Math 164 Course Syllabus

Foundations of Arithmetic (5 credits)

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Course Description: Mathematical problem solving, reasoning, communication, and connections will the foundation of every activity. Specific content will include concepts and procedures of: (a) numeration, computations, and number theory for the number systems of whole, integer, and rational numbers; (b) functions and relationships; and (c) probability and statistics.

Course Rationale: To meet the expectations for mathematics education for elementary teachers a shift in content, instructional and assessment practices are crucial. The Curriculum and Evaluation Standards of School Mathematics (NCTM, 2000) outlines the specific changes needed in pre-service mathematics education. "Prospective teachers must be taught in a manner similar to how they are to teach--by exploring, conjecturing, communicating, reasoning, and so forth." In addition, " all teachers need an understanding of both the historical development and current application of mathematics. Furthermore, they should be familiar with the power of technology." This course is designed to address these changes in mathematics education and prepare preservice elementary teachers with the necessary mathematical content to implement the different pedagogy modeled in this class. Traditionally elementary mathematics has had a preoccupation with computation and other traditional skills. The vision of this course is to initiate the following instructional reforms.

Content: Toward A rich variety of mathematical topics and problem situations
Away from just arithmetic
Learning: Toward investigating problems
Away from memorizing and repeating
Teaching: Toward questioning and listening
Away from telling
Evaluation: Toward evidence from several sources judged by the teacher
Away from a single test judged externally
Expectation: Toward using concepts and procedures to solve problems
Away from just mastering isolated concepts and procedures

Text: A Problem Solving Approach to Mathematics for Elementary School Teachers (9th)

Authors: Billstein, Libeskind, and Lott

Learner Outcomes: Students will be able to

Performance Outcomes	Assessment Methods
1. problem solving •define the problem; •be able to use a variety of appropriate strategies to solve a problem; • reflect on the solution and process	course activities text assignments projects papers quizzes exams oral presentations portfolio
2. communicate mathematically •organize and communicate their mathematical thinking through examples and multiple representations •use the language of mathematics to express mathematical ideas precisely.	course activities text assignments projects papers quizzes exams oral presentations portfolio

3. mathematically reason •make and investigate mathematical conjectures; •develop a mathematical arguments or proofs;	course activities text assignments projects papers quizzes exams oral presentations portfolio
4. making connections •recognize and use connections among mathematical ideas; •recognize and apply mathematics in contexts outside of mathematics.	course activities text assignments projects papers quizzes exams oral presentations portfolio

Student will demonstrate their understanding of these basic mathematical concepts and procedures by explaining, how to use them and why they work. There are three major content areas covered in this course: **number sense** - numeration, basic arithmetic, number systems, and estimation; **algebraic Sense** - patterns and algebraic equations and operations; and **probability and statistics** - data display and interpretation and calculations probability.

5. For students to demonstrate an understanding of the concepts and procedures of **Number Sense** they must be able to:

Performance Outcomes	Assessment Methods
demonstrate an historical and practical knowledge of the development of the real numbers from the whole numbers;	course activities text assignments projects papers quizzes exams oral presentations portfolio
use concrete, pictorial, and symbolic representations of whole, integer, and rational numbers to: ° explain concepts and processes of the four basic operation; ° explain computational algorithms through place-value representations; ° demonstrate computation of powers and roots ° explain the properties of whole, integer, and rational number systems	
use a variety of concrete, pictorial, and symbolic representations of whole numbers to explain the concepts and processes of prime and composite numbers, divisibility, factors, and multiples;	
explain and applies the concepts of ratio and proportion in a variety of mathematical and real-world situations;	
identify situations in which estimation is sufficient and computation is not required and use a variety of estimation techniques to predict computation results;	

6. For students to understand the concepts and procedures of **Algebraic Sense** they must be able to:

Performance Outcomes	Assessment Methods
•represent, analyze, and generalize a variety of patterns with tables, graphs, words, and, when possible, symbolic rules; •develop an initial conceptual understanding of different uses of variables; •use symbolic algebra to represent situations and to solve problems, especially those that involve first degree, second degree, and exponential equations; •model and solve contextualized problems using various representations, such as graphs, tables, and equations.	course activities text assignments projects papers quizzes exams oral presentations portfolio

7. For students to demonstrate an understanding of the concepts and procedures of **Probability and Statistics** they must be able to:

Performance Outcomes	course activities text assignments projects papers quizzes exams oral presentations portfolio
calculate numerical measures of uncertainty;	
list all possible outcomes of simple experiments	
conduct experiments and compare the empirical and theoretical methods of determining probabilities;	
explain how there can be different interpretations of the same set of data and how statistics can be used and misused to support different points of view or arguments;	
describe a population and systematically collect data;	
organize and appropriately display data in tables, charts, and graphs;	
conduct experiments and compare the empirical and theoretical methods of determining probabilities;	
calculate and use the different measures of central tendency, variability, and range as appropriate in describing sets of data.	

Assessment and Evaluation Guidelines: The instructional and assessment activities are designed to inform student on their progress in achieving the course performances outcomes. The portfolio and written final exam give multiple summative assessments of achievement in meeting these performance outcomes. The instructor will give the students feedback on their progress in meeting the performance outcomes but they are responsible to monitor and initiate their own remediation of weak performances.

Homework: Homework will be given daily and check randomly from your math notebook. The math notebook will be revised into a portfolio in the later two weeks of the course.

Quizzes: You can expect 6 quizzes (20 points). These quizzes will give both the instructor and the students feedback on their performances of course outcomes.

Examinations: Three examinations (100 points each) will be given during the quarter after completing one or two chapters. The date of the test day will be announced at least four days prior to being given. The examinations will address the performance outcomes covered in the quizzes given since the last examination. After self-assessments of each exam the students may retake similar exams and earn back up to half of the miss points. The retake exams must be completed before the date of the next exam. A final comprehensive examination worth 200 points will be given at the end of the quarter covering all course's performance outcomes.

Project Papers: Three class projects and four writing papers (10 points) will be assigned and assessed. Three projects will be open-ended questions requiring discourse demonstrating an understanding and ability to use the concepts of the three content areas of the learner outcomes. The four writing papers will address each of the four process standards of doing mathematics.

Portfolio: During the quarter homework, class activities, projects, writings papers, tests, quizzes, and self evaluations will be organized into a course portfolio (100 points) by following these steps:

1. Use a three ring notebook is needed to organize activities into one of the following four sections: (1) Assessment Activities, (2) Algebraic Sense, (3) Number Sense, or (4) Probability and statistics.
2. Complete the assessment section by demonstrating your proficiency on the first four outcomes putting your four writing papers first followed by all tests, quizzes, and self-assessments.
3. Revise the three project papers and put them at the front of their corresponding portfolio sections: Project 1-Algebraic Sense, Project 2- Number Sense, and Project 3- Probability and Statistics.
4. Include the course syllabus, portfolio evaluation, Individual Information, and a table of content at the beginning of the portfolio (before the assessment section).

Grading: Grades will be determined by the following percents:

93-100% = A, 90-93% = A-, 87-90% = B+, 83-87% = B, 80-83% = B- , 77-80% = C+, 73-77% = C, 70-73% = C-, 67-70% = D+, 63-67% = D, 60-63%, 0-60% = F.

Schedule/Rules: The instructor has a class schedule for the quarter but it is subject to change depending on the needs of the students. Toward the end of the course a record of all activities will be given to each student for the purpose of organizing their portfolio. Attendance is not taken but class participation is essential for learning the course objectives. If a student misses class, it is their responsibility to find out what was covered announced or assigned. In case of emergencies, it is their responsibility to contact the instructor as soon as possible. If a course deadline, quiz, or exam was missed assessment alternatives are left up to the discretion of the instructor.

How to succeed: Take the responsibility for your own achievement of these performance objectives. Use the activities, assignments, assessments, and people such as the instructor to insure that you understand the mathematical concepts and can demonstrated this understanding in the form of the performance objectives.

ADA:

Students with special needs or disabilities who desire academic accommodation are encouraged to submit a copy of the 'Confirmation of Eligibility for Academic Adjustments' from the Disability Support Services office as soon as possible so a plan can be developed that best serves the learning needs of the student. Students without this form should contact the Disability Support Services office in Bouillon 205 at 963-2171 or dssrecept@cwu.edu as soon as possible.