of the book is to present efficient and effective ways of dealing with your learning of mathematics. Many study skills have been preached constantly at you over the years. You have probably been told:

“Read mathematics carefully.”

“Keep paper and pencil handy so you can constantly try the problems.”

“Arrange your work neatly so you or someone else can find any errors.”

“Do all your assignments and never get behind.”

All of these statements are excellent advice. If you have ignored them in the past, make certain that you follow them in this course.

In this section, however, we want to go beyond some of the past advice you have been given and expand on four major themes for organizing your study of mathematics. Our aim here is to encourage you to change the ways you study mathematics. It is the way you have studied in the past that is the problem. The mathematics will be far easier if you find new ways to study it.

The four themes for organizing your study of mathematics are from the work of Claire E. Weinstein, Professor of Educational Psychology, University of Texas at Austin. These four themes are:

1. Work and study in quality environments.
2. Learn what is to be memorized and what must not be memorized.
3. Keep your mind active.
4. Learn to evaluate your own work and study habits.

## 1. Always work and study in a quality environment

A student does better work, stays at it longer, and feels better about the learning when that work is done in a setting in which the student is comfortable and physically relaxed. Your body and your mind should not be the source of any distractions. You want to be able to devote full energies, physical and mental, to your study.

*Focus on  
building a  
quality  
study  
environment*

A good restaurant earns its reputation on much more than the quality of its food. A restaurant is judged as much on its atmosphere (ambiance) as on its menu. Customers expect fine food to be served in a comfortable environment.

Make a list of the physical attributes of a fine restaurant. Some of these attributes may be different than you want in a good study. The important new idea to incorporate in your behavior is the selection, by you, of an environment that will allow you to study more effectively. Don't settle for less in your study environment than you demand in your other activities. Otherwise, you will not be your best when studying.

### Physical Attributes of Quality Environments

Physical attributes such as lighting, temperature, and noise level are obvious factors to be carefully regulated by the student. Yet these obvious factors are sometimes ignored by students who are having trouble in a subject. Serious study cannot occur while working the drive-in window at MacDonald's or watching the Super Bowl on television. Although these examples may seem extreme, you need to look at your own study sessions and make certain they eliminate all possible physical distractions.

*Focus  
on sounds  
in your  
study  
environment*

The sounds in your study environment would be a good place for you to start altering the way you work. Complete silence is not necessarily the best condition, but loud rock and roll is definitely not helpful. You should try to find sound that is soft enough not to be intrusive and with a slow beat. Try playing classical musical at such a low volume that you cannot pay attention to it. That music will over-ride other sounds in your environment that might be distracting.

## Psychological Attributes of a Quality Environment

Besides the obvious physical attributes of your learning environment, but equally important, are qualities which are psychological in nature. Fear of mathematics or anxiety over mathematics interferes greatly with the study habits of some students. Those fears or anxieties must be dealt with prior to a study session if they are to be overcome. Your mind, as well as your body, must be free from distractions. A mind that is full of fear or worry has no capacity to also learn mathematics. If your mind is distracted by other thoughts find ways to clear it before studying. Otherwise, it will make your study time inefficient and distasteful. The result will be a lessening of your efforts and eventual failure.



Relaxation techniques can be learned and they will lower the level of fear or anxiety. You can learn methods like Benson's Relaxation Technique from books in the school library or on the Internet.

All students should learn, as a minimum, to pay attention to their breathing. Do not attempt to alter your breathing. Just pay attention to it and its rhythm. That simple focusing will, by itself, have beneficial results in any anxiety producing situation. Try it. The more you try it, the better will be your results.

## Play the Role of a Scholar

A final aspect of your environment needs close attention. Education is more than simply learning a list of facts. It is a different lifestyle with a value system that respects books, music, art, and beauty from an altered perspective. Put good literature, classical music, fine art, and flowers into your environment. Live with these elements in your study environment.

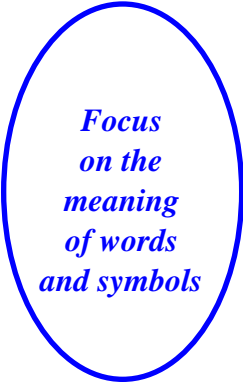
Imagine the private study of a learned professor at Yale and try to create the same study conditions for yourself. Playing the role of a scholar is helpful in becoming a good student.

## 2. Learn what part of mathematics needs to be memorized and those portions of the subject that must be figured out.

A major problem for many students is the belief that all mathematics should be memorized. This is false and trying to memorize everything always leads to failure. If you have been memorizing much in mathematics, that is not only inefficient – it is destructive. Read this section carefully and develop new ways of dealing with mathematics information.

### Memorize Definitions and Symbols

In general, the **only** material that should be memorized in a mathematics course is the meaning of words and symbols. A good mathematics student must know the meaning of a word like “percent” and its symbol “%.” **Memorize words and symbols** because their meanings are crucial to working out problems that contain them.



*Focus  
on the  
meaning  
of words  
and symbols*

Words and symbols play a crucial role in mathematics which is often overlooked by students. At the same time, words and symbols do not have meanings that can be figured out or discovered. Someone, your teacher or your textbook, needs to give you clear definitions for all the words that are relevant and clear descriptions of any new symbols that are introduced.

Words like “percent” and symbols like the radical sign,  $\sqrt{\quad}$ , must be clearly understood before problems that contain them can be learned. Such words and symbols must be memorized. Don’t skip past them and attempt to do problems without first understanding them.

## Do Not Memorize Rules, Laws, or Processes

In general, do not memorize the steps involved in working a problem. **Do not memorize** rules or laws. Such memorization clutters your mind unnecessarily and tends to misdirect all your study. Blindly memorizing a “bunch of rules” is not the same as learning mathematics. Find reasons why rules, laws, processes, or steps work. If you understand why, there will be no need to memorize more than words or symbols.

*Focus  
on not  
memorizing  
rules or  
processes*

Treat rules or laws in mathematics just as you treat the legal laws in your community. Nobody memorizes all the state laws. Instead, the good citizen tries to make sense of them and learns how they apply to his/her needs.

Rules and laws of mathematics also need to make sense. Your study of them needs to uncover the logic that supports them. If you learn the reasons for different steps in a problem then you will find it is both unnecessary and unwise to learn the steps themselves!

## Focus

Finally, and very importantly, you need to direct your attention to the particular idea or skill that is to be learned. **FOCUS** on each new idea or skill. The format and presentation of the instruction will constantly alert you to the new material that must be the object of your attention.

You need to **FOCUS** specifically on the purpose of each new idea or skill as it is presented. Do not be distracted by other parts of a problem or its accompanying material.

*Focus  
on the  
objective of  
each lesson*

Each new idea or skill in mathematics will be presented to you in a context which contains many other ideas with other skills. It is essential that you recognize both the new ideas and the older ones. You must learn to concentrate on the new ideas. This is what is meant by **focusing**.

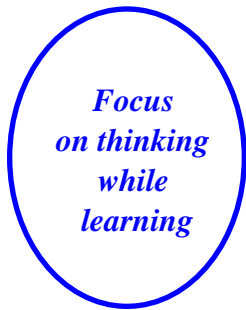
Poor mathematics students generally try to learn with only a vague idea of the particular new skill being taught at any moment. Good mathematics students practice the habit of giving their undivided attention to the one new aspect of a problem that needs to be learned while treating the other parts of the problem as background information.

### 3. Keep your mind active

Learning is an activity of the mind and no one is learning when they aren't thinking.

**There is no way to divorce learning from thinking.**

You can improve your ability to learn by constantly making certain that you are thinking. Good learning of mathematics occurs when the student is thinking about the mathematics. Poor learning of mathematics occurs when the student's mind is elsewhere.



It may come as quite a surprise, but even the best learners encounter difficulties at trying to maintain their thinking. All students, good and bad, have their minds wander. Good students have learned methods for constantly bringing their minds back to the activity. Poor learners have frequently seemed pleased when they could do a lot of problems without thinking.

If you find yourself doing mathematics without thinking, stop and bring yourself back to learning.

## Inner Dialogues Keep Your Mind Active

An excellent way to keep your mind active is to carry on a conversation with yourself as you study. This “inner dialogue” might be structured by always asking the following two questions:

**“What is the meaning of this problem?”**

**“Why is the problem worked this way?”**

Neither of these questions is simple. Both of them force the learner to think and that is their purpose. The first question will keep the student on track in constantly knowing the meaning of words and symbols. The second question will emphasize the need to understand the reasoning behind a problem rather than memorizing the steps used to solve it.

An “*inner dialogue*” is a form of talking to oneself and such conversations are

*Focus  
on the  
meaning of  
inner  
dialogue*

valuable. It is also valuable to talk with someone else when studying. Find another student who will participate in a common learning experience. Again, the two major questions you can build into your study sessions are:

“What is the meaning of this problem?”

“Why is the problem worked this way?”

You want to constantly look at both meaning and reasoning. The questions, whether in an “inner dialogue” or with a learning “buddy,” will structure your thinking and keep you on track for learning mathematics effectively.

#### 4. Learn to evaluate your own learning

Many students believe that it is the task of the teacher to give them a grade and, consequently, accept little responsibility for making accurate judgements about their own progress in a mathematics course. When such students are asked, “How did you do on the test?” they are likely to give very vague or inaccurate responses. This is a characteristic that is drastically different from good students. When good students are asked, “How did you do on the test?” they are likely to be very specific in their comments and will accurately predict the grade they will receive.

*Focus on  
knowing how  
well you are  
learning*

Most math programs and texts provide students with opportunities for evaluating the extent to which learning has occurred. For example, most texts contain answers for many of the problem sets. Students who check the answers to problems carefully and restudy those problems that are missed gained valuable insight into both the mathematics and their learning of the mathematics.

To make any evaluation of your work pay its best dividends be certain that enough is written to provide a clear trail of your thinking on each problem. Finding wrong answers is not nearly as helpful as finding the point in a problem where you went wrong.

#### Two Kinds of Knowledge

Knowing how well you are learning in a mathematics course is very different from knowing the mathematics. In other words, there are always two types of knowledge for the mathematics student:

1. Knowledge of the mathematics, and
2. Knowledge about how well the mathematics has been learned.

Knowledge about the mathematics is not enough. The most effective student needs to have a knowledge about his/her learning of the mathematics. In studying mathematics, always pay attention to both the subject and the learning of that subject.

A simple example involves the checking of a problem. The student who does a problem, but skips the check of the problem is accepting responsibility for the mathematics, but ignoring the equally important responsibility for evaluating their learning.



The best of students make mistakes, misunderstand directions, and encounter real difficulties with some topics. But these students have developed mechanisms for telling them when those errors in learning occur.

Knowing when the required material has not been learned gives direction and meaning to further study. Excellence is achieved for the mathematics student when he/she knows the mathematics and also knows that he/she knows the mathematics.

## Failures in Learning Are Correctable

A major difference between good and poor mathematics students is the fact that poor students do not know whether they know the mathematics. After studying for a mathematics test, poor students are unable to determine correctly whether they know or don't know the material. This is truly tragic because it is almost always correctable. The tragedy is that poor students generally do not take advantage of the opportunities they have for accurately assessing how much they know.

Use your textbook, your instructor, and other sources for help on and off

campus. If you look for them there are ample opportunities for you to determine how much and how well you know the mathematics. Problem sets, review exercises, practice tests, supplementary teaching aids (television, computers, Web, etc.) and learning centers are usually available. Good students take advantage of them. Poor students may not realize their value in the learning process and either ignore them or give them only slight attention.

If you want to improve your knowledge of mathematics, begin by raising your awareness of the ways you use to learn mathematics. All students have troubles, at times, learning the mathematics. Good students realize that and take the necessary steps to overcome the difficulties.

Learn the mathematics, but use every tool available to accurately tell you how well you have learned the mathematics.

A good relationship with yourself, your instructional material, and your instructor will make learning mathematics a very important part of your total educational and real life experiences.