

How to study & take notes...in math!

Math is Not a Spectator Sport

You cannot learn mathematics by just going to class and watching the teacher lecture and work problems. In order to learn mathematics you must be actively involved in the learning process. You've got to attend class and pay attention while in class. You've got to take a good set of notes. You've got to work homework problems, even if the teacher doesn't assign any. You've got to study on a regular schedule, not just the night before exams. In other words you need to be involved in the learning process.

The reality is that most people really need to work to pass a math class, and in general they need to work harder at math classes than they do with their other classes. If all that you're willing to do is spend a couple of hours studying before each exam then you will find that passing most math classes will be very difficult.

If you aren't willing to be actively involved in the process of learning mathematics, both inside and outside of the class room, then you will have trouble passing any math class.

Work to Understand the Principles

You can pass a history class by simply memorizing a set of dates, names and events. You will find, however, that in order to pass a math class you will need to do more than just memorize a set of formulas. While there is certainly a fair amount of memorization of formulas in a math class you need to do more. You need to understand how to USE the formulas and that is often far different from just memorizing them.

Some formulas have restrictions on them that you need to know in order to correctly use them. For instance, in order to use the quadratic formula you must have the quadratic in standard form first. You need to remember this or you will often get the wrong answer!

Other formulas are very general and require you to identify the parts in the problem that correspond to parts in the formula. If you don't understand how the formula works and the principle behind it, it can often be very difficult to use the formula. For example, in a calculus course it's not terribly difficult to memorize the formula for integration by parts for integrals. However, if you don't understand how to actually use the formula and identify the appropriate parts of the integral you will find the memorized formula worthless.

Mathematics is Cumulative

You've always got to remember that mathematics courses are cumulative. Almost everything you do in a math class will depend on subjects that you've previously learned. This goes beyond just knowing the previous sections in your current class to needing to remember material from previous classes.

You will find a college algebra class to be very difficult without the knowledge that you learned in your high school algebra class. You can't do a calculus class without first taking (and understanding) an Algebra and a Trigonometry class.

So, with these three main ideas in mind let's proceed with some more specific tips to studying for a math class. Note as well that several of the tips show up in multiple sections since they are either super important tips or simply can fall under several general topics.

General Tips for Studying Mathematics

These are some general tips that were either important enough to single out or just didn't seem to fit into any of the other sections.

- **Go To Class.** Remember that math is cumulative. If you don't go to class you will miss important material that will be used in later sections and/or important announcements.
- **Get to Class On Time.** Sometime important announcements are only given during the first few minutes of a class.
- **LISTEN During Class.** In order to get something out of the class you need to listen while in class. Often this can be difficult to do but it is very important. Sometimes important ideas will not be written down on the board, but instead just spoken by the teacher.

Watch for things the teacher emphasizes, even if just in words. This often means the teacher thinks it's important. The more important that a teacher thinks a topic is, the more likely that it will show up on the exam!

- **Take Good Notes.** Try to write down everything that teacher puts on board. It may seem easy when watching the teacher, but it often is not so easy when it comes time for you to do it. A good set of notes will help remind you how to do these problems. For some teachers writing down everything may be difficult. In these cases you should try to write down as much as possible.

Note as well that this seems to contradict the previous tip. It is often hard to both listen and take a good set of notes. This is something that one often only gains with practice. You need to be able to listen while you are writing down the important parts of the lecture.

- If you find that you are having trouble both listening and taking good notes then you might consider bringing in a tape recorder and record the lecture.

Note however that prior to doing this you should first speak with your teacher. There are a few teachers out there in the world that do not like to have their lectures recorded.

- **Ask Questions.** If you don't understand something then ask your teacher. Chances are you are not the only one who doesn't understand.
- **Listen When Others Ask Questions.** When other students ask questions make sure you listen to both the question and the answer. It may be that the student asking the question thought of something that you didn't think of.
- **Review Notes After Class.** After each class you should review your notes. Note the topics that you found confusing and formulate questions that you can ask your teacher or tutor to help you understand the topic.
- **Make a Set of Index Cards.** Make a set of index cards with important formulas and concepts on them. You can carry these around with you to look over when you've got a few spare minutes. Use them to help you memorize the important formulas and concepts.
- **Learn The (Proper) Notation.** Teachers will assume you know it so you'll need to and many teachers will take points off for bad notation.

- **Get Into A Study Group.** It is often helpful to study in groups. People often look at things differently so someone else may see how to solve a problem that can't do or understand a topic that you find confusing.
- **Note Due Dates.** Write down the due dates for homework and dates for exams someplace you'll see them so you don't forget about them.
- **Budget Adequate Time for Studying/Homework.** It often takes more time studying mathematics to learn the subject than you may require in other classes. Homework will often take more time than you had originally thought it would. Keep this in mind as you budget time.
- **Do Homework After Each Class.** At the end of each class budget some time to look over the homework from that days lecture and attempt to do it. Doing this will allow you time to really work at understanding the concepts covered that day. Do not wait until the last minute to do the homework as this often results in an incomplete homework set and/or an incomplete understanding of the concept.
- **Do Homework Without Notes and Book.** After the first few homework problems, put your notes and book up and try to do the remaining problems without referring to your notes and/or book. In most cases you will not have these during your exams so get used to doing problems without them.
- **Do More Homework.** Do not limit yourself to just the homework that your teacher assigns. The more problems that you work the better off you'll be.
- **Practice, Practice, Practice.** Practice difficult concepts as much as possible. By just practicing, you won't become an expert at a particular problem, but it will improve your success when you see them in the future. Practicing in addition to studying the general problem solving techniques will ensure success on all types of problems.
- **Persevere.** You will not just instantly get every topic that is covered in a math class. There will be some topics that you will have to work at before you completely understand. The only way to really grasp some topics is to go home and think about it and work some problems. You will often find that after a little work a topic that initially baffled you will all of a sudden make sense.
- **Keep Old Homework and Exams.** Do not throw away homework and exams once you get them back. The homework is a good source of study material for exams and both the homework and exams is a good source of study material for comprehensive final exams (if you've got one).
- **Seek Help If You Need It.** If you are having trouble with your math class you have many options open to you and you should take advantage of them. You can go to your teacher's office hours, go to Bulldog Brilliance, Math Lab, or hire a tutor to get help. In addition to all of these resources, the internet has infinite sources of information that will guide you on your mathematical journey.
- **Have the Proper Attitude.** Always do the best that you can. Do not do try to do just enough to get by. Doing this can lead to major problems if you aren't careful. If you are trying to do just enough to get by then all it takes is one bad exam and you are now failing the course.

You should always do the best that you can and strive for the best grade that you can possible get.

Studying for Exams

Here are some tips on studying for exams.

- **Start on Day One.** You should always be studying for the next exam. Do a little each day, or at the very least start studying 2 – 3 days before the exam. Do NOT start studying the night before the exam. Cramming, while a time honored college tradition, just doesn't work as well as spending time each day studying, especially with a math class.
- **Get a Good Night's Sleep.** Get a good night's sleep the night before the exam. It is important to be well rested and mentally sharp when you take the exam.
- **Make a List of Important Concepts/Formulas.** Review your notes and make a concise list of important concepts and formulas. Make sure you know these formulas and more importantly how to use them!
- **Rework Homework Problems.** Do not just read over the homework problems. Actually rework them. Writing down the steps will help you to remember them. Make sure that you try to do the problems without looking at the solutions.
- **Rework Book/Notes Examples.** Cover up the solutions to book or note examples and try to rework them. When looking for problems from the book don't forget that most books have a review section at the end of each chapter that usually contains more problems.
- **Look for Identifying Characteristics in Problems.** While doing your homework you knew which section it came out of. This provided some clues as to the solution process. During an exam you won't have this to help you. So, while reviewing your homework look for identifying characteristics that will give you clues on how to identify that kind of problem.
- **Take a Practice Exam.** Find some problems and treat them a practice test. Give yourself a time limit and don't use your notes or book.

Learn From Your Errors

This is probably one of the more important sections here and also one of the most over looked. Learning from your mistakes can only help you.

- **Review Homework.** When you get your homework back review it looking for errors that you made.
- **Review Exams.** Do the same thing with exams.
- **Understand the Error.** When you find an error in your homework or exams try to understand what the error is and just what you did wrong. Look for something about the error that you can remember to help you to avoid making it again.
- **Get Help.** If you can find the error and/or don't understand why it was an error then get help. Ask the teacher, your tutor, or a classmate who got the problem correct.
- **Rushed Errors.** If you find yourself continually making silly arithmetic or notational errors then slow down when you are working the problems. Most of these types of errors happen because students get in a hurry and don't pay attention to what they are doing.

- **Repeated Errors.** If you find yourself continually making errors on one particular type of problem then you probably don't have a really good grasp of the concept behind that type of problem. Go back and find more examples and really try to understand just what you are doing wrong or don't understand.
- **Keep a List of Errors.** Put errors that you keep making in a "list of errors". With each error write down the correct method/solution. Review the list after you complete a problem and see if you've made any of your "common" errors.

Let's recap:

- Listen in Class. Do not just write down what you see on the board.
- Write Down Explanatory Remarks.
- Note Important Formulas/Concepts.
- Question Your Teacher.
- Note Topics You Don't Understand.
- Review/Edit Your Notes.
- Make mistakes. Learn from your mistakes.
- Review Regularly (this means a little every night...30 seconds to 5 minutes).