

Content Refresher and Pedagogy Enhancement for Teachers: Geometry

COURSE SYLLABUS: MTE 505—3 graduate credits

Prerequisites: Knowledge of Geometry content and an undergraduate degree.

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Emails will typically be answered within 48 hrs during weekdays and 72 hrs during weekends.

General Description The primary goal of this class is for the student to begin to acquire the techniques necessary to effectively teach Geometry at the secondary level. This course will focus on the investigation of materials, pedagogy, and technology to teach Geometry and to refresh content knowledge in ways that conform to the National Council of Teachers of Mathematics (NCTM) standards. Students will examine strategies and skills to creatively engage secondary level mathematics students as they begin to master Geometry.

Objectives This course is intended to provide appropriate training for the Algebra teacher by providing opportunities to

- understand the core concepts of each content area through exploration of problems as they relate to teaching and learning strategies for the specific topics;
- develop an understanding of the role of investigative experiences in each content area which lead to the discovery of key mathematical relationships;
- gain an historical perspective on the development of mathematics in diverse cultures;
- develop specific methods, ideas, materials, models, and activities for teaching the different content that encourage flexible and resourceful problem solving;
- develop methods and ideas for appropriate uses of technology in both teaching and discovery;
- use the different content areas of mathematics as a source of mathematical models in the natural world;
- develop a strong understanding of the different content areas and their roles in the K–12 mathematics.

Text and Materials

Teaching Secondary Mathematics, Third Edition, Brumbaugh and Rock

Navigating through Geometry in Grades 9–12, NCTM 2001

Technology requirements: Computer access with Internet with sufficient bandwidth to stream online videos (i.e., DSL, Cable modem, or T1/T3). Access to email account. DVD player (television or computer).

Blackboard: Students will be given access to the course website through Blackboard. The course materials will ONLY be accessible when you login to the course website. You must have an email address and

update the site to include your active email. All questions and assignments should be emailed to the address provided on the website. All emails MUST have the subject with the course number followed by the student's last name, comma and first name (for example: MTE 505 Smith, John). **To protect the professor's computer from potential viruses, no email will be opened unless the subject is in the correct format.** It is the student's responsibility to save all work until a final grade has been issued in case they need to be resent.

DVDs: Four DVDs are provided that contain content information for this course. This information is supplemental and should be used by the student to review content information when necessary.

In addition, practice problem sets are located on the course website. They are representative of the content knowledge required on the quizzes and the final exam.

Graphing Calculator: The use of a graphing calculator is not required for this course; however it is useful to have access to a TI-83 or TI-84. Knowledge and competence for use of other graphing calculators will be the sole responsibility of the participant.

Geometer's Sketchpad: The use of the Geometer's Sketchpad is required for this course. There are multiple activities that require its use.

Course Requirements

This course will be offered through Distance Education. Participating teachers may take up to nine months to complete all requirements. There are no scheduled class sessions or meetings. There is an Internet web site that contains practice problems, three activity packets, four quizzes and a cumulative Final Examination. Modules must be completed sequentially. Each module (activity, practice problems, blog entries and quiz) must be COMPLETE prior to beginning the next module.

Each module includes a reading component. Students are expected to use the activity packet essay as a catalyst for analysis of reading content. The essay should reflect not only knowledge of the content but demonstrate a deep understanding of how this knowledge impacts the teaching of mathematics. The content of the reading will also be covered on the quizzes and the final exam.

Each module includes a set of practice problems (answers are included). These problems are recommended (but will not be submitted for grading) to assess the student's recall of the required level of mastery of the mathematical content. If the content knowledge is deficient, the student should use the DVDs to achieve this level since this content will be included on the quizzes and the final exam.

Some modules include reading and activities from the *Navigating through Geometry* text. These activities should be completed to aid the student in gaining a rich understanding of the teaching of geometry. As with the reading, the essay should include the analysis and synthesis of all of components of the module. This material will also be included on the quizzes and the final exam.

Course Timeline

I. Complete **each** module using the following sequence.

1. Complete practice problems – use DVDs to aid in mastery as needed
2. Complete readings and associated materials
3. Complete Activity Packet
4. Submit Essay (if assigned)
5. Complete online quiz - Essay must be submitted prior to taking the quiz.

II. Complete Final exam – all modules must be completed prior to taking the exam.

Course Policies

1. The participant must master the material assigned for each module.
2. Participants must complete the three activity packets and the four practice problem sets that are provided on the course web site.
3. Each of the four modules will have an accompanying timed quiz posted on Blackboard. The participant must complete each of these quizzes online.
4. There will be a cumulative final examination. The participants will complete the final exam in the presence of a school or district administrator, have the administrator sign the Proctor Form and mail the Proctor Form and pages used to work out problems on the exam to Tania McDuffie, 226 Hydrick Street, Spartanburg, SC 29306. Students should email the professor to approve an alternate proctoring situation.
5. Blog entries are intended to be an avenue for students to communicate with each other, as well as faculty. Students are encourage to use this tool to share ideas and facilitate discuss about course topics. While students will not be graded on their blog participation, we hope students will see the value in this component of the course and utilize it to enrich their experience.

Grading

Participation as demonstrated through:

Three Activity Essays	60%
Quizzes.....	25%
Final Exam	15%
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Grade Range:

93–100.....	A
90–92.....	A-
87–89.....	B+
83–86.....	B
80–82.....	B-
77–79.....	C+
73–76.....	C
70–72.....	C-
Below 70	F

Course Topics

The topics of this course are arranged by content. While students are expected to have prior knowledge of these specific topics, they will be reviewed on the DVDs and embedded in the pedagogy components of each module.

Module #1 – Basics of Geometry, Reasoning and Proof, Perpendicular and Parallel Lines

List of Topics	Complete the following assignments in sequential order. All prior material will be covered on the quiz.
1. Patterns and inductive reasoning 2. Points, lines and planes 3. Segments, angles, bisectors, angle pairs 4. Introduction to perimeter, circumference and area 5. Conditional and biconditional statements 6. Deductive reasoning 7. Proving statements about segments and angles, lines and angles 8. Proof and perpendicular lines 9. Parallel lines and transversals in the coordinate plane 10. Proving properties of parallel lines	Required 1. <i>Teaching Secondary Mathematics, 3rd Ed.</i> , Brumbaugh and Rock: Read Chapter 1 and 2 2. <i>Navigating through Geometry in Grades 9–12: Fold Me, Flip Me</i> pp. 12–13 read and complete activity 3. Activity #1: Finding Proof 4. Recommended (not required): DVD Refresher Content Geometry Unit I 5. Content Practice Problems: on website 6. Complete Quiz #1

NOTE: You must submit your Activity Essay for activity #1 and take quiz #1 BEFORE you can start Module #2.

Module #2 - Congruent Triangles and Properties of Triangles and Quadrilaterals

List of Topics	Complete the following assignments in sequential order. All prior material will be covered on the quiz.
1. Triangles, angles and congruence 2. Shortcut methods for congruence of triangles 3. Using congruent triangles 4. Isosceles, equilateral and right triangles 5. Coordinate proof and triangles 6. Perpendiculars and bisectors of triangles	Required 1. <i>Teaching Secondary Mathematics, 3rd Ed.</i> , Brumbaugh and Rock: Read Chapter 4, 5 and 6 2. Activity #2: Properties of Parallelograms 3. Recommended (not required): DVD Refresher Content Geometry Unit II 4. Content Practice Problems: on website

<p>7. Medians and altitudes of triangles, midsegment theorem</p> <p>8. Inequalities and indirect proof in one and two triangles</p> <p>9. Polygons, properties of parallelograms, proving quadrilaterals are parallelograms</p> <p>10. Special parallelograms: rhombuses and squares</p> <p>11. Trapezoids, kites and special quadrilaterals</p>	5. Complete Quiz #2
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NOTE: You must submit your Activity Essay for activity #2 and take quiz #2 BEFORE you can start Module #3.

Module #3 - Transformational Geometry, Similarity, Right Triangles and Trigonometry, Rigid Motion in the Plane, Reflections, Rotations

List of Topics	Complete the following assignments in sequential order. All prior material will be covered on the quiz.
<p>1. Translations and vectors</p> <p>2. Glide reflections and compositions, frieze patterns</p> <p>3. Tessellations</p> <p>4. Ratio and proportion, problem solving with proportions and similar triangles</p> <p>5. Similar polygons, similar triangles and proof</p> <p>6. Dilations</p> <p>7. Similar right triangles</p> <p>8. Pythagorean theorem and its converse</p> <p>9. Special right triangles, trigonometric ratios, solving right triangles</p> <p>10. Vectors</p>	<p>Required</p> <p>1. <i>Teaching Secondary Mathematics</i>, 3rd Ed., Brumbaugh and Rock: Read Chapter 6 and 7</p> <p>2. <i>Navigating through Geometry in Grades 9–12: Into the Light with Transformations</i> pages 21–25 Read and Complete activity.</p> <p>3. Activity #3: Treasure Island</p> <p>4. Recommended (not required): DVD Refresher Content Geometry Unit III</p> <p>5. Content Practice Problems: on website</p> <p>6. Complete Quiz #3</p>

NOTE: You must submit your Activity Essay for activity #3 and take quiz #3 BEFORE you can start Module #4.

Module #4 - Circles, Area of Polygons and Circles, Surface Area and Volume

List of Topics	Complete the following assignments in sequential order. All prior material will be covered on the quiz.
<ol style="list-style-type: none"> 1. Tangents to circles, arcs chords, inscribed angles 2. Other angle relationships in circles 3. Segment lengths in circles 4. Equations of circles and locus 5. Angle measurement in polygons, area of regular polygons 6. Perimeters and areas of similar figures 7. Circumference and arc length 8. Areas of circles and sectors 	<p>Required</p> <ol style="list-style-type: none"> 1. <i>Teaching Secondary Mathematics, 3rd Ed.</i>, Brumbaugh and Rock: Read Chapter 11 2. <i>Navigating through Geometry in Grades 9–12: Coordinate Connections</i> pp. 52–53 Read and complete activities 3. Recommended (not required): DVD Refresher Content Geometry Unit IV 4. Content Practice Problems: on website 5. Complete Quiz #4