MA 203-04 Syllabus FA15
Foundations of Elementary Mathematics I

Catalog Description: This course involves a careful examination of mathematical ideas behind the mathematics taught in grades K-6, and their history and applications to daily life. It is intended primarily for future elementary school teachers to provide them with a better understanding of the mathematics they will teach. The course will also be of value for any student who wants a better understanding of these ideas. The course will focus on understanding and exploring the mathematics through problem solving, projects, group explorations, use of manipulatives, and some use of technology. MA 203 concentrates on problem solving, whole number arithmetic and theory, discrete math (set theory and number theory), integers, fractions, decimals, and algebraic concepts. MA 203 does not count towards the mathematics major or minor requirements.

Course Goals: The course will give students

- an active understanding of problem-posing and problem-solving in mathematics, including a familiarity with problem-solving heuristics;
- experience with the use of manipulatives, calculators and computer software, small-group discovery, and other current techniques for teaching and learning mathematics;
- the opportunity to examine and construct for themselves the mathematical concepts underlying the methods of arithmetic computation;
- experience developing algebraic models of mathematical situations;
- experience with a variety of applications of elementary mathematics;
- a deeper understanding of fractions and decimals;
- confidence in their abilities to solve mathematical problems, and to determine whether a proposed solution to a problem is valid or invalid;
- an appreciation of the historical development of mathematics.

Course Objectives: Students will be able to

- demonstrate proficiency in the major concepts, procedures, and reasoning processes involved with pre-number concepts and whole numbers, including using multiple ways to explore and present number concepts
- apply the four basic operations fluently and flexibly to solve problems and develop computational algorithms
- demonstrate proficiency with the major concepts, procedures and reasoning processes of the natural numbers, including divisibility, primes and composites, and greatest common divisors and least common multiples
- demonstrate proficiency in the major concepts, procedures, and reasoning processes to represent mathematical situations and relationships using algebraic symbols, patterns, relations, and functions
- demonstrate proficiency with the concepts, procedures, and reasoning processes of integers, fractions and decimals.

General Education outcomes: Students will demonstrate an understanding of various mathematical relationships and their applications in real-world problems by:

- **Mathematical modeling**: Students will demonstrate the ability to read a story problem, determine relevant variables and constants, and describe the mathematical relations among the variables.
- **Problem solving**: Students will demonstrate the ability to use algebraic, geometric, numerical, graphical, and/or statistical methods (possibly using technology) to solve problems.
- **Evaluating results**: Students will demonstrate the ability to check solutions to mathematical problems and to evaluate whether their solutions (estimated or exact) are reasonable.
- **Interpreting results in context**: Students will demonstrate the ability to interpret answers developed in the language of the problem.

Class Schedule: Monday, Thursday 2:50 – 4:10 p.m., Howard Hall 211
Instructor: B. Gold, Howard Hall 247, 732-571-4451, bgold@monmouth.edu
Office Hours: Monday 1 – 2, Tuesday 3:15 – 4:15, Wednesday 4:30 – 5:30, Thursday noon – 1, or by appointment or chance.
Required Text: Sybilla Beckmann, *Mathematics for Elementary Teachers with Activity Manual*, 4th edition.
Course Requirements: Pre-class reading activity, daily homework assignments, classroom participation, reflective journal, major project, three in-class examinations.
Methods of Evaluation and Grading Policy: In-class group work 20%; Homework 20%; Project 15%; Examinations 30%; Reflective mathematical journal 15%.
On a scale of 0 to 100, grades of:

A and A- will be assigned to scores of 90 and above
B+, B and B- will be assigned to scores between 80 and 89
C+, C and C- will be assigned to scores between 65 and 79
D+, D and D- will be assigned to scores between 50 and 65
F will be assigned to scores below 50.

If you are have to miss an examination, you must let me know *prior* to the exam or you receive an automatic 0. You must make arrangements with me *prior to the next class* about when you will take a make-up exam.

Attendance Requirement: As in-class group work is a large component of the grade, attendance in *mandatory*. **All unexcused absences will result in reduction in grade**, and excused absences (for illness, family emergency, or participation in official college activities) must be promptly made up with additional work assigned by the instructor in consultation with the student. If a student expects to miss more than 3 classes during the semester, she or he is advised to take the course during a different semester.

Last date to Withdraw with automatic assignment of "W" grade: November 5, 2015.

Statement on Academic Honesty: You are welcome to consult other students in the class on homework via the eC@mpus discussions only. Students are not otherwise to work together on homework. If you consult with a tutor in the Mathematics Learning Center,

you are to state that at the beginning of the solution to the problem. Unless it becomes excessive, there will be no reduction in credit for getting such assistance.
Examination Rules: No student is permitted to have at his or her desk any books or papers that are not given out by the instructor. Possession of such material will be regarded as evidence of intent to use the information dishonestly. No communication between students during the examination is permitted. If there are questions, or if there is a need for additional material, the instructor should be asked. Details of calculations should be written on the pages of the exam. The following pledge must be signed and submitted with the examination:
"I, _____, certify that I have read the above rules for examinations, and that I have abided by them. By signing, I affirm that I have neither given nor received aid during this examination, and I understand that violation of this affirmation may result in suspension or expulsion from Monmouth University."
Statement on Special Accommodations: Students with disabilities who need special accommodations for this class are encouraged to meet with me or the appropriate disability service provider on campus as soon as possible. In order to receive accommodations, students must be registered with the appropriate disability service provider on campus as set forth in the student handbook and must follow the University procedure for self-disclosure, which is stated in the University *Guide to Services and Accomodations for Students with Disabilities*. Students will not be afforded any special accommodations for academic work completed prior to the disclosure of the disability, nor will they be afforded any special accommodations prior to the completion of the documentation process with the appropriate disability office.

Pre-class reading activity: Before each class you must read the sections assigned for that day, and do the Practice Exercises assigned for that section *without* reading the answer. Then look at the answer, and write your reflection on the problem and what you have learned by doing it. This must be put in the appropriate week's eC@mpus dropbox prior to class. You will then use these problems as part of your reflective journal for that week. ***Reflective mathematical journals*** should document your mathematical development through the course, your questions and concerns, your inspirations and ideas. If you couldn't do a problem, this is where to share what you tried. If something happened in class that you felt was important, write it here. There should be at least one journal entry of at least 100 words per week. These must be submitted via e-campus's Dropbox feature by class time on Thursdays.

Be sure to **bring your textbook** to every class: we will do activities every day.

There will then be ***homework*** from the day's section, due at the following class. Homework problems are at the end of each section, labeled "Problems for Section …." If you have difficulty with them, look at the practice exercises that come right before them: there's usually one quite similar that has been worked out. Notice that most of the homework problems ask you to "explain why." You will be teaching in a few years, and explaining why will be your main job. So this is by far the most important part of the homework, and your homework grade depends on you doing a thoughtful job of explaning why. "Because that's how you do it" is **not** explaning why. You may work

with other students on these problems, but you MUST say who you worked with: otherwise, if two students' papers are similar, both will receive a 0.
There will be one ***major project***. This will involve choosing an article from the journal *Teaching Children Mathematics*, summarizing and critiquing it, and then developing an elementary-school class activity, including appropriate manipulatives and presentation aids based on the article. These will be presented on the last day of class and during our final examination period. Detailed expectations for the project will be handed out later in the semester.

Tentative schedule:

Date	Reading/Practice exercises	Homework due
9/10	1.1	(READ section 1.1 after first class if you didn't read it before)
9/14	1.2/6, 1.3/5	See 1.1 homework, p. 5; also, mathematical autobiography
9/17	1.4/3, 2.2/1, 3	1.2/2bd, 4, 5, 9 *and* **2bd in base 6**; 1.3/6, 8, 13
9/21	2.3/3, 2.4/3	1.4/1; 2.2/2, 3, 4, 8, 9, 11, 18, 20
9/24	2.1, 2.5/3	2.3/4, 19, 22; 2.4/1, 2, 4, 6, 17
9/28	3.1/3, 3.2/7	2.5/2, 4, 9, 20, 21
10/1	3.3/5, 3.5/3	3.1/1, 6; 3.2/3, 8, 10, 11 and addition table in base 6
10/5	3.4/1	3.3/4, 7, 12a, 13a and 3.3 problems on p. 5; 3.5/2, 3, and SGP
10/8		FIRST EXAM, chapters 1, 2, and 3.1-3.3
10/12	4.1/1; 4.2/1	3.4/2, 5, 7, 9, 10, 12
10/15	4.3/9; 4.4/8	4.1/1, 2, 4, 8; 4.2/1, 2, and multiplication table in base 6
10/17 – 10/20		fall break; no class
10/22	4.5/4, 4.6/6	4.3/5, 11, 14; 4.4/1, 6a, 8, 9, 10
10/26	5.1/3	4.5/4, 7, 10, 16; 4.6/2, 4, 12, and 4.6 problem on p. 5
10/29	5.2/1, 5.3/3	5.1/4, 7, 14, 16
11/2	6.1/6, 6.2/3	5.2/1, 4, 6, 11; 5.3/1
11/5	6.3/3	6.1/2, 3, 5, 7; 6.2/4, 5
11/9	6.4/4	6.3/1, 6, 8, 22; 6.3 problem on p. 5; and SGP
11/12		SECOND EXAM, 3.4, 3.5, chapters 4 and 5, 6.1 – 6.3
11/16	6.5/3, 6.6/5	6.4/4, 5, 12, 14, and PROJECT TOPIC DUE
11/19	7.1/5, 7.2/4	6.5/2, 3, 6, 9; 6.6/1, 5, 6

11/23	7.3/1, 7.4/2, 7.5/1	7.1/1, 2, 5, 8; 7.2/1, 5
11/25 – 11/29		Thanksgiving break; enjoy!
11/30	8.1/3, 8.2/1, 8.3/1ab	7.3/3, 5; 7.4/1, 6; 7.5/2, 3, 4
12/3	8.4, 8.5	PROJECT WRITE-UP DUE
12/7	9.1/3, 9.2/3, 9.3/4	8.1/2, 3; 8.2/1; 8.3/1, 3; 8.4/2; 8.5/3, 6, 9, 16
12/10	Proj. Presentations	9.1/2, 12, 14, 16; 9.2/2, 4, 7; 9.3/5, 12 and SGP
12/14		THIRD EXAM, 6.4 – 6.6 and Chapters 7 – 9
Final Exam day		Project Presentations

1.1 homework:

1. Use bundling to represent, in base 6, the following number of toothpicks:
   a. 15_{ten} b. 35_{ten} c. 43_{ten}

2. What number, in base 6, comes **after**:
   a. 32_{six} b. 35_{six} c. 155_{six}

3. What number, in base 6, comes **before**:
   a. 32_{six} b. 30_{six} c. 500_{six}

3.3 additional homework: Do the following addition and subtraction problems **in base 6**. Do not convert to base 10.

$$\begin{array}{rrr} 34 & 215 & 412 \\ +\ 23 & +\ 454 & +\ 244 \end{array} \qquad \begin{array}{rrr} 54 & 215 & 400 \\ -\ 23 & -\ 154 & -\ 241 \end{array}$$

4.6 additional homework: Do the following multiplication problems **in base 6**. Do not convert to base 10. Do each three times: using the standard algorithm, using lattices, and using arrays (graph paper).

$$\begin{array}{r} 34 \\ \times\ 23 \end{array} \qquad \begin{array}{r} 25 \\ \times\ 54 \end{array}$$

6.3 additional homework: Do the following division problem **in base 6**. Do not convert to base 10. Do it twice: using the scaffolding algorithm, and using arrays (graph paper).

$34_{six}\overline{)2445_{six}}$