

How to Study for Math and Science Courses

Problem solving courses like those in Math, Chemistry, Physics, Engineering and Statistics require an approach to studying that is unique from humanities courses, social science courses, and certain life science courses. With problem solving courses, learning essentially takes place through the regular and routine application of theories and concepts. In other words, learning takes place by working through example problems and practicing a variety of problem-solving scenarios.

Begin with Some Preparation

One mistake that some students commonly make is to spend too much time reviewing their textbook and lecture notes without doing any practice problems. Although some preliminary review is important, you should transition quickly from reviewing course materials to doing practice problems. To prepare effectively, you should begin by reviewing your course outline, textbook and lecture notes with the following focus:

1. Develop a basic understanding of foundational concepts. You need to have some understanding of the concepts before you can attempt practice problems.
 - ex: What are the features of a five number summary? (minimum, first quartile, median, third quartile, and maximum)
2. Learn the procedural knowledge required to perform various calculations.
ex: What steps are required to calculate the five number summary from a given set of data? (110, 135, 133, 145, 120, 134, 120, 132, 150, 121, 166, 170, 170, 189, 200, 100)
3. Search for sample problems that have been used to explain foundational concepts in the textbook or class notes. This helps to determine which practice problems to attempt once you decide to start putting theories into practice.

Practice Makes Perfect

Problem-solving courses tend to be cumulative. For this reason, it is important to set time aside to work through some practice problems several times each week. Keep up with the course material by doing problems related to the content being covered in class. A good time to study is right after class while the information is still fresh. Attempt to solve problems that were discussed in class or find related problems from the textbook or other materials. Consider the following guidelines:

1. Attempt to solve problems without looking at the solutions manual. This will provide a sense of how well you can do the problems. This type of practice is more beneficial than looking over problems that have already been solved.
2. Ensure that you understand how to apply the process or method that has been explained by doing a variety of problems related to a particular concept. This is more important than trying to memorize as many problems as possible.

3. Identify knowledge gaps. What are your weaknesses? Make a list of problems that have been previously answered incorrectly. Write down the names of chapter sections and concepts that are especially challenging.
4. Re-do difficult problems that have already been attempted. This can be especially beneficial when it comes to mastering troublesome concepts.
5. Anticipate difficult problems based on the questions that you have already encountered. Problems to watch out for could include situations where:
 - information is hidden or not provided
 - a conversion of units is required
 - reversing the sequence or order of steps may be necessary
 - extraneous or distracting information is provided
 - preliminary calculations or steps are required before proceeding

When you cannot solve problems or get stuck on certain questions, go back to your textbook or lecture notes to review the concepts and re-familiarize yourself with the process that is being explained. If that does not help, keep working on other problems until you can get clarification on the particular problems that are confusing.

Access Resources

Students should always familiarize themselves with the various resources available to help with a course. In addition to textbooks and notes, some of the following resources can be valuable:

- Professors and teaching assistants
- Help centres ([Math](#), [Statistics](#))
- Tutors ([ALC content tutors](#), [the Science Students Association tutors](#), [the Engineering Students Association tutors](#))
- [Supplemental Instruction](#) (peer-mentor-led study groups for select classes in Chemistry, Computer Science, Engineering, etc.)
- Practice tests and old exams (if approved by the professor)
- Internet resources

When approaching a professor, a help centre or a tutor for assistance, make sure to formulate specific questions in advance related to practice problems. It is easier for someone to provide timely and accurate assistance if they know more specifically what you are having trouble with.

References

Fleet, J., Goodchild, F., & Zajchowski, R. (1999). *Learning for success: Effective strategies for students* (3rd ed.). Nelson Thomson.