"‘The best thing for being sad,’ replied Merlyn, beginning to puff and blow, ‘is to learn something. That is the only thing that never fails. You may grow old and trembling in your ananomies, you may lie awake in the middle of the night listening to the disorder of your veins, you may miss your only love, you may see the world around you devastated by evil fanatics, or know your honor trampled in the sewers of baser minds. There is only one thing for it then — to learn. Learn why the world wags and what wags it. That is the only thing the mind can never exhaust, never alienate, never be tortured by, never fear or distrust, and never dream of regretting. Learning is the thing for you. Look at what a lot of things there are to learn — pure science, the only purity there is. You can learn astronomy in a lifetime, natural history in three, literature in six. And then, after you have exhausted a million lifetimes in biology and medicine and theoricriticism and geography and history and economics — why, you can start to make a cartwheel out of the appropriate wood, or spend fifty years learning to begin to learn to beat your adversary at fencing. After that you can start again on mathematics, until it is time to learn to plough.'"  
— T. H. White, The Sword in the Stone, 1938

Course Goals

Ability to read at the sixth-grade level is not enough to qualify a person to teach first-grade reading. In the same way, being able to do the mathematics required of elementary students is not enough to qualify a person to teach elementary mathematics. The present course is intended to give students a deep knowledge of problem solving and arithmetic, as a foundation for professional practice in teaching mathematics to elementary students.

Secondly, the course is intended to give students a sound basis in pedagogy. The successful student will have the beginnings of a tool box of teaching techniques to help all students master mathematics (and will believe that such a goal is possible!).

More broadly, students completing this course will become exemplars of the educated world to their students. It is important that the educated elite of your students’ world (that is, their teacher) make being educated look good. You will do this better and better the more comfortable you are with mathematics.

Course Content

The content of the course is roughly divided into four parts. In the first, we look at problem solving. Mathematics exists to solve problems. It exists, not to make simple things complicated, but complicated things simple. Too often, the way mathematics is taught belies this fact, and that creates a self-perpetuating cycle. We will explore mathematics as a way of thinking about the world, and some general strategies that outline this way of thinking. This includes the consideration of patterns, multiple representations of the same information, and precise communication.

The second part of the course involves the mechanics of addition and subtraction, the third part multiplication and division. To teach these subjects it is not sufficient to be able to do them correctly (although it’s surely necessary!). We must have a bottomless well of alternate explanations, representations for every possible learning style, applications, and ways to think about what students understand of what they’re doing — whether they ultimately pull it off or not.

The fourth and final part of the course involves factorization of numbers, including some properties of fractions. Fractions alone are the subject most often identified by in-service teachers as their biggest mathematical challenge, both for their students and for themselves. A careful exploration based on meaning will make it less of a stumbling block for you.

Some particular topics in the course are central. Others are less central, and if time constraints demand it, we may omit some rather than doing everything badly.
Course Activities

Homework will be assigned daily or almost daily and will be due weekly, on Wednesdays at 4:30 (unless otherwise announced). You are, of course, welcome, to turn your homework in when we meet. If you wish, though, you may continue to work on it, and may deliver it to my office or my department mailbox.

There will be a truckload of homework, and that's not because I want you to suffer. The most common thing in all of mathematics — I do it myself, as does every other mathematician I know — is to see somebody else doing a problem and say, “Yes, yes, of course. I understand completely,” and then walk away and realize that we had no idea at all what was going on. Homework is your guard against this. If you really understand how to do the homework, you're generally in pretty good shape. If you can't, you've got plenty of time to figure it out, ask me, ask a friend, or take whatever other action you see fit.

Cooperation on homework is strongly encouraged. There will almost certainly be problems on which it is necessary. Talk with each other, talk with me, talk with friends, use any resource. It is important, however, to be sure that you understand the solution you present. In designing the tests, I will assume thorough familiarity with all homework problems due before the date of the exam.

This is a course for pre-service teachers, so the ability to communicate in and about mathematics is a central requirement. Consequently, there will be several writing assignments, which will focus on deep thought and clear expression. Each writing assignment will be given with a detailed writing guide and the criteria on which it will be evaluated. Again, cooperation is encouraged, but the work you submit must be your own.

In like manner, you will be required to write a lesson plan on some subject related to the course. I hope that the practical importance of this activity needs no further explanation. The lesson plan will be assessed using the standard Elementary Education lesson plan rubric used by the Department of Curriculum and Instruction. Details on this assignment will follow.

You are also encouraged to visit me in my office (see note on office hours above) or to call or e-mail me. To be more clear: It's a hard class. I'd like to see you do well in it. I'd love to talk with you and to help you in any way that I can.

It is wise to work on the homework as it is assigned, for a couple of reasons. First, there will be enough of it that it will not be practical to just sit down and do the whole week’s worth in an evening. Second (and more importantly), the material builds on itself, so that a few days without working through at least some of the problems may find you feeling a little lost.

The class will meet on Mondays, Wednesdays, and Fridays at noon. A typical meeting will begin a discussion of any questions folks have, with procedural matters treated first. This will be followed by a discussion of new material (often in the form of problems, on which students will work in groups) and typically an assignment of new homework.

You should be in every class meeting, and should make sure that you are actively engaged. It goes without saying that when a problem is assigned for group work, you must do it. If you wait for me to tell you how to do it, then by the time I talk about the solution with the class, everybody else will understand it and will be ready to ask about issues you haven’t encountered, and you will be lost. Don’t do this. You should be careful to ask any questions you have. You should also feel free to be wrong. We all will be at some point in the class. That’s why we gather together, instead of just reading the book on our own: we can help one another understand better, and we can try out ideas on each other, even if we aren’t quite sure of them.

There will also be some exams. Each exam will be preceded by a review sheet indicating exactly what material will be covered, an in-class review session, and an out-of-class review session. Exams will be given in the regularly scheduled class time and place on September 18, October 18, and November 20. In addition, there will be a final exam. I will forward information on the final exam schedule as soon as I have it. The final will test your ability to do all of the things we have worked on in class.

The general philosophy is that class sessions and homework will be very hard and tests will be pretty easy (assuming, of course, that you’ve suffered through the class meetings and homework leading up to them). Again, my goal with the homework is to help you to understand the material so well that you’re unhappy with me for giving such a boring (easy) test.

In all activities for this class, make sure that you do something. It is depressing how often students who probably know something relevant to a problem does absolutely nothing, allowing no opportunity to receive credit on the part they actually know.

Grading

Grades will be calculated from the following sources:
I regret that I will not be able to provide a detailed reading of every problem I ask you to submit. The truth is, to learn the material, you need to do more homework than I could possibly read. On each assignment, I will grade a small but representative sample of the problems. If you would like more detailed feedback on another problem, I would be glad to give it.

Failure to attend class regularly will certainly adversely affect your grades on each of these factors. For instance, while I do not artificially lower grades for bad attendance, it has consistently held that almost all grades below C- that have been achieved in classes that I have taught have been associated with significant attendance problems.

In like manner, you should not underestimate the impact of your homework. Not only does the experience of the homework problems impact your test grades, but the homework itself is a considerable portion of the grade in the class. Moreover, since you can use the book, talk with friends, talk with a tutor, ask me how to do the problem, etc., everyone should receive a grade of near 100% on the homework. It is depressing how rarely this happens. Indeed, due largely to negligence in completing and turning in all of the assigned problems, many students find that their homework grade instead brings their grade in the course down. Don’t let this happen to you.

In all work done for this class, work is more important than answers. A correct answer without correct work (or worse, with work that does not match the answer) is not worth much at all, while generally correct work with an incorrect answer is almost as good as being completely right. Thus, getting the right answer does not guarantee a good grade on the problem, and getting a wrong answer does not guarantee a bad one.

I will make the following guarantees about letter grades. I may decide to lower these criteria (i.e. give a higher grade than the one shown here, if I see that the questions were hard enough that lower numbers more accurately reflect my true standards), but will never raise them.

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<tr>
<th>Percent of total</th>
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<tr>
<td>90–100</td>
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Prerequisites

The prerequisites of this course are designed to save you from spending a semester being miserable and failing this course. I am on your side, and wish you success. That is why I am telling you this. To take this course, you must have three years of college preparatory mathematics including Algebra I, Algebra II, and Geometry. Any student not meeting these requirements is strongly advised to delay taking this class until they are satisfied.

Catalog Description

120 (3 credits) Mathematics Content and Methods for the Elementary School I (Same as CI 120) Modern approaches to mathematics instruction for the elementary grades. Mathematics content involves problem solving, intuitive set theory, development of whole numbers, integers, and rational numbers, and the fundamental arithmetic operations. Place value. Prime numbers and divisibility properties. Computation includes students’ informal mathematics, mental computation and estimation, algorithms and the appropriate use of calculators. Emphasis is placed throughout on reasoning, multiple representations of mathematical concepts, making connections, and communication. Two hours lecture and two hours laboratory per week. Prerequisite: Three years of college preparatory mathematics including Algebra I, Algebra II, and Geometry.

Emergency Procedures

Southern Illinois University Carbondale is committed to providing a safe and healthy environment for study and work. Because some health and safety circumstances are beyond our control, we ask that you become familiar with
the SIUC Emergency Response Plan and Building Emergency Response Team (BERT) program. Emergency response information is available on posters in buildings on campus, available on BERT's website at www.bert.siu.edu, Department of Safety's website www.dps.siu.edu (disaster drop down) and in Emergency Response Guideline pamphlet. Know how to respond to each type of emergency.

Instructors will provide guidance and direction to students in the classroom in the event of an emergency affecting your location. It is important that you follow these instructions and stay with your instructor during an evacuation or sheltering emergency. The Building Emergency Response Team will provide assistance to your instructor in evacuating the building or sheltering within the facility.