

# MATH 211 CRN ..., FUNDAMENTALS MASTERY OF ELEMENTARY MATHEMATICS I

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## 0.1. Prerequisites and Required Materials.

- Successful completion (C- or better) of or placement past Math 095 needed as prerequisite.
- Elementary... 8th edition, by Billstein, Libeskind and Lott.
- Knowing and Teaching Elementary Mathematics: Teachers' Understanding of Fundamental Mathematics in China and the United States, by Liping Ma. We will reference this book for discussions and writing projects.
- Calculator A standard scientific calculator is recommended. Graphing calculators (or others with greater functionality) are allowed in class and for homework, but not on exams. On some assignments or parts of exams the use of calculators of any kind may be prohibited.
- A notebook or scratch paper brought to class on Mondays and Wednesdays.

You could probably make do by sharing the textbook with a friend and/or using the copy on reserve in the Math Library. The book by Ma will be used for reading assignments, so it would be best to have your own copy (which is relatively inexpensive).

## 0.2. Outcomes. Success in this course will be reflected by your ability to do the following.

- Provide arguments prescribed by the Common Core State Standards in Mathematics (CCSSM) justifying properties, strategies and algorithms in arithmetic, in both child-appropriate and formal adult language.
- Correctly use definitions and models and reason based on those, grounded in content which has value through K-12 classroom relevance and/or through meeting university liberal-arts expectations.
- Provide evidence of deep understanding of arithmetic through: successfully engaging with strategies and algorithms in other bases; producing modeling settings which illustrate arithmetic constructs; answering hypothetical questions from elementary students and troubleshooting student errors; and making and proving conjectures about topics such as divisibility.
- Be able with modest guidance to read the CCSSM Progressions documents and explain the mathematical choices made and the pedagogical rationale for those choices.
- Engage in the mathematical practices as a learner, and begin to identify and address what is needed of content and mindset to encourage such engagement.

**0.3. Class structure.** This course will be structured differently than most others. We will have experience-building and mastery learning components of each unit, with two units per week. Experience-building learning components include “pre-work,” where you must read new material and record definitions and/or do straightforward problems to be handed in, as well as worksheets to be started in class in small groups and finished as homework. Mastery learning components include the write-up phase of homework, participating in lecture which builds on material from the pre-work, doing reading assignments, and reviewing for exams.

Prework will be due and worksheets will be done on Mondays and Wednesdays. Completed worksheets will be due on Tuesdays and Fridays. When you work on the worksheets in class, you are to only work on scratch paper until you have a full solution. The worksheets themselves are for clean write-ups.

**0.4. Content and Schedule Outline.** Most of the topics listed below mention only an arithmetic operation (e.g. multiplication). For such operations-focussed topics, we will emphasize the following content:

- The definition(s) and model(s) chosen by the CCSSM, and why they are equivalent.
- Properties which hold, and reasoning to establish those properties (primarily what is emphasized in the CCSSM).
- Common strategies and algorithms for calculation, including in other bases, and reasoning to establish their validity using properties.
- Relevant problem and modeling situations, and how they engage algebraic thinking and can be used to both support development of understanding and to engage mastery.
- The development in the CCCSSM proceeding from Meaning to Machinery to Mastery (a framework due to Cody Patterson from the University of Arizona).

Week	Topics	
1	Introduction / Other number systems	
2	Other bases and addition & subtraction	
3	Addition and subtraction	First paper
4	Multiplication	First exam
5	Multiplication	
6	Multiplication and Division	Second paper
7	Division	Second exam
8	Division and GCD	
9	Divisibility rules	
10	Divisibility rules	

## 0.5. Assignments.

40% Pre-work and worksheets. Pre-work assignments involve reading, recording definitions, and doing straightforward problems. They will be due most Mondays and Wednesdays, at the beginning of class. Worksheets are to be started in class on (most) Mondays and Wednesdays. The material will overlap with the pre-work. You are to bring scratch paper or a notebook to work on. You are to not write anything on the worksheet during class unless you have fully worked it out on scratch paper, and even then we suggest you don't start writing up your final solutions on the worksheet until you've done all the problems (to make best use of class time).

Calculational problems will be graded customarily, with points taken off for errors. For problems which require reasoning, you should either write up an attempted full solution or you can provide the following, clearly labeled, for partial credit:

- examples which illustrate the statement to be established or problem to be solved;
- relevant definitions or models;
- some correct partial reasoning;
- some incorrect partial reasoning (you honestly started to follow) along with why it is incorrect.

You can get up to 80% partial credit by providing these, while a full solution is required for full credit, with points taken off for errors. You should clearly say “Full solution” or “Progress for partial credit”.

Your lowest two scores will be dropped. If you cannot attend a class, you need turn in the pre-work by e-mail or under Professor Sinha's door by noon that day, and you can do the worksheet on your own and turn it in at class the next day.

5% Class participation. Prof. Sinha will make note of how active you are in your group (or on your own) working on the worksheets. The class will regularly have to answer questions during lecture, and some class members might even be asked to go to the board and explain things.

10% Writing assignments. There will be two writing assignments, due ... and ..., based on Liping Ma's book (required above) and articles by Ball, Bass and their collaborators.

25% Exams. There will be in-class exams on .... Make-up exams may be scheduled in case of excused conflicts (this does not include “a lot of other work being due”) or illness (in which case you need a note signed by a doctor or health services).

20% Final Exam. The two-hour final exam will be comprehensive, covering material from the entirety of class.

0.6. **Grading.** This is a content course, so except for the writing assignments your grades will be entirely based on your mastery of the mathematics.

You will have work due almost every day of the week, which in particular means that you'll generally need to attend class. Such an expectation serves full proficiency and is well within the norm of general demands of college and professional life.

I will consider accommodations for illness or other issues as they arise. On worksheets, my reaction is likely to be that you cannot turn an assignment in late, and that the grade will be one of the grades dropped. For those whose life circumstances effect a large amount of work, I will be accommodating as I can, and will also insist that you also be working with the University Counseling Center to address the issues.

Final grades will be assigned as follows.

A final average greater than or equal to	60	64	67	70	74	77	80	85	88	91	96
guarantees at least a	D-	D	C-	C	C+	B-	B	B+	A-	A	A+