

**MATHEMATICS 100B  
MATHEMATICS FOR ELEMENTARY TEACHING**

**Instructor:** Laura Zirbel

**Faculty in Charge:** Bill Jacob

**Class Meetings:** Tuesday and Thursday 8:00 – 9:15 in Trailer 940

**Course Coordinator:** Prof. Bill Jacob, jacob@math.ucsb.edu, 6719 South Hall, x8048

**Required Reader, Text and CDROM:**

Math 100AB Reader, Available at Alternative Copy Shop **SAME AS 100A-you do not need another.**

Fosnot, C. Dolk, M. , Young Mathematicians at Work : Constructing Multiplication and Division Note: **DIFFERENT FROM 100A!**

Fosnot, C. Dolk, M. *Exploring Soda Machines* (CD-Rom) **DIFFERENT FROM 100A!**

**YOU MUST BRING YOUR READER TO CLASS EVERY DAY. It contains the instructions for your in-class assignments and has all your homework problems.**

**Overview of the Course:** The focus of Math 100B will be on integers, rational numbers, proportional reasoning, and an integrated treatment of algebra and geometry.

The mathematical topics in this class will be developed through collaborative explorations. There will few (if any) lectures. The course will require considerable out-of-class work, including reading assignments and solving problems from the reader, some observations from CD-Rom clips, and short reflective papers. Assessment will be based on both in-class and out-of-class assignments.

**Content Coverage/Exam Schedule:** See attached Tentative Class Activities and Assignment Schedule

**Grading:** The course is designed for students who are contemplating becoming an elementary school teacher. The fact that it is a pass/no-pass course has nothing to do with level of work expected of the student. A few years ago, a number of students with strong backgrounds in mathematics took this course to raise their GPA--even though they would not receive credit for satisfying major requirements. As a result, the classes became crowded with students who had no intention of becoming teachers. Students who really needed the course frequently were unable to take the course because of the overcrowding.

Your final grade in the course will be based on your performance on homework problems, reflective writings, group participation and presentations, a portfolio, quizzes, and a final examination.

The course grade will be based on the following:

Homework	20 %
Group participation, presentations and write-ups	20 %
Reflective Writing	20 %
Quizzes	20 %
Portfolio	20 %
	100 %

A Five-Point Grading Rubric will be applied to the reflective writings, quiz problems and some of the problems occurring on homework as follows:

5 Complete and correct response including extensions and connections

4 Complete and correct response

3 Substantially complete and correct response

2 Some partial success

1 Engaged task with little success

0 No response. Did not engage question

A passing score consists of receiving a majority of 3 or better on an assignment's tasks.

**Portfolio.** This is based on your work from both 100A and 100B. A description of what you need to do is on the last page of the reader,

**Attendance:** *Attendance is required.* Group activity will be a regular part of this class. There are unforeseen emergencies that do come up. However, anyone missing the class 2 times during the term will not receive credit for the course. (This is consistent with TEP policy.) Group activity will regularly be collected and will determine 20% of the student's course grade. There is no make-up of missed group activity.

**Math Lab:** South Hall 1607, open Monday through Thursday, 12:00 - 5:00 p.m. and Friday 10:00-3:00. A Teaching Assistant will be available to assist you with mathematical questions you may have.

**Office Hours:** Please take advantage of my office hours. I actually look forward to students dropping by and discussing mathematics.

**Pedagogy:** My role will be that of a facilitator to *our* construction of mathematical ideas during the term. **This is not a methods course.** Again, I repeat, **this is not a methods course. It is a mathematics content course.** However, you will find that the way this class is taught will be much different than the typical lecture format of many mathematics classes--though there will be some lectures and videos interspersed during the term. This is an important shift in teaching practice for many of us. Often, portions of our class time will be spent working in groups in an effort to develop solution strategies for various problems and explorations. Courses in pedagogy (teaching methods) will occur during your coursework within the credential program.

**Overall Philosophy:** I require written explanations of the mathematics you are studying on all homework, group investigations, quizzes, and exams. This course emphasizes the conceptual framework of mathematics and is designed to avoid the "turn the crank" style of computation that is typical of many mathematics courses. Solution of homework problems will require careful thinking about what is really going on. You will not always be able to solve the problems by imitating a procedure found in class or in a book. **Also:** Just getting an answer is not enough, you are expected to explain connections between ideas and think about extensions of your work. You may wish to use answers as hints for certain problems, but they are not models for complete solutions. Again I emphasize, if you are stuck, work with a classmate, come to the Math Lab, see one of the assistants, send me e-mail, and bring questions to class meetings. On all assignments and exams, it is crucial that you explain, in complete sentences, what you are thinking. It is possible to receive a poor score for a correct answer if you do not communicate to me your ideas. On the other hand, a clear exposition with a minor computational error can receive a good score. You are expected to read the text carefully. Not every detail will be covered in class meetings (in fact quite a few may not), and some different issues and examples raised in the text could show up on the exams or on assignments.

**Video Work:** During Math 100B, several class meetings will be devoted to watching and discussing video clips of elementary students doing mathematics. This is not intended to prescribe how to teach (as I said this is not a methods course). Instead, we want you to be aware of how students can develop their mathematical thinking by using inquiry in instruction. Also, we want you to think about the role of context in posing mathematical questions, and to think about how instructional decisions are made and can be based upon student responses. (Instructional decisions that are made by turning to the next page in the book typically do not meet students' needs.) You should try to think about relationships between what you see in the videos and your study of mathematics in this course. Reflective writings will expect you to consider these issues.

**A Final Comment:** I want this to be a successful and enjoyable learning experience for you. During the term, I hope that you will reflect carefully on any plans you might have for entering teaching at the elementary level. The present climate of reform in mathematics education offers many opportunities and challenges for teachers. On occasions we will discuss these issues. The education of our youth is a tremendously complex process, and I will do everything I can to help you get started in this profession. Please feel free to contact me if you have questions or want to share insights. Using e-mail is probably the most efficient way of reaching me. It's also a way of getting clarification on homework problems.

**Part 1:** Division, Fair Shares and Fractions

- 3/29 Exploration #12: Representing Division
- 3/31 Exploration #12: Continued
- 4/5 Video and Discussion: Introducing the Soda Machine
- 4/7 Discuss Fosnot and Dolk Chapters 3 & 4. Begin Exploration # 13: Fractions with Different Manipulatives, **Problem Set 6 Due**

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**Part 2:** Fractions and Proportional Reasoning

- 4/12 Video and Discussion: Submarine Sandwiches
- 4/14 Exploration # 13 Continued: Fractions with Different Manipulatives and Partitioning Wholes **Problem Set 7 Due, Quiz 1**
- 4/19 Video and Discussion: The Ratio Table
- 4/21 Exploration # 14: Models for Operations with Fractions (Part I)
- 4/26 Exploration # 14: Models for Operations with Fractions (Part II) **First Reflective Writing Due**
- 4/28 Exploration #15: Mystery of the Meter (Decimals)
- 5/3 Exploration #15: Continued **Problem Set 8 Due**
- 5/5 Exploration #16: The Gas Tank and the Pennsylvania Turnpike
- 5/10 Exploration #16 Continued, **Problem Set 9 Due Quiz 2**

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**Part 3:** Linking Number to Algebra and Geometry

- 5/12 Exploration #17: Frog Jumping Problems **Problem Set 10 is a long assignment. Start work on it.**
- 5/17 Exploration # 18: Comparing Quantities **Second Reflective Writing Due**
- 5/19 Exploration # 18 Continued
- 5/24 Exploration # 19: Patterns, Functions, Proportional Reasoning
- 5/26 Exploration # 20: TERC Spatial problems **Problem Set 10 Due**
- 5/31 Exploration # 21 Maggie's Farm
- 6/2 Closing discussion, **Portfolio Due, QUIZ 3**

*Math 100B*

**Final Exam: (REQUIRED)**

## Math 100 B First Reflective Writing: Supporting Number Understanding with Geometric Representations

NOTE: You must visit the Curriculum Lab in the UCSB Library to complete this assignment. So do not put it off until the last minute.

First, in your Exploring Soda Machines CD go to Journey 1, How to Continue, The Next Day: Sprite Machine. Explain how this scenario is different from the previous scenario. Also explain what the point is of adding the boxes. Do you think this context will help students construct an understanding of division procedures or should they be taught the division algorithm before giving them this problem?

Second, you should go to the Curriculum Laboratory on the first floor of the UCSB Library. Find the shelves containing the current California mathematics adoption. (In the back on your left in the second or third rack as you walk toward the window.) Find a fourth grade student text and look at the tasks they are assigned when introducing multiplication and/or division. Spend 5 minutes and jot down a few notes about what you find, and be sure write down the publisher and page numbers too for later reference. (Note: you cannot check these texts out—please return them to the shelf so your classmates can find them too.) Answer the following questions.

(i) Is the text designed so that its readers will be likely to develop their own representations that become tools for calculation?

(ii) In general, would a student be more likely to "mathematize" or use a previously taught algorithm while working on the exercises provided in the text? To support your answer, provide a specific example of a problem from the text and speculate on how a student might solve the problem.

## Math 100B Second Reflective Writing: Models to Tools

One of the themes of the Fosnot-Dolk book (and videos) is that a good contextual task leads students to develop a model or a representation that is both a tool for solving the problem and enables them to construct deeper mathematical understandings. Then, early in Chapter 5, Fosnot and Dolk quote Gravemeijer:

“The shift from *model of* to *model for* concurs with a shift in the students thinking, from thinking about the modeled context situation, to a focus on mathematical relations.”

Fosnot and Dolk say that this shift is a “major landmark in mathematical development”. They discuss what they mean in more detail pp. 86-88 of the Multiplication and Division book. In class, and in your reading, we have developed several models for multiplication and division. Discuss both of the following:

(1) The soda machine provides a context for developing the array model to understand division. Discuss how this model became a tool for some students. Discuss how the questions were structured to bring out certain ideas and strategies. Don't forget about the sprite machine. Cite specific children in the CD's.

(2) Second describe your favorite representation for used in Math 100A or 100B. In a few sentences, say what it is and how it works. Then give an example of how this model can subsequently be used as a model for thinking about a particular mathematical relationship (so now, the question or relationship being considered is no longer in context.) You may cite the readings, the CDs, the work in the class, or other experiences.