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Foundations for College Mathematics 12

Practice and Homework Book

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Problem Solving

All people solve problems. To become a successful problem solver, you must be aware that significant problems cannot be solved in a few minutes. Persistence is required. Understand that there will be moments of frustration whenever you challenge yourself. Learn when to take a break from a problem so you can go back to it, refreshed. With practice, your problem solving ability will grow.

A Problem Solving Model

As you continue to develop your own particular style of problem solving, keep in mind this four-step process, which you might find helpful.

Understand **Read the problem three times.**

- On the first reading, get a general sense of what the problem is about.
- On the second reading, determine the type of information that is given and the sort of information you are asked to find.
  - Do you need a model or diagram to understand the situation?
  - Do you need to act the problem out?
- On the third reading, get the details straight.
  - Is there unnecessary information?
  - Is there hidden information?
  - Is there missing information you will need to find elsewhere?
  - Do you need to make any assumptions?
  - Do you need to ask a question before you go further?

Plan **Decide which strategy or strategies you will use.**

Does this problem look like one you have solved before? If so, could you solve this one in a similar way? Here are some strategies that you might use.

- Brainstorm or make an idea web
- Draw a diagram, graph, or model
- Solve a simpler problem
- Make a table, chart, or organized list
- Express a pattern using algebra
- Work backward
- Make an assumption
- Find hidden or missing information
- Choose an operation or a formula
- Use logical reasoning
- Estimate
- Act it out
- Break the problem into simpler parts
- Look for a pattern
- Write and solve an algebraic equation
- Use systematic trial
- Look at the problem from a different view
- Account for all possibilities
- Apply a previously learned procedure
- Use graphing technology

If you are unsure where to begin, start by brainstorming or making an idea web. Write down all the things you know about the problem and all the things you can find out using the given information. Work with the information until you can think of another strategy.

Do it! **Solve the problem by carrying out your plan.**

- Estimate the answer so you will know whether you are on the right track.
- Perform any required calculations.
- Record your steps so you can refer to your solution later for explaining or checking.

Look Back **Examine your answer. Is it reasonable?**

- Is your answer close to your estimate? Does your answer fit the facts given in the problem? Are you sure you have answered the question? Are there any other answers?
- Consider solving the problem using a different method. Do you get the same answer?
- Compare your method and results with those of other students. If you are presenting your solution to someone else, make sure you explain your reasoning and show your calculations.

Remember that this problem-solving model is a guide. If you are in the middle of carrying out your plan when you think of a better solution, you can go back to step two and revise your strategy. You may find the four-step model most useful when you do not know how to get started on a problem. Whatever approach you decide to use, be sure that you understand the problem and look back to check that your answer makes sense.

Taking Notes

Taking notes and making sense of your notes are two different things. Write notes in class using shorthand or using a word processor, if allowed. Insert interesting ideas or side notes in the margins or in boxes. Later, read your notes again and write them out neatly and in greater detail. On the second read, you will probably organize your notes better and come to assimilate some of the ideas that were introduced in class. Try reading your notes to a classmate to see if they understand what you have written. This will also provide an opportunity to exchange ideas and correct any misunderstandings. Provide examples to illustrate key concepts or ideas.

Preparing the Right Environment

Working in a comfortable environment goes a long way in helping you to study and learn. What makes you relaxed? A quiet room? Your favourite music playing in the background? Having the right tools will save you time and make studying easier. Keep everything in the same place so you do not waste time looking for the tools you need. Getting enough sleep can help you concentrate and stay focussed on the task at hand. The time of day can help. Are you most alert in the morning or in the evening?

Studying More Effectively

Learning is a process, and so is learning how to study. Study skills need to be applied and practised before you see an improvement. Always look back at what you did to see which skills worked best. Then, use this knowledge to improve your study plan. The more you use these study skills, the more familiar they will become. Once studying becomes a routine, you will have a tool you can apply to any subject in school or to any topic you want to learn about.

Creating a Schedule

Time is the main tool you need for studying but it is often wasted. A schedule will help you organize your activities and your time. It will help you stay focussed and give you the flexibility to deal with the unexpected and still meet your deadlines.

How much time do you have?

- Use a calendar or make a spreadsheet for each month. Divide each day into 24 h.
- Mark off the times when you need to sleep, eat, and travel.
- Write down every planned use of your time that you know of for that month.
  - Note every class and laboratory you need to attend.
  - Note test dates and the dates when assignments are due.
  - Be sure to include sports or recreational activities, social events, and work hours, if you have a job.
- Look at the time that remains on your schedule. This is the time you have to work with.

How much time do you need?

- Teachers will usually tell you how long a homework assignment or project should take you to complete. If they do not tell you, be sure to ask.
- Write down the time you need for each task so you can remember.
- Compare the time you need to the time you have available. If you really do not have enough time to complete your school assignments, you may need to cut down on your extracurricular or social activities.

Make a plan.

- *Homework:* Schedule time each day for doing homework. You might have free time in school if your school has spare periods between classes or plan to do it soon after you get home. If you do it sooner rather than later, then it will be done and you will have the rest of the day for yourself. Doing homework every day also means it will not build up and ruin your weekend.
- *Assignments:* Work backward from assignment dates to schedule the time you need for each assignment. Give yourself more time than you think you will need, so you only need to do a small part of the assignment each day. This will give you time to think about any problems you might encounter as you are working. You will also have the flexibility to revise your schedule if needed and still meet your deadline.
- *Group work:* Knowing your own schedule and the time you have to work with will help you to schedule time for a group assignment. Working at school, if space is available, will cut down on travel time and the distractions you might have if you work at home.
- *Tests and examinations:* Work backward from test dates to plan your study time. Make a list of the topics on the test and divide them between the scheduled times. If you study for a short time over many days, you will understand and retain more than if you study for hours on the night before the test.

Be realistic.

- Be kind to yourself. It is easy to make a schedule that fits in every activity neatly and accounts for every hour of your time but this is not always realistic.
- Schedule study time when you know you will be alert and able to concentrate. If you are more alert in the evening, do not schedule study time in the morning.
- Spread the time you need for studying or working on an assignment out over several days. Last minute cramming before a test is not an effective study method.
- Plan for free time and schedule activities that you enjoy. You will understand more if you have time to think and reflect on what you have learned.

Revise your schedule as needed.

- Do not be afraid to adjust your schedule to make it work better. You might need to test your schedule before you know what works and what does not work.
- If you get sick or some unexpected event comes up, adapt your schedule to fit.
- Give yourself enough time for each task so that if you need to revise your schedule, you can still meet your deadlines.

Follow your schedule.

- Like any plan, a schedule is only useful if it is followed.
- Make a list of things you need to do each day and do them.
- Encourage your friends to make a schedule as well. It is easier to follow a plan if other people are doing the same thing.
- Following a schedule might be difficult at first but it is much less painful than doing things at the last minute or failing to get them done at all.

Preparing for an Essay or Report

There is some essay and report writing in mathematics. Topics can include the biography of a mathematician, nuclear medicine, or an environmental issue. Reports will usually contain tables and graphs or calculations.

Choosing your topic.

- Your teacher might give you a list of subjects or might ask you to choose your own topic. Check with your teacher that your chosen topic is acceptable.
- Look for information on several topics to see how much information is available. Choosing a topic that is well researched will make your job easier. It will also give you a variety of information to work with if other students are writing about the same topic.
- If there is not much information available on your chosen subject, your teacher might be able to suggest an alternative.
- Choose a topic that interests you.

Gather your material.

- Use reliable sources of information. If using the Internet, compare several Web sites on the same topic and make a list of the common facts.
- Paraphrase or use point form when taking notes to avoid plagiarism. If copying text from a Web site, keep this text separate from your essay so you do not reuse it.
- Record your sources as you do your research, especially when using the Internet.

Write an outline and report.

- Check the format your teacher wants you to use. Some teachers will allow you to present your work as a poster, a Web page, or a Powerpoint® presentation.
- Write an outline of your report. Put your ideas in point form. Use headings and sub headings to organize your ideas.
- Use your outline to determine the main point of your report and your conclusion.
- Write your report, using your outline as a guide. Read it over or have another student read it over and make suggestions on how to clarify your points. Revise your report. Be sure that you prove and justify your conclusion.

- Check your textbook, books, or Web sites for how to insert and format graphs, tables, and/or calculations in a report. If you are using secondary data, be sure to note your source below the table or graph.
- Check your grammar, spelling, and punctuation.
- Include a list of the sources you used on the last page of your report.

Preparing for a Test or Examination

Preparing for a test or examination is more than just studying the material. You need to understand the test format and the instructions.

Studying.

- Note which chapters or sections of your textbook are being covered in the test.
- Review each section. Note the homework questions you found difficult and try them again. Do any questions that you were not previously assigned or did not complete. Ask for help on questions you still do not understand.
- Write out the vocabulary, key concepts, and formulas for each section. Describe each word or concept in your own words to check your understanding. Check that you understand how to apply the formulas.
- Studying with other students can be useful if you can avoid distractions.

Writing the test.

- Read or listen to the instructions before starting the test. Ask questions before the test starts if you do not understand the instructions.
- Read the entire test before starting so you know what to expect.
- Estimate the amount of time you need for each section. Keep an eye on the clock as you are writing the test so you do not lose track of the time.
- Do the easy questions first. If you have trouble with a question, skip it and go back to it once you have done the other questions.
- Show your work. You might be assigned marks based on the process of solving the problem. The teacher cannot give you marks for what you do not show. You might also get partial marks for showing your work even if you arrive at the wrong answer.
- If you have time, read over your answers. Check that you have included the correct units and have rounded numbers, if necessary. Fix obvious errors but resist the temptation to change your answers. The first answer you gave is likely the correct one.