

MATH 4161  
Mathematical Reasoning  
3.0 Semester Hours (3-0-3)  
Department of Mathematics  
College of Arts and Sciences  
Valdosta State University

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**PREREQUISITE**

Grade C or higher in either Math 3162 or Math 3180.

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**REQUIRED MATERIALS**

Textbook: Custom edition of *Reconceptualizing Mathematics for Elementary School Teacher* (3<sup>rd</sup> edition) by Judith Sowder, Larry Sowder, and Susan Nickerson, Macmillan Learning.  
ISBN-10: 1319141943 ISBN-13: 9781319141943

Other: Three-ring binder, colored pencils or markers, ruler (12 inches and 30 cm), scissors, compass, protractor, stapler.

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**COURSE DESCRIPTION**

An in-depth study of concepts and processes underlying the P-8 school mathematics curriculum, with special emphasis on informal and formal mathematical reasoning. Problem solving and historical context serve as unifying strands. The analysis and remediation of student errors manifested in the application of conceptual and procedural mathematical knowledge will also be addressed.

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**GENERAL STUDENT LEARNING OUTCOMES**

By the time you finish this course, you should know (understand) and be able to do the following:

- 1) understand, model, and appreciate the role of informal and formal mathematical reasoning skills and processes within the context of teaching and learning mathematics.
- 2) understand fundamental concepts of formal logic and the relationship to deductive reasoning.
- 3) a) solve a variety of routine and non-routine problems;  
b) select and apply appropriate problem-solving strategies, and describe all aspects of the problem-solving process;  
c) approach unfamiliar problems with confidence in your ability to find solutions.
- 4) a) model pre-number and numeration concepts, including place value;  
b) meaningfully develop and model each of the four basic operations of arithmetic and apply those to a variety of problem settings;  
c) model and explain computational algorithms in a meaningful, developmentally appropriate fashion;  
d) develop and apply a variety of mental computation and estimation techniques;  
e) extend number system knowledge from the whole number system to integers, rationals, and real numbers;  
f) model and apply fundamental number theory concepts.
- 5) a) develop and apply a variety of geometric and measurement computations;  
b) describe and identify different types of spatial reasoning and/or Van Heile Levels.
- 6) describe and utilize appropriately the content and process standards contained within the NCTM Standards 2000 and the Georgia Performance Standards (GPS).

7) diagnose elementary or middle grades students' misunderstandings of mathematical concepts or procedures and develop and deliver appropriate instruction designed to correct those misunderstandings.

## **COURSE OVERVIEW**

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Content and processes of mathematics will be treated in an environment that encourages pre-service teachers to view mathematics as a fascinating and stimulating intellectual endeavor which provides skills, insights, and modes of thinking that are essential in the twenty-first century. The class will consist of instructor and student facilitated discussions of the content and processes. Additionally, students will spend a majority of class time in problem-solving sessions. Or put another way, you are going to spend a lot of time in and out of class solving problems. You will be challenged at times. You may not be able to solve all of the problems.

I also have the expectation that you are able to clearly communicate your reasoning through written and spoken word. You will get practice by writing solutions, presenting solution in class, and sharing your solutions with classmates.

## **ASSESSMENT**

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For all assessments, assignments and due dates will be given in class and posted on BlazeVIEW, when appropriate.

For homework, quizzes, and exams, each problem will be assessed on a 5 point scale:

5: Outstanding    4: Exceeds expectations    3: Acceptable    2: Poor    1: Dreadful

The correctness of an answer and the clarity of the written solution will be considered when assigning the score. The assignment grade will be calculated by taking the geometric mean of the problem scores and rounded to the nearest hundredth.

### **Presentations/Homework (5 pts)**

You must present a problem solution a minimum of 4 times throughout the semester. The solutions could be worked homework problems or problems posed during a class meeting. You will receive a score of 5 for 4 or more presentations, a score of 2 for 1-3, and a score of 1 for 0.

You should complete each assigned problem with a genuine effort. You may seek help on problems from others, including me, but please let your submitted work reflect your understanding.

To calculate the Presentations/Homework score, I will take the geometric mean of your Presentation score and all of your Homework scores, rounded to the nearest hundredth.

Here is an example calculation. Suppose these are your hypothetical scores:

Presentation: 5, HW1: 4.2, HW2: 3.7, HW3: 4.9, HW4: 2.9, HW5: 4.6, HW6: 3.75, HW7: 2.96

$$\text{Geometric Mean: } (5 \cdot 4.2 \cdot 3.7 \cdot 4.9 \cdot 2.9 \cdot 4.6 \cdot 3.75 \cdot 2.96)^{1/8} = 3.93$$

Your Presentations/Homework score would be 3.93.

### **Semester Exams (5 pts each)**

You will take 3 semester exams that will give you an indication of how well you understand the new material covered. While the exams may not be intentionally comprehensive, consider that much of mathematics is built on prior knowledge. Tentative dates are stated on the course schedule.

### Final Exam (5 pts recorded twice)

The final exam is a mandatory comprehensive final. You must take this comprehensive exam at the stated time provided by the university.

### Final Grade

Your lowest score among the Presentations/Homework and three Semester Exams will be replaced by your Final Exam score (if it helps).

I will take the geometric mean of your Presentation/Homework score, your 3 Semester Exam scores, and your Final Exam score (recorded twice). I will then round your score to the nearest whole number.

Course letter grades will be assigned as follows: 5 = A, 4 = B, 3 = C, 2 = D, 1 = F

Here is an example calculation. Suppose these are your hypothetical scores:

Presentations/Homework: 3.93, Exam 1: 4.2, Exam 2: 3.5, Exam 3: 4.8, Final: 4.2

$$\text{Geometric Mean: } (3.93 \cdot 4.2 \cdot 3.5 \cdot 4.8 \cdot 4.2 \cdot 4.2)^{1/6} = 4.12$$

Rounded, this gives a score of 4, which means you earn a B for the semester.

Note about the Geometric Mean: The geometric mean doesn't balance the way the arithmetic mean does. It is influenced more by lower scores. For example, the arithmetic mean of 1 and 5 is 3, while the geometric mean of 1 and 5 is 2.24. The moral of the story is, do not settle for mediocrity! Consistency will be rewarded.

### Final Grade Calculator

$$\left( \underbrace{\hspace{1.5cm}}_{\text{P/H Score}} \cdot \underbrace{\hspace{1.5cm}}_{\text{Exam 1}} \cdot \underbrace{\hspace{1.5cm}}_{\text{Exam 2}} \cdot \underbrace{\hspace{1.5cm}}_{\text{Exam 3}} \cdot \underbrace{\hspace{1.5cm}}_{\text{Final}} \cdot \underbrace{\hspace{1.5cm}}_{\text{Final}} \right)^{1/6} = \underline{\hspace{2cm}}$$

**Make-Up Work:** Under no conditions will late work be accepted and assessed a score other than 1. If you anticipate being absent from class, you must arrange for any assignments due that day to be turned in during that class. You should make every effort to catch up with any work or notes missed.

If you know in advance you must miss a quiz or exam day, let me know in advance so potential arrangements can be made to take the quiz early. It is NOT your right to take a quiz or exam early. This is done at my discretion.

### ATTENDANCE AND TARDINESS

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It is very important that you attend every class session, arriving on time. Roll will be taken each day. Being tardy = being absent. Excessive tardiness or absences may result in the notification of your major chair and/or the filing of a Departmental Concern Form.

We have 26 class meetings. If you miss more than 20% of the class meetings (> 5 days), you will receive an **F** in the course as per Valdosta State University Policy found in the VSU Undergraduate Catalog. Please note that there are **no** distinctions made between "excused" and "unexcused" absences. **All absences are counted equally no matter what the reason.** If you are absent, be certain to get class notes, handouts, and assignments from another student in the class. It is **completely your responsibility** to get class materials for a session that you missed.

## **TECHNOLOGY**

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Please adhere to these policies.

- Unless otherwise noted, please keep cell phones off and stored away during class time.
- All email correspondence should occur through your VSU email account. Do not use the email feature in BlazeVIEW as I do not check that frequently.

## **UNIVERSITY POLICIES**

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### **CONCEALED CARRY POLICY**

It is your responsibility to abide by all pertinent state laws and regulations if you choose to carry a concealed firearm to class. Remember that you are not allowed to carry into a classroom if a high school student is enrolled in the course.

### **SOI STATEMENT**

At the end of the term, all students will be expected to complete an online Student Opinion of Instruction survey (SOI) that will be available on BANNER. Students will receive an email notification through their VSU email address when the SOI is available (generally at least one week before the end of the term). SOI responses are anonymous to instructors/administrators. Instructors will be able to view only a summary of all responses two weeks after they have submitted final grades. While instructors will not be able to view individual responses or to access any of the data until after final grade submission, they will be able to see which students have or have not completed their SOIs. These compliance and non-compliance reports will not be available once instructors are able to access the results. Complete information about the SOIs, including how to access the survey and a timetable for this term is available at:

<http://www.valdosta.edu/academics/academic-affairs/vp-office/directions-for-accessing-and-completing-sois.php>

### **ACADEMIC INTEGRITY**

“Academic integrity is the responsibility of all VSU faculty and students. Faculty members should promote academic integrity by including clear instruction on the components of academic integrity and clearly defining the penalties for cheating and plagiarism in their course syllabi. Students are responsible for knowing and abiding by the Academic Integrity Policy as set forth in the Student Code of Conduct and the faculty members’ syllabi. All students are expected to do their own work and to uphold a high standard of academic ethics.”

Deviation from the stated, implied, or orally given professional standards may result in the notification of your major chair and/or the filing of a Departmental Concern Form with the College of Education to be entered into your permanent file. Serious infractions such as cheating, verbal abuse, and so forth will be reported to the Dean of Students for additional actions.

Full information on Academic Honesty at VSU is available at <http://www.valdosta.edu/academics/academic-affairs/vp-office/academic-honesty-at-vsua.php>

### **CLASSROOM ACCOMMODATIONS**

Students with disabilities who are experiencing barriers in this course may contact the Access Office for assistance in determining and implementing reasonable accommodations. The Access Office is located in Farber Hall. The phone numbers are 229-245-2498 (V), 229-375-5871 (Video Phone) and 229-219-1348 (TTY). For more information, please visit:

<http://www.valdosta.edu/student/disability/> or email: [access@valdosta.edu](mailto:access@valdosta.edu)

### **TITLE IX STATEMENT**

Valdosta State University (VSU) is committed to creating a diverse and inclusive work and learning environment free from discrimination and harassment. VSU is dedicated to creating an environment where all campus community members feel valued, respected, and included. Valdosta State University prohibits discrimination on the basis of race, color, ethnicity, national origin, sex (including pregnancy status, sexual harassment and sexual violence), sexual orientation, gender identity, religion, age, national origin, disability, genetic information, or veteran status, in the University's programs and activities as required by applicable laws and regulations such as Title IX. The individual designated with responsibility for coordination of compliance efforts and receipt of inquiries concerning nondiscrimination policies is the University's Title IX Coordinator: Director of the Office of Social Equity, [titleix@valdosta.edu](mailto:titleix@valdosta.edu), 1208 N. Patterson St., Valdosta State University, Valdosta, Georgia 31608, 229-333-5463.