GOSHEN COLLEGE
MATHEMATICS DEPARTMENT
MATH 131 MATHEMATICAL CONCEPTS FOR THE ELEMENTARY CLASSROOM I – FALL 2011

Motivation

Quantitative information and reasoning is important for many personal, business, and societal decisions. An advanced understanding of mathematics is needed for some careers (e.g., accountants, doctors, engineers, and scientists). To become quantitatively literate adults and have the opportunity to enter any career, elementary school students need to build a solid foundation in mathematics. This includes an understanding of concepts, competence in the use of procedures, ability to apply mathematics to new problems, and an enthusiasm for learning more mathematics. In order to flexibly guide their students' foundation building, elementary school teachers must have an adult-level understanding of elementary mathematics.

Learning Goals

By the end of the course, students will do the following.

1. Solve problems found in the elementary school mathematics curriculum and beyond using a variety of methods, and describe these methods and their comparative advantages.
2. Describe concepts, employ reasoning, recognize connections, and use representations found in the elementary school mathematics curriculum and beyond.
3. Communicate mathematical ideas and reasoning accurately and clearly.
4. View mathematics as an important, enjoyable, exploratory, collaborative, and sense making process.
5. Make effective use of and reflect upon a variety of personal experiences, resources, and pedagogical approaches to learn about mathematics and teaching.

Instructor

David Housman, SC 117, dhousman@goshen.edu, 535-7405, 875-0339 (home)
Office hours posted on office door and at http://people.goshen.edu/~dhousman/Schedule11Fall.htm

Class Time

TR 11:00 a.m. - 12:15 p.m. in SC 107.

Textbooks

Bassarear, Tom. (2012) *Mathematics for Elementary School Teachers*, 5th edition. New York: Houghton Mifflin Company. ISBN-13: 978-0-8400-5463-0. This print version is optional.

Bassarear, Tom. (2012) *Mathematics for Elementary School Teachers: Explorations*, 5th edition. New York: Houghton Mifflin Company, ISBN-13: 978-0-8400-6245-1.

Enhanced WebAssign with eBook LOE Printed Access Card for One-Term Math and Science, ISBN-13: 978-0-538-73810-1. Provides an eBook version of the text but not the explorations manual.

All three of the above will also be used in Math 132.

On-line

https://moodle.goshen.edu for grades and many resources.

https://webassign.net/login.html for homework and electronic text book.
The first time you visit this site, you should

1. Click on the I Have a Class Key link.
2. Enter the Class Key: `goshen 4112 4955`.
3. Follow the directions to either use an existing or create a new WebAssign account.

You can do this before purchasing access to WebAssign; however, eventually you will need to pay on-line or enter a code obtained when purchasing the bundled text.

Learning Journal

A three-ring binder with loose-leaf lined and graph paper is recommended so that you can keep a written record of anticipatory reading work, assignment related work, class notes, concept discoveries, process assessments, questions, and answers. The instructor will occasionally browse these as part of your participation grade.

Calculator

Any basic calculator is sufficient. One that uses scientific notation and can work with fractions is best. These can be purchased for less than $20 or may come for free on a cell phone.

Manipulative Kit

Manipulatives are often used in elementary classrooms and will be used sometimes in Math 131 and Math 132. To purchase a kit, go to http://www.etacuisenaire.com and enter 978-0-7406-8393-0 in the "search" field. This is an optional purchase.

Activities and Grading

The study of mathematics is not a spectator sport! Reading, listening, solving problems, writing explanations, reflecting upon ideas, and receiving feedback are essential to learning mathematics. Course grades will be based on performance in the activities in the table. If helpful, the Final Exam grade will replace one mid-term exam score.

Activity	Weight
Participation	10%
Assignments	20%
Projects	20%
Three mid-term exams	30%
Final Exam	20%

Participation

Attend class and contribute useful questions, answers, explanations, ideas, assessments, and comments. Maintain a Learning Journal. Summarize class activities, task answers, content discoveries, process reflections, and questions. Complete four surveys.

Outside Activities

For participation extra credit, tutor an elementary school student in mathematics, observe an elementary school classroom when mathematics is explored, document an error in the course resources, participate in a math-related activity, or read a mathematics (not education) journal article.

Assignments

Construct and exhibit understanding by completing exercises. Answer each question in your Learning Journal first. Include a description of your thinking process, explanations, questions, and/or reflections. After you have obtained your answer on paper, input your answer into WebAssign. It can be beneficial to collaborate but make sure you could solve similar problems on your own.

Projects

Opportunities to delve into the mathematics education literature, internet resources, and standards. Also an opportunity to create your own numeration system, which will help you understand the experiences of students and teachers in elementary school.

Exams

Exhibit your ability to solve problems, describe methods and concepts, employ reasoning, recognize connections, and use representations found in the elementary school mathematics curriculum. Exams will primarily be in-class without notes but may also have take-home portions. The only excused absence for an exam is for an event that is completely beyond your control and over which you have no choice. You must seek approval for a make-up exam as soon as you become aware of the problem. Unless otherwise stated, you are expected to complete exams without assistance from other people.

Tentative Schedule

Activity	Chapters	Exam or Due Date
Project 1 on Math Education Journals		Tuesday, September 13
Exam 1 on Foundations and Fundamentals	1 – 2	Tuesday, September 27
Project 2 on Internet Resources		Tuesday, October 11
Project 3 on a Numeration System		Thursday, October 27
Exam 2 on Basic Operations and Number Theory	3 – 4	Tuesday, November 1
Project 4 on Standards		Tuesday, November 22
Exam 3 on Fractions, Proportions, and Uncertainty	5 – 7	Thursday, December 1
Final Exam	1 – 7	Friday, December 10, 3:30pm

Academic Resource & Writing Center and Disabilities

Goshen College wants to help all students be as academically successful as possible. If you have a disability and require accommodations, please contact Lois Martin, the Director of the Academic Resource & Writing Center early in the semester. In order to receive accommodations, documentation concerning your disability must be on file with the Academic Resource & Writing Center, Good Library 113, x7576, lmartin@goshen.edu . All information will be held in the strictest confidence. The Academic Resource & Writing Center offers tutoring and writing assistance for all students. For further information please see http://www.goshen.edu/studentlife/asc.php.

Collaboration and Academic Integrity

You are encouraged to use all available resources in order to learn the concepts and techniques discussed in this course. In particular, conversations with other students and the instructor can be an effective learning method. Reading other books and web pages can be another effective learning method. However, copying someone else's work subverts the learning process.

For assignments, give written acknowledgement to people with whom you have had discussions and to any written materials (other than the text) that were helpful.

For exams, you may *not* use any resources unless a specific exception is stated by the instructor.

Failure to observe the above rules will result in a penalty ranging from a zero on the assignment or exam to immediate failure of the course. Any violation of academic integrity will be reported to the Academic Dean.

Observation of the above rules will help you learn the material well and give you the satisfaction of knowing that you have earned your grade.

Exam 1 Learning Objectives	1. Apply and adapt a variety of appropriate strategies to solve problems. 2. Describe sets with words, roster notation, and Venn diagrams. 3. Translate among verbal, roster notation, and Venn diagram descriptions of sets. 4. Find the complement of a set, and find the intersection and union of two sets. 5. Solve simple enumeration problems and word problems requiring only arithmetic. 6. Recognize and explain patterns in numbers. 7. Use multiple representations of numbers including Babylonian, Roman, and Arabic in different bases.
Exam 2 Learning Objectives	1. Provide multiple interpretations of addition, subtraction, multiplication, and division of whole numbers. 2. Describe how addition, subtraction, multiplication, and division relate to one another. 3. Determine appropriate operations to use in applied problems. 4. Add, subtract, multiply, and divide fluently using a variety of standard and non-standard methods including in bases other than ten. 5. Describe the comparative advantages of different methods of computation. 6. Make reasonable estimates for computations. 7. Determine factors of a natural number and recognize whether a number is prime.
Exam 3 Learning Objectives	1. Provide multiple interpretations of addition, subtraction, multiplication, and division of integers, fractions, and decimals. 2. Add, subtract, multiply, and divide fluently using a variety of standard and non-standard methods. 3. Use proportionate reasoning to solve problems. 4. Formulate questions that can be addressed with data. 5. Collect, organize, and display relevant data to answer questions. 6. Select and use appropriate statistical methods to analyze data. 7. Develop and evaluate inferences and predictions that are based on data. 8. Describe and apply basic concepts of probability.
Project 1 Journals	Each student will be assigned a date (month and year). For the assigned date, browse the issues of *Teaching Children Mathematics*, *Mathematics Teaching in the Middle School*, and *Teaching Mathematics* (all available in the Good Library). Read ten articles on topics related to this course (which is just about anything except geometry). At least five articles should be chosen from the features. Write a 1-2 paragraph summary for each article. Enter each summary as an item in this database.
Project 2 Internet	Browse the internet to find ten activities (e.g., software or worksheets) that would be suitable for use by elementary or middle school teachers to teach or students to learn some aspect of mathematics covered in this course. Write a 1-2 paragraph description of the activity and what mathematical concepts or skills are intended to be learned by engaging in the activity.
Project 3 Numeration	Devise a numeration system. There must be between three and nine different symbols. The symbols 2, 3, 4, 5, 6, 7, 8, and 9 may not be used. No single symbol may represent a positive multiple of 5. The numeration system should be able to represent whole numbers up to 500. Describe your numeration system, including how to count up to at least the equivalent of 500 and appropriate addition and multiplication tables, without reference to the Hindu-Arabic number system. Devise four story problems whose solutions involve the four basic operations of addition, subtraction, multiplication, and division. Devise solutions that illustrate how to perform the four basic operations within your numeration system, without reference to the Hindu-Arabic number system. The numbers used should be chosen so that all aspects of computation are illustrated. Rubric /7 Devised an appropriate numeration system. /7 Described the numeration system clearly. /2 Devised an appropriate addition story problem.

/7 Illustrated addition algorithm fully and clearly.
/2 Devised an appropriate subtraction story problem.
/7 Illustrated subtraction algorithm fully and clearly.
/2 Devised an appropriate multiplication story problem.
/7 Illustrated multiplication algorithm fully and clearly.
/2 Devised an appropriate division story problem.
/7 Illustrated division algorithm fully and clearly.
/50 Total

Project 4 Standards

Each group of one to three students will be assigned a grade level and create a wiki page with the following information. For the assigned grade level, include and compare the Common Core State Standards with the National Council of Teachers of Mathematics Standards in the areas that are relevant to Math 131. For each member of the group, describe three educational activities (e.g., software or worksheets) appropriate for this grade level and identify the standards each activity will help children achieve. Include your names, and acknowledge resources used with appropriate citations (including links if web resources). The page should be organized and formatted so that a reader can easily extract relevant information.

Participation

Participation is 10% of your course grade and is made up of the components listed below. Since the maximum score for engagement is limited by your attendance score, it is important to attend every class. If you have a valid excuse for missing a class (e.g., personal illness, family death, and official Goshen College activities), please inform the instructor as soon as possible and complete an outside activity as a replacement. Of course, for any class you miss, it would be good to find out what happened from the class wiki and/or other students in the class.

Attendance (0-25 points). Start with the maximum score of 25 points, subtract 5 points for each missed class (whether or not for a valid excuse), and add 5 points for each outside activity replacement for an excused absence (illness or a Goshen College sanctioned activity that takes precedence over a class).

Engagement (0-25 points). Assign maximum points (attendance score) if a frequent contributor of useful questions, answers, explanations, ideas, assessments, and comments.

Learning Journal (0-20 points). Maintain a journal containing personal anticipatory reading work, assignment related work, class notes, concept discoveries, process assessments, questions, and answers. Assign 20 points if the journal is organized and complete.

Recorder (0-10 points). Post to the appropriate wiki page within seven hours a summary of class activities, task answers, content discoveries, process reflections, and remaining questions. Expect to devote about an hour to this activity. Assign 5 points for each of two classes.

Introduction (0-5 points). Post an entry to the Introduction forum.

Initial Survey (0-5 points). Complete the Initial Survey.

Final Survey (0-5 points). Complete the Final Survey.

GC Course Evaluation (0-5 points). Complete the GC Course Evaluation.

Outside Activity (0 or more extra credit or attendance replacement points). Tutor an elementary school student in mathematics, observe an elementary school classroom when mathematics is explored, document an error in the course resources, participate in a math-related activity, or read a mathematics (not education) journal article. Each activity should be about an hour in duration. For each activity, add an entry containing (1) a short name, (2) a short identifying description of the activity, and (3) a review of an interesting math-related aspect of the activity. See the ActivitySample and TutorSample entries for more detail. Each entry can be used either as a replacement for an excused class absence or as 5 points extra credit.

Total (0-100 points).