

## Intuitive Geometry for Elementary Teachers Math 250, 4 Credits, Fall 2008

Instructor: Dr. Teri Willard

Meeting Time: **12:00 – 12:50 pm, M, Tu, Th, F**

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**Office Hours: 11 am M, Tu, Th, F or by appointment, or by email**

**Texts:** *A Problem Solving Approach to Mathematics for Elementary School Teachers*, 9<sup>th</sup> Edition, by Billstein, Libeskind, and Lott

**Supplies:** colored pencils, calculator, several colored folders, 3-ring binder with 8 dividers/tabs, several plastic sleeves/pockets for a binder, graph paper, compass, protractor, ruler,

**Course Description:** Prerequisite Math 164. An intuitive approach to the geometry topics relative to the elementary school curriculum.

**Course Rationale:** According to the *Principles and Standards for School Mathematics* (2000), “Through the study of geometry, students will learn about geometric shapes and structures and how to analyze their characteristics and relationships. Spatial visualization – building and manipulating mental representations of two– and three–dimensional objects and perceiving an object from different perspectives – is an important aspect of geometric thinking. Geometry is a natural place for the development of students’ reasoning and justification skills, culminating in work with proof in the secondary grades. Geometric modeling and spatial reasoning offer ways to interpret and describe physical environments and can be important tools in problem solving. ... The notion of building understanding in geometry across the grades, from informal to more formal thinking, is consistent with the thinking of theorists and researchers.” (p. 41)

### Learner Outcomes for Process and Content Areas\*:

**Process Outcomes:** The five process standards are problem solving, mathematical reasoning, communicating mathematically, making connections, and representation. After completing this course, you will be able to:

Performance Outcomes	Performance Outcomes
1. Problem Solving <ul style="list-style-type: none"> <li>• define a problem;</li> <li>• use a variety of appropriate strategies to solve problems;</li> <li>• monitor and reflect on the problem solution and the process of mathematical problem solving.</li> </ul>	4. Connections <ul style="list-style-type: none"> <li>• recognize and use connections among mathematical ideas;</li> <li>• recognize and apply mathematics in contexts outside of mathematics.</li> </ul>
2. Reasoning and Proof <ul style="list-style-type: none"> <li>• make and investigate mathematical conjectures;</li> <li>• develop mathematical arguments or proofs.</li> </ul>	
<b>(continued)</b> 3. Communication <ul style="list-style-type: none"> <li>• organize and consolidate your mathematical thinking through communication;</li> <li>• communicate your mathematical thinking coherently and clearly;</li> <li>• use the language of mathematics to</li> </ul>	5. Representation <ul style="list-style-type: none"> <li>• create and use representations to organize, record, and communicate mathematical ideas;</li> <li>• select, apply, and translate among mathematical representations to solve problems.</li> </ul>

express mathematical ideas precisely.	
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**Content Outcomes:** The two content areas in this course are *Geometry* and *Measurement*. After completing this course, you will be able to

<b>Performance Outcomes</b>
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1. Geometry
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- analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships
- specify locations and describe spatial relationships using coordinate geometry and other representational systems
- apply transformations and use symmetry to analyze mathematical situations
- use visualization, spatial reasoning, and geometric modeling to solve problems

2. Measurement
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- understand measurable attributes of objects and the units, systems, and processes of measurement
- apply appropriate techniques, tools, and formulas to determine measurements

\*Outcomes are adapted from the *Principles and Standards for School Mathematics* (NCTM, 2000).

**Specific skills:** After completing this course, you will be able to

1. formulate your own definitions and discover generalizations through investigation;
2. express mathematical ideas orally and in writing;
3. make and test conjectures, write simple proofs;
4. formulate counterexamples;
5. understand and construct logical arguments;
6. explain connections between mathematical concepts;
7. explain connections between mathematics and real-world problems;
8. create and explain constructions using compass and straight edge;
9. find the perimeter, area, and volume of two and three-dimensional geometric figures;
10. use standard and nonstandard units of measure to solve problems;
11. convert from one unit to another in standard and metric measurement systems;
12. name one-, two-, and three-dimensional geometric figures;
13. use correct mathematical terminology;
14. use construction to explain geometric concepts or relationships;
15. demonstrate knowledge of the relationship between parallel lines and angle measures;
16. demonstrate knowledge of the properties of triangles and special cases of triangles;
17. demonstrate understanding of the sum of interior and exterior angles of any polygon;
18. explain and use the properties of quadrilaterals;
19. explain and use the concept of similarity in geometry and real-world problems;
20. identify and create the basic geometric transformations;
21. explain and use the properties of isometries;
22. identify and explain different types of symmetries;
23. identify and explain different types of tessellations;
24. explain and use various methods for finding perimeter, area, and volume;
25. use similarity and basic trigonometry to solve problems;
26. explain and use relationships between units of measure within standard and nonstandard measurement systems.

**Work and Assessment:** Please remember that organization, neatness, and legibility count! Points will be deducted for late work at the discretion of the instructor.

**Homework (0 formal points):** Expect to read your textbook and do homework daily. Homework will not be picked up, nor will it be graded. However, homework problems may appear conveniently on quizzes and tests. If you need help with homework, arrange for help from me, classmates, or the Math Center.

**Activities (30 points):** We will be doing a number of activities in class. If we do not complete them in class, you will be responsible for finishing them outside of class. These will be due near the end of the quarter and housed in your notebook (see below).

**Writing Assessments – 4 (60 points)** You will be writing papers demonstrating your fulfillment of specific outcomes for this class. You will receive a handout and rubric describing each assessment. These assignments will have firm due dates that are on your calendar.

**Notebook (45 points total):** Near the end of the quarter, you will turn in a 3-ring binder with 8 sections labeled Introduction, Information, Definitions, Notes, Activities, Quizzes/Tests, Writing Assessments, and Resources. I will discuss what will be contained in each section. This will include an Explanation of Notebook (15 points of 45) and Definitions Section (15 points of 45).

**Quizzes/Daily Grades/Presentations (150 points):** Each item in this category will be worth 25 points. There will be at least 7 of these scores, which could include: quizzes (in-class or take-home) and special in-class activities or presentations in class (unannounced). At least 1(one) of the scores in this category will be dropped for a total of 150 points. **Make-up grades are not possible.**

**Tests (500 points):** There are **two** tests covering 1–2 chapters each and a comprehensive final. The first two tests are 100 points each. The final is worth 200 points. Dates will be announced well in advance. The final is to be taken at the scheduled time. Make-up tests will be allowed only for extraordinary circumstances that I **must** know about in advance. You must do your own work on tests. Notes, cell phones, headphones, or similar items will not be allowed during testing situations. Calculators are allowed.

**Grades: total points = 785 from above**

In order to teach others, you must have a good command of the subject. If you do not understand the material well enough to teach it, both you and your students will suffer. Therefore, your work in this course must be assigned a grade.

93-	90-	87-	83-	80-	77-	73-	70-	67-	63-	60-	<60%
100%	92%	89%	86%	82%	79%	76%	72%	69%	66%	62%	F
A	A-	B+	B	B-	C+	C	C-	D+	D	D-	

### **Attendance and Professionalism**

If you are to fully benefit from this class, you must attend. As you prepare to become a teacher, you need to become accustomed to setting a good example for students. Attendance demonstrates professionalism and dedication. High quality work and organization demonstrate professionalism, as well.

### **Academic Honesty**

There are times when it is proper to get help from others and times when it is not. Feel free to ask others for help on homework, activities, and take-home quizzes. You can only learn how to do something new by doing it correctly. During in-class quizzes and tests, you must do your own work. Academic dishonesty will not be tolerated during testing situations.

### **Schedule**

I will keep you informed of the schedule and assignments and you can record them on the calendar I will hand out. Keep the calendar in your notebook.

### **Success**

To be successful, you must work hard and **be organized**. I encourage you to form study groups. You must also study regularly, take notes, do your homework, and read the textbook (Read each lesson before you come to class. Most material will be presented in class from a different perspective than the textbook.) You must seek help before you are in trouble and/or too far behind. Never hesitate to ask for help from me, your classmates, or anyone else who can help. I am here to serve you and help you be successful. If you need help, decide what you need help with and write it down. If you are working on a problem unsuccessfully, write down the approaches you have tried. Then seek help with your paper in hand. Write down the helpful hints you receive. Finally, after you successfully complete this course, do not let this be your last course in mathematics. After you join the ranks as a teacher take more courses, attend workshops, read professional journals, attend conferences, and network with other teachers. Successful teachers continually renew themselves.

### **Additional Note**

Students with disabilities who wish to set up academic adjustments in this class should give me a copy of their "Confirmation of Eligibility for Academic Adjustments" from the Disability Support Services Office as soon as possible so we can discuss how the approved adjustments will be implemented in this class. Students without this form should contact the Disability Support Services Office, Bouillon 205, or [dssreceipt@cwu.edu](mailto:dssreceipt@cwu.edu) or 963-2171.

**Good Luck** in this course! I hope you find it enjoyable and never hesitate to talk to me if you have any problems.

**Don't skip class!**