Math 3703
Geometry for Teachers
Fall 2009

Instructor: Dr. Joy Black  E-mail: jblack@westga.edu
Office Location: 318 Boyd Building  Office Phone: 678-839-4128

Office Hours: TTh – 9:00 – 9:30 a.m.
TTh – 11:00 a.m. – 2:00 p.m.
Th – 3:30 – 5:30 p.m. or by appointment
(Office hours are subject to change)

Course Objectives

Students will demonstrate:

• A better understanding of standard vocabulary and symbols of elementary mathematics;
• An ability to reason logically and to provide justifications and coherent arguments for the plausibility of conjectures;
• An ability to use geometry in real-world problem solving;
• Well-developed spatial sense including both two- and three-dimensional figures (tessellations, symmetry, congruence, similarity, polygons and other curves, polyhedra);
• A better understanding of geometry and measurement from a historical perspective;
• A better understanding of measurement including the metric system;
• An ability to solve measurement problems involving perimeter, circumference, area, volume, temperature, and mass;
• A better understanding of synthetic, coordinate, and transformational geometry with an emphasis on problem solving;
• A better understanding of the uses of a variety of manipulatives, technology, and other materials for the P-8 level;
• A better understanding of the vision of mathematics education as put forth in NCTM’s Principles and Standards (2000);
• A better understanding of the scope and sequence of elementary school mathematics programs;
• A knowledge of current professional literature in the field of mathematics education.

Text (OPTIONAL)

Additional Required Supplies

Math 3703 course packet of handouts which is available at the university bookstore.
Compass
Protractor
Ruler
Two children’s books related to mathematical topics in MATH 3703 Folder
Three Ring Binder for Portfolio
Geometer Sketchpad – Can be accessed from any computer on campus or purchased from Key Curriculum Press for $39.95 – www.keycurriculumpress.com/x4752.xml - go down to the Student Edition (requires CD in the drive)

Course Evaluation

<table>
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<th>Assignments</th>
<th>Points</th>
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<td>Test - 2 @ 150 points</td>
<td>300</td>
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<td>Portfolio</td>
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<td>Pre &amp; Post Test</td>
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<td>In-class group work &amp; presentations</td>
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<td>Comprehensive Final Exam</td>
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<td>Bonus Assignment</td>
<td>20</td>
</tr>
<tr>
<td>Total</td>
<td>1000</td>
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</table>

Final course grades will be assigned as follows:  A (900-1000 points); B (800-899 points); C (700-799 points); D (600-699 points); F (0-599 points).

Test

Math 3703 will consist of two regular exams and a comprehensive final exam. The instructor reserves the right to alter the exam schedule/format as conditions may warrant.

Test Dates

September 24th – Test 1
November 17th – Test 2
Final for 9:30 Class – December 10th – 8:00 – 10:00 a.m.
Final for 2:00 Class – December 8th – 2:00 – 4:00 p.m.

Portfolio

You are to create a geometry portfolio which will consist of five sections. The final portfolio is due on or before November 12th. Any portfolio turned in after the due date will be assessed a
late penalty of **twenty points**. Parts of the portfolio will be turned in on different dates during the semester. Due dates for these particular assignments are included in the section explanations.

Each section is expected to be neat and well organized, incorporating correct spelling and grammar.

**Section 1 – Geometry in ________**

In this section, you will display geometric ideas that we have covered/will cover this semester. This Section is worth 75 points. Note the following:

- This portfolio section should have a theme. For example, your theme could be “Geometry on Campus” and you would therefore feature geometric ideas that appear on campus.
- This portfolio section may include pictures cut from magazines OR it may consist of actual photographs. If you would like to make a video, that is acceptable as well.
- The contents of this portfolio section should be clearly labeled with appropriate definitions. For example, a picture of parallel lines should be labeled parallel lines and the definition of parallel lines should be included. If you are making a video, then the narration should include the label and its definition. Definitions should be obtained from the text and/or class notes.
- This portfolio section should be neat!
- **Items should appear in the order that they are listed below.**
- The following is a list of items that should appear in your portfolio:
  1. parallel lines
  2. perpendicular lines
  3. scalene, acute triangle (This is a triangle that is both scalene and acute.)
  4. isosceles, right triangle (This is a triangle that is both isosceles and right.)
  5. rectangle
  6. square
  7. rhombus
  8. circle
  9. pentagon OR hexagon
  10. prism
  11. pyramid OR cone
  12. cylinder OR sphere
  13. tessellation
  14. a figure with line symmetry and/or rotational symmetry
- One picture may be used to represent at most two of the above terms. Be sure that everything is clearly labeled.
- If there are any other geometric ideas that you would like to represent in your portfolio that would be great!
Section 2 – Geometry in Teaching

This section consists of scenarios or problems that require you to take an in-depth look at the geometry concept involved. They will be handed out periodically throughout the semester and graded. When you turn in your project, you should include these graded assignments. This section is worth 140 points.

1) Quadrilateral Quandary – September 3rd
2) Geometry Constructions – September 17th
3) Patty Paper Geometry – September 22nd
4) Area – October 20th
5) Volume – October 29th
6) Tessellations – November 12th (In Portfolio)
7) Geometer Sketchpad – November 24th – Email to me

Section 3 – Children’s Literature Related to Mathematics

You will also select TWO mathematics literature books related to geometry/measurement for your grade level(s). Identify the GPS (www.georgiastandards.org). Develop an activity for the story along with relative questions pertaining to the book. The book along with the information about the book, activity, materials needed to complete the activity, and questions should be turned in together. Plan an extension for the activity you have included with the children’s book. When you turn in your portfolio, you should include these graded activities. This section is worth 40 points. Literature Assignment due dates are as follows:

1) Literature Assignment 1 Due – October 1st
2) Literature Assignment 2 Due – October 13th

Section 4 – Journals

(60 points)

This semester you will create a journal. Note the following:

- Journal entries will be written either during class sessions or outside of class.
- Journal entries should be brought with you to class each day.
- If you are absent, you are still expected to complete the assigned journal entry. It is your responsibility to complete this missed entry. It is important to keep current in your writing and not fall behind.
- Journal entries should be written in complete sentences with correct spelling, grammar, and punctuation.
- Neatness is important!
- Please do not place your journal entries in plastic, protective coverings.
- Journal entries will be collected for grading purposes and to provide feedback on the specified dates (see below).
- Once a journal entry has been graded, it will not be regraded.
Journal entries will be scored according to the following:

- 0 = The entry is missing OR only the journal prompt is included OR no meaningful response is given.
- 1 = A meaningful attempt to respond to the journal prompt was made but it was either incomplete or it fell far short of providing an accurate solution/response.
- 2 = A complete but inaccurate response was given OR a correct response was provided without a clear explanation. For example, an inappropriate strategy led to an incorrect answer OR some condition of the problem was ignored OR work leading up to the correct response is omitted.
- 3 = A thorough, accurate, clear response is provided.

The journal counts for 60 points of the total portfolio’s final grade.

**Math 3703**

**Journal Entries**

Most days will have specific questions to write entries about. On days when it says “Class” write a short reflection about what was done in class.

**Section 4** – Journals will be taken up on these dates and should include any entries from the following dates.

- September 10th – Journal Entries from August 20th – September 8th – 18 points
- October 22nd – Journal Entries from September 10th – October 20th – 24 points
- November 12th – October 22nd – November 8th (In Portfolio) – 18 points

**Journal Prompts**

**August 20th** – Your 5th grade students are learning to use protractors to measure angles. Several of your students measured the angle below as 130°.

\[ \text{\includegraphics{angle.png}} \]

a) Why do you believe the students are incorrectly reporting the measurement of 130°?

b) How could you enable your students to see why their measurement is incorrect? What exactly would you say to the student? (be specific)
August 25th – In class we saw that the sum of the interior angles for a convex n-gon can be found using the formula \((n-2)180\). Explain in your own words why this formula works.

August 27th – a) Compare and contrast figure A with figure B (below). (Note: Compare means to tell how they are alike. Contrast means to tell how they are different.)

![Figure A](image1)

![Figure B](image2)

b) Explain why every square is a rectangle but not every rectangle is a square.

September 1st – Compare and contrast a square-based prism with a square-based pyramid. Include a drawing of each.

September 3rd – Explain in your own words why “SSA” is not enough information for showing two triangles congruent. Include example triangles to support your reasoning. Triangles should be accurately drawn.

September 8th – Construct with a straightedge and compass an angle that is congruent to the angle below. Include a written description of the steps you take.

September 10th – Explain why 2 squares are always similar but 2 rectangles are not always similar.

September 15th – Class

September 17th – No Entry

September 22nd – No Entry

September 24th – No Entry
September 29th – Class

October 1st – Your student, Shelly, measured the segment pictured below as 1.4 inches.

![Ruler Measurement](image)

1.4 inches

a) What do you believe Shelly’s reasoning was that led to this response?

b) Explain to Shelly WHY her answer is incorrect and how she should use the ruler to correctly find the measurement.

October 6th – Many people incorrectly believe that since there are 3 feet in one yard, there are also 3 square feet in a square yard. Provide a conceptually-based explanation of why this is not true. Be sure to include drawings to support your explanation.

October 8th – Class

October 13th – Class

October 15th – No Entry

October 20th – What is meant by the phrase “surface area”? Explain how to find the surface area of a rectangular prism. Include an example.

October 22nd – Fran reported that the volume of her cone was 50 inches. Explain to Fran why it is incorrect to report volume in inches. Include with your explanation a description of what a cubic inch looks like and what it means to have a volume of 50 cubic inches.
October 27th – Examine the pre-image and the image of the equilateral triangle. Explain how you know that the image is not the result of a translation. Explain how you know it is the result of a rotation.

October 29th – Examine the pre-image and the image from the previous entry. Explain how you know that the image in not the result of a reflection.

November 1st – Compare and contrast rotational symmetry and point symmetry.

November 3rd – Class

November 8th – Provide a thorough explanation of why a regular pentagon will not tile a plan.

Section 5 – Article Reflections

Throughout the semester, you will read a variety of journal articles and be required to write reflections about them. Your reflection should follow the format and guidelines contained in this document. Reflections should be between 1 ½ to 2 pages in length. When you turn in your portfolio, you should include these graded reflections. Each article reflection is worth 5 points and the section is worth 30 points.

Format for article reflections 1 - 4 should be as follows:

Article Reflection # - TITLE of article
Name_________________________ Date________________

Introduction
This section of the paper consists of one paragraph which introduces the topic and summarizes the content of the article.

**Classroom Application**

This section of the paper consists of several paragraphs which describe in detail how the information from the article will be applied in your future classroom.

**Conclusion**

This section of the paper consists of one paragraph that describes your personal thoughts and opinions regarding the content of the article.

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<th>Reflection</th>
<th>Due</th>
<th>TITLE</th>
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<td>1</td>
<td>August 18th</td>
<td>Geometry and Me</td>
</tr>
<tr>
<td>2</td>
<td>August 25th</td>
<td>Vygotsky and the Three Bears</td>
</tr>
<tr>
<td>3</td>
<td>September 1st</td>
<td>ECED – Young Children’s Ideas about Geometric Shapes</td>
</tr>
<tr>
<td></td>
<td>(Reflection 1)</td>
<td>MGED – The Role of Definition</td>
</tr>
<tr>
<td>4</td>
<td>October 6th</td>
<td>ECED – Shape Up!</td>
</tr>
<tr>
<td></td>
<td>(Reflection 3)</td>
<td>MGED – Perimeter and Area through the van Hiele Model</td>
</tr>
<tr>
<td>5</td>
<td>October 27th</td>
<td>ECED – Educating Hannah: It’s a What?</td>
</tr>
<tr>
<td></td>
<td>(Reflection 4)</td>
<td>MGED – Using Origami to Promote Geometric Communication</td>
</tr>
<tr>
<td>6</td>
<td>November 12th</td>
<td>Geometry and Me (Chapter 2)</td>
</tr>
<tr>
<td></td>
<td>(In Portfolio)</td>
<td></td>
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</tbody>
</table>

**Scoring for Geometry Portfolio**

- Section 1 – 75 points
- Section 2 – 140 points
- Section 3 – 60 points
- Section 4 – 60 points
- Section 5 – 30 points
- All Sections Included/Neatness – 15 points

Total Points – 380
Bonus Assignment

Points Possible – 20 Points

Bonus Assignment must be turned in by October 8th. This assignment may be turned in early but no bonus assignment may be turned in after October 8th.

Create a set of the following Regular Polyhedron. Your set should be made of something other than regular paper such as card stock or poster board. Full credit of the twenty points will depend on neatness! Be sure to include the name of the three dimensional shape, number of faces, edges, and vertices.

1. Cube
2. Tetrahedron
3. Octahedron
4. Dodecahedron
5. Icosahedron

In-class Group Work & Presentations
Students will be participating in group work in class. It is the responsibility of the group to make sure that each member of the group is prepared to present their solutions to the remainder of the class. Students must be in class and actively participating in the group work to receive these points.

Attendance Policy
Students are expected to attend all classes. This term a student may withdraw with a grade of W through October 6th, regardless of grades, absences, etc. This deadline has been established by the University. After this deadline, if a student accumulated more than five absences throughout the semester, he/she will normally receive a grade of WF. (A grade of WF counts as an F.) The five absences should be saved for sickness and other emergencies. Late arrivals and early exits count one-half of an absence. If a student is absent for a test and has an excuse from someone in authority, then the final exam grade will be used in the calculation of the final course grade. No make-ups will be given. For each day a student is absent from class sixteen points will be deducted from the class participation total. Students who maintain a perfect attendance record (i.e. no excused or unexcused absences) will have 6 points added to their Total Points at the end of the semester. Students should understand that NO EXTRA CREDIT WILL BE GIVEN FOR ANY REASON!

Conferences
Conferences can be beneficial and are encouraged. All conferences should occur during the instructor’s office hours, whenever possible. If these hours conflict with a student’s schedule, then appointments should be made. The conference time is not to be used for duplication of lectures that were missed; it is the student’s responsibility to obtain and review lecture notes before consulting with the instructor. The instructor is very concerned about the student’s achievement and well-being and encourages anyone having difficulties with the course to come
by the office for extra help. **Grades will be based on coursework, not on Hope Grant needs, financial aid, GPA, or any other factors outside the realm of coursework.**

**Individual Accommodations**
Students requiring individual educational accommodations should discuss their needs with the instructor within the first week of class.

**Conduct and Academic Integrity**
It is expected that students be familiar with the Student Conduct Code, Disciplinary Procedures and Disciplinary Sanctions in the Student Handbook. Cheating and/or any conduct that disturbs the classroom, the instructor, or the students WILL NOT be tolerated!! Any evidence that may show otherwise will be reported; appropriate actions will be taken; and consequences will result. If you are caught cheating on a reflection, children’s literature assignment, portfolio assignments, or test you will receive an F for the course.

**Pagers and Cell Phones**
Students are not allowed to carry pagers and cell phones in the classroom unless they are set to an inaudible setting.
### Math 3703
**Fall 2009**
**Course Outline**

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<td>Syllabus Pre-Test</td>
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<td>August 18th</td>
<td>Lonesome Llama Point, Line, Plane</td>
<td></td>
<td>Geometry &amp; Me</td>
</tr>
<tr>
<td>August 20th</td>
<td>Measuring Angles Polygons on the Geoboard Sorting Polygons</td>
<td>Your 5th grade students are learning to use protractors to measure angles. Several of your students measured the angle below as 130°.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>a) Why do you believe the students are incorrectly reporting the measurement of 130°?</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) How could you enable your students to see why their measurement is incorrect? What exactly would you say to the student? (be specific)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>August 25th</td>
<td>Interior &amp; Exterior Angles of Regular Polygons Angles – Parallel &amp; Perpendicular Lines</td>
<td>In class we saw that the sum of the interior angles for a convex n-gon can be found using the formula ((n-2)180). Explain in your own words why this formula works.</td>
<td>Reflection 1 Due</td>
</tr>
<tr>
<td>August 27th</td>
<td>Quadrilateral Quandary</td>
<td>a) Compare and contrast figure A with figure B</td>
<td></td>
</tr>
<tr>
<td>Date</td>
<td>Topic</td>
<td>Activity</td>
<td>Due Date</td>
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<tr>
<td>September 1st</td>
<td>Three Dimensional Shapes</td>
<td>Compare and contrast a square-based prism with a square-based pyramid. Include a drawing of each.</td>
<td>Reflection 2 Due</td>
</tr>
<tr>
<td>September 3rd</td>
<td>Congruency – Triangles</td>
<td>Explain in your own words why “SSA” is not enough information for showing two triangles congruent. Include example triangles to support your reasoning. Triangles should be accurately drawn.</td>
<td>Quadrilateral Quandary Due</td>
</tr>
<tr>
<td>September 8th</td>
<td>Constructions</td>
<td>Construct with a straightedge and compass an angle that is congruent to the angle below. Include a written description of the steps you take.</td>
<td></td>
</tr>
<tr>
<td>September 10th</td>
<td>Similarity of Polygons</td>
<td>Explain why 2 squares are always similar but not every rectangle is a square.</td>
<td>Journals Due</td>
</tr>
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b) Explain why every square is a rectangle but not every rectangle is a square.

Figure A
Figure B
Circles are not always similar.

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<th>Activity</th>
<th>Notes</th>
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<td>September 15&lt;sup&gt;th&lt;/sup&gt;</td>
<td>Circles Folding Circles</td>
<td>Class</td>
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<tr>
<td>September 17&lt;sup&gt;th&lt;/sup&gt;</td>
<td>Origami – Folding a Cube, etc.</td>
<td>No Entry</td>
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<tr>
<td>September 22&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>Review for Test 1</td>
<td>No Entry</td>
</tr>
<tr>
<td>September 24&lt;sup&gt;th&lt;/sup&gt;</td>
<td>Test 1</td>
<td>No Entry</td>
</tr>
<tr>
<td>September 29&lt;sup&gt;th&lt;/sup&gt;</td>
<td>How Big is a Foot? Leaping Frog</td>
<td>Class</td>
</tr>
<tr>
<td>October 1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>Circumference Activity Linear Measurement</td>
<td>Your student, Shelly, measured the segment pictured below as 1.4 inches. (See diagram in packet)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>a) What do you believe Shelly’s reasoning was that led to this response?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b) Explain to Shelly WHY her answer is incorrect and how she should use the ruler to correctly find the measurement.</td>
</tr>
<tr>
<td>October 6&lt;sup&gt;th&lt;/sup&gt;</td>
<td>Area &amp; Perimeter Activity Areas on a Geoboard</td>
<td>Many people incorrectly believe that since there are 3 feet in one yard, there are also 3 square feet in a square yard. Provide a conceptually-based explanation of why this is not true. Be sure to include drawings to support your explanation.</td>
</tr>
<tr>
<td>(Last Date to Withdraw with a W)</td>
<td></td>
<td>Reflection 3 Due</td>
</tr>
<tr>
<td>October 8&lt;sup&gt;th&lt;/sup&gt;</td>
<td>Area Formulas</td>
<td>Class</td>
</tr>
<tr>
<td>October 13&lt;sup&gt;th&lt;/sup&gt;</td>
<td>Pythagorean Theorem</td>
<td>Class</td>
</tr>
<tr>
<td>October 15&lt;sup&gt;th&lt;/sup&gt;</td>
<td>Fall Break – No Class</td>
<td>No Entry</td>
</tr>
<tr>
<td>October 20&lt;sup&gt;th&lt;/sup&gt;</td>
<td>Volume Activity Surface Area &amp; Volume Formulas</td>
<td>What is meant by the phrase “surface area”? Explain how to find the surface area of a rectangular prism. Include an</td>
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<tr>
<td>Date</td>
<td>Topic</td>
<td>Description</td>
</tr>
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</tr>
<tr>
<td>October 22&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>Surface Area &amp; Volume Formulas Continued</td>
<td>Fran reported that the volume of her cone was 50 inches. Explain to Fran why it is incorrect to report volume in inches. Include with your explanation a description of what a cubic inch looks like and what it means to have a volume of 50 cubic inches.</td>
</tr>
<tr>
<td>October 27&lt;sup&gt;th&lt;/sup&gt;</td>
<td>Translations &amp; Rotations</td>
<td>Examine the pre-image and the image of the equilateral triangle. Explain how you know that the image is not the result of a translation. Explain how you know it is the result of a rotation. (See diagram in packet.)</td>
</tr>
<tr>
<td>October 29&lt;sup&gt;th&lt;/sup&gt;</td>
<td>Reflections</td>
<td>Examine the pre-image and the image from the previous entry. Explain how you know that the image in not the result of a reflection.</td>
</tr>
<tr>
<td>November 3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>Size Transformations</td>
<td>Compare and contrast rotational symmetry and point symmetry.</td>
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<tr>
<td>November 5&lt;sup&gt;th&lt;/sup&gt;</td>
<td>Line Symmetry</td>
<td>Class</td>
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<tr>
<td>November 10&lt;sup&gt;th&lt;/sup&gt;</td>
<td>Tessellations</td>
<td>Provide a thorough explanation of why a regular pentagon will not tile a plan.</td>
</tr>
<tr>
<td>November 12&lt;sup&gt;th&lt;/sup&gt;</td>
<td>Review for Test 2</td>
<td></td>
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<tr>
<td>November 17&lt;sup&gt;th&lt;/sup&gt;</td>
<td>Test 2</td>
<td></td>
</tr>
<tr>
<td>November 19&lt;sup&gt;th&lt;/sup&gt;</td>
<td>No Formal Class – NCTM Regional Conference in Nashville, TN (Work on Geometer Sketchpad)</td>
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<tr>
<td>Date</td>
<td>Assignment</td>
<td>Notes</td>
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<tr>
<td>November 24th</td>
<td>No Formal Class – Finish Geometer Sketchpad Assignment</td>
<td>Email Geometer Sketchpad Assignment to Dr. Black</td>
</tr>
<tr>
<td>December 1st</td>
<td>Last Day of Class – Review for Final</td>
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<tr>
<td>December 8th</td>
<td>2:00 Class Final from 2:00 – 4:00 p.m.</td>
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<tr>
<td>December 10th</td>
<td>9:30 Class Final from 8:00 – 10:00 a.m.</td>
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