University of Texas at El Paso
College of Education

Fall 2014
SCED 4367 (CRN 12254, Hybrid)
Teaching Mathematics in Secondary School

This syllabus is subject to change as needed. Any changes to the syllabus will be announced in class and/or posted on Blackboard.

Class meeting time: 5:30 pm - 8:20 pm, Mondays, Educ 405
Location: face-to-face sessions and labs will be meeting in Educ 405, online sessions will be conducted via Blackboard.

No ringing cellular phones or beepers are permitted in class.

If you have or suspect a disability and need accommodations you should contact Disabled Student Services (DSSO) at 747-5148 or at dss@utep.edu or come by Room 106 Union East Building.

Instructor Contact Information:
Ruby Lynch-Arroyo, PhD, Department of Teacher Education, 105G
Phone or Text Message: 915-588-9226
E-mail: rlynch@utep.edu or text message with name included (best means of contact)
Office Hours: Mondays, 3:00 PM – 5:00 PM; Mondays, 8:30 PM – 9:00 PM. Or by appointment.

Required Text: Teaching Mathematics: A Sourcebook of Aids, Activities, & Strategies, by Evan M. Maletsky, Max A. Sobel. ISBN 0-205-29256-9 The following is the link to this book on Amazon.com:

Other materials/resources we will be using:
- This website includes all the Texas Essential Knowledge and Skills (TEKS) for all content areas and grade levels.
http://ritter.tea.state.tx.us/rules/tac/chapter111/index.html
- Texas College Readiness Standards
http://www.thecb.state.tx.us/index.cfm?objectid=EADF962E-0E3E-DA80-BAAD2496062F3CD8
- Common Core Standards
http://www.corestandards.org/
- National Council for Teachers of Mathematics (NCTM)
http://www.nctm.org/
http://standardstrial.nctm.org/triallogin.asp
- NCTM curriculum focal points
http://www.nctm.org/focalpoints/
- This website provides a wide selection of virtual manipulatives for teaching mathematics:
http://nlvm.usu.edu/en/nav/vlibrary.html
• Book "High School Mathematics at Work"
  http://www.nap.edu/openbook.php?isbn=0309063531
• Book "How Students Learn: Mathematics in the Classroom". You can read it online at
  http://www.nap.edu/catalog.php?record_id=11101
• Book "Adding It Up: Helping Children Learn Mathematics". You can read it online at
  http://books.nap.edu/books/0309069955/html/
• “Why Problem-Based Learning Is Better”. Posted by Tim Holt on Jan 10, 2013 in Less
  Teacher, More Student, Making The Shift, The How of 21st Century Teaching, Voices
  http://plpnetwork.com/2013/01/10/problem-vs-project-based-learning/

  emphasis-on-math-science-needed-in-texas/tydp/

• Dana Center website. This site provides great ideas for teaching mathematics.
  http://www.utdanacenter.org

This course will integrate English Language Proficiency Standards (ELPS) for English Language
Learners (ELLs) in order to provide strategies for language acquisition and academic success in all
content areas for students at different levels (beginning, intermediate, advanced, and advanced high) in
the domains of listening, speaking, reading and writing. You can find the ELPS standards and
presentations about ELPS and Texas English Language Proficiency Assessment System (TELPAS) at
http://www.esc4.net/users/0001/docs2/122-ELPS.pdf

http://www.tea.state.tx.us/WorkArea/linkit.aspx?LinkIdentifier=id&ItemID=2147501849&libID=214750
1843
http://ritter.tea.state.tx.us/rules/tac/chapter074/ch074a.html#74.4

Materials: You will need to bring to each class session a scientific calculator. Other things that
might be useful throughout the semester include: ruler, graph paper, poster board, colored
pencils/markers, scissors and tape.

Course Philosophy

"Teaching is a lifelong art that ... involves continuous learning not just for the student
but for the teacher as well." -- Joseph Katz and Mildred Henry

For teachers of mathematics to be truly effective involves bringing together four basic
components:
A. An appreciation of the discipline of mathematics itself;
B. An understanding of how students learn and construct ideas;
C. An ability to design and select challenging tasks, create problem-solving environment;
D. The ability to integrate appropriate, mathematically meaningful assessment within the
   teaching process.
One of the main components of teaching is helping students to “discover” mathematics for themselves by creating successful learning environments, a friendly atmosphere, and an open mind” approach. The goal of mathematical training is not only to find the correct answer, but to find it using the "best" method. Hence, a teacher needs to promote students' thinking, to encourage searching for different methods leading to the same answer. When a mistake is made in one of the methods, the other methods will help students to arrive at a correct answer, so it is very important not to give students the right answer, but allow them to arrive to it, possibly through a sequence of mistakes [error analysis], and corrections of the mistakes.

Students should get a lot of practice in solving a variety of problems; the role of teacher is to select the true variety, to engage students by posing challenging problems and encouraging students to creatively invent new ways of approaching the problem without fear of making a mistake.

This course has been constructed to help you in critically examining the philosophies, theories, research, pedagogical techniques, and materials associated with effective learning and teaching in the secondary mathematics classrooms.

Course Objectives:
Students enrolled in this course will explore the methods of teaching mathematics in secondary classrooms. Emphasis is placed on the equity principle (mathematics for all) and development of conceptual understanding of mathematics topics. Specifically, students will:

- Explore innovative learning theories and techniques of teaching and learning mathematics: problem-based, inquiry, open-ended approach.
- Study how to apply general and content methods of teaching and learning secondary mathematics in diverse classroom settings.
- Help the students to create successful learning environment in teaching and learning of secondary mathematics.

Course Structure:
Each face-to-face class session will consists of a brief lecture and/or students’ interactive discussion/presentation, and problem solving activities. The discussion will focus on how the lessons exemplify the given standard, on how to assess the effectiveness of the lesson, and on extensions, modifications, and improvements. You will be required to take notes during each class session.

During online sessions you will be asked to read mathematics education papers and chapters from the book, write reflections and participate in online discussion (all these activities will be conducted via Blackboard or in class).
Course Requirements and Assignments

Attendance and participation

[*See grading procedure below]: It is EXTREMELY important that you attend class and lab regularly AND on time. Because classroom discussion and participation in presentations and activities are essential to learning from this course, all students will be graded on their prompt arrival to class, attendance, and participation in class. Attendance will be taken each meeting using a sign-in sheet (which is your responsibility to make sure you sign); sometimes you will be asked to sign in the beginning of class session, and at the end of class session. Your active participation and positive attitude towards learning innovative ideas about mathematical pedagogy in each class session is vital to your learning, as well as, to the learning of other students in the class. The instructor may count late arrival, early departure, or blatant nonparticipation as a half-absence or even a full absence, depending on what is missed. We meet only once a week and most of the activities in this course involve collaborative learning, group activities or discussions.

Class activities will include participation in whole class and small group discussions, initiating discussion(s), respectfully and insightfully responding to, and engaging in discussion with the instructor and other students.

(Points procedure on not attending class)

*You have ONE FREE day to miss class. What you do with that day is up to you, so use it wisely! **After one missed day, for every day that you miss class, 8 points will be subtracted from your OVERALL point total.** Each absence will affect your grade. I reserve the right to drop a student from a course after two absences. *If you are more than 20 minutes late to class, it will be counted as an absence. Attendance at a math related conference, such as NCTM, will not be considered as the “one free day” with documentation provided. However, you will be expected to make up any missed assignments/class work and submit a summary of your learning experience as a result of attending the conference. This summary must be 2 pages typed, double spaced, 12 point font, and may include artifacts from the conference as attachments.

**Note:** If you are having personal, academic, professional or other issues that are inhibiting or will inhibit your attendance and performance in this course, please come and talk to me about it. My desire is for everyone to succeed in this course.

The official UTEP attendance policy for undergraduate students is as follows:

“The student is expected to attend all classes and laboratory sessions. It is the responsibility of the student to inform each instructor of extended absences. When, however, in the judgment of the instructor, a student has been absent to such a degree as to impair his or her status relative to credit for the course, the instructor may drop the student from the class with a grade of “W” before the
course drop deadline and with a grade of “F” after the course drop deadline.” (UTEP Undergraduate Catalog).

Assignments

- Assigned readings are a vital aspect of the course. You will be asked to write reflections on your readings, research, and create your own math activities using manipulatives and technology. Writing should be scholarly reflections not summaries. If you use material from readings you are expected to cite, or it will be considered plagiarism. At this level in your college career, writing submitted should be free of spelling and grammar errors in APA style [see grading rubric]. If you need assistance with writing, contact the UTEP Writing Center and/or have someone else read what you have written before submitting.
- Some on-line sessions quizzes on assigned readings will be conducted.
- You will be asked to take reflection notes during or after each class session.
- There will be two comprehensive exams (one in October and one in December)
- One teaching presentation [videotaped] with embedded face-to-face teaching/facilitation

Video Presentation/ Lesson Facilitation

Each student will be prepared to facilitate interactive discussions with other students in the class. You will teach the objectives of the selected content via videotape and facilitate your Meta lesson using interactive activities. Following videotaped teaching presentation [homework assignment with peer review], you will facilitate providing content activities, and will help to maintain and encourage student interest and focus on conceptual understanding through a Socratic questioning dialog. You should also promote interaction within and among groups participated in content activities. The ultimate goal: by utilizing a blended classroom approach and through participation in hands-on activities, students will be actively constructing their own knowledge and deepen their understanding of mathematical concepts and procedures (group work). With your permission, non-identified videotapes will be reviewed by in-service instructors and you will be given their feedback. If an in-service instructor wishes to implement your video as part of their classroom curriculum, you will be invited to participate in their classroom for that lesson. Students will, also, be expected to complete self-review of their lesson presentation.

The main criteria for evaluation of the organization and conduct of Video Presentation/ Lesson Facilitation are as follows:

1. **Content Activities design:** Your content activities should correspond to assigned topic. The activities should be enhanced by your own ideas, examples from mathematics teaching observation, ideas from other resources (please, provide proper references/citations for all the resources you will be using). (10%)

2. **Content Area Knowledge:** Confidence in the mathematics content area should be visible and identifiable. Awareness of various approaches addressing solution of the concept-related questions, and the ability to respond to various questions accurately should be present. (10%)
3. **Level of challenge:** Content activities should motivate students’ learning and address creativity, critical and high-order thinking skills development. (10%)

4. **Level of class involvement:** You should demonstrate good communication skills, encourage students to share their ideas, and orchestrate the whole class discussion. Specifically, questions from other students and the instructor should be encouraged during the whole presentation (not just at the end). Number of questions asked, and answers provided would be one of the main criteria for evaluation. (25%)

5. **Level of instructional materials preparation and application:** The use of a variety of instructional materials including manipulatives, visuals, and technology tools. (10%)

6. **Written report (Lesson Plan describing activities, assessment, discussion questions, etc.)** (35%)  

**Lab:**
As identified in the schedule, there may be a ‘Lab’ time identified prior to a face to face class meeting. Lab time will be scheduled from 5:30 – 6:15 and will be held in the same room as the class will meet. Lab sessions will have an assigned task and allow for time to discuss and prepare Video Presentation/Lesson Facilitation. Attendance during lab is NOT OPTIONAL and is considered as part of attendance tracking.

**Extra Credit:**
You will have many opportunities to receive extra credit as suggested or approved by the Instructor. For example, you may be invited to participate in service learning, tutoring, participate in College of Education focus groups, surveys, conferences etc. Bonus points [10 points] will be given for attendance at a math-related conference, upon submission of a summary of your learning experience as a result of attending the conference. This summary must be 1 page typed, double spaced, 12 point font, and may include artifacts from the conference as attachments.

**Guiding Principles for this Course :**
*Texas State Examination: TEXES Exam #135 Mathematics 8-12*
*[Preparation Manual Posted on Blackboard]*

**Competency Domain I: Number Concepts**
The mathematics teacher understands, and uses numbers, number systems and their structure, operations, and algorithms, quantitative reasoning and technology appropriate to teach the statewide curriculum (Texas Essential Knowledge and Skills [TEKS]) in order to prepare students to use mathematics.

**Competency Domain II: Patterns and Algebra**
The mathematics teacher understands and uses patterns, relations, functions, algebraic reasoning, analysis and technology appropriate to teach the statewide curriculum (Texas Essential Knowledge and Skills [TEKS]) in order to prepare students to use mathematics.
Competency Domain III: Geometry and Measurement
The mathematics teacher understands and uses geometry, spatial reasoning, measurement concepts and principles and technology appropriate to teach the statewide curriculum (Texas Essential Knowledge and Skills [TEKS]) in order to prepare students to use mathematics.

Competency Domain IV: Probability and Statistics
The mathematics teacher understands and uses probability and statistics, their applications and technology appropriate to teach the statewide curriculum (Texas Essential Knowledge and Skills [TEKS]) in order to prepare students to use mathematics.

Competency Domain V [Standards V and VI]: Mathematical Processes and Perspectives
The mathematics teacher understands and uses mathematical processes to reason mathematically, to solve mathematical problems, to make mathematical connections within and outside of mathematics and to communicate mathematically [Standard V].

The mathematics teacher understands the historical development of mathematical ideas, the interrelationship between society and mathematics, the structure of mathematics and the evolving nature of mathematics and mathematical knowledge [Standard VI].

Competency Domain VI [Standards VII and VIII]: Mathematical Learning, Instruction and Assessment
The mathematics teacher understands how children learn and develop mathematical skills, procedures and concepts; knows typical errors students make; and uses this knowledge to plan, organize, and implement instruction to meet curriculum goals and to teach all students to understand and use mathematics [Standard VII].

The mathematics teacher understands assessment, and uses a variety of formal and informal assessment techniques appropriate to the learner on an ongoing basis to monitor and guide instruction and to evaluate and report student progress [Standard VIII].

Student Learning Outcomes
The course’s learning outcomes will require the student to acquire throughout the semester new knowledge and skills and build upon them. The following table provides a list of the most relevant student learning outcomes for the course. The following outcomes are aligned with SBEC-approved Texas educator standards. Please, see the full standard* at


Table 1. Student learning outcomes and assessment

<table>
<thead>
<tr>
<th>Student Learning Outcomes</th>
<th>Assessments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TeXes 8-12</strong> By the end of course, the student will be able to:</td>
<td>To evaluate these outcomes, the faculty member will use the following assessment procedures:</td>
</tr>
<tr>
<td>V, VI Develop an understanding of current issues, practices and directions in mathematics curriculum and the ability to inquire into these.</td>
<td>a. Class and online interactive discussions; b. Quizzes and exams; and c. Reflections</td>
</tr>
<tr>
<td>V, VI Develop knowledge and skills in educational research.</td>
<td>a. Class and online interactive discussions &amp; presentations; b. Quizzes and exams; and c. Reflections</td>
</tr>
<tr>
<td>V, VI Identify and analyze topics of importance in current mathematical education.</td>
<td>a. Class and online interactive discussions/presentations.; b. Quizzes and exams; c. Graded Electronic Databases Literature searches; and d. Reflections</td>
</tr>
<tr>
<td>ALL Deepen their commitment to their pupils’ learning of mathematics.</td>
<td>a. Pre/Post-Test; b. Pre/Post-survey; and c. Reflections</td>
</tr>
<tr>
<td>ALL Increase their confidence to teach mathematics.</td>
<td>a. Pre/Post-Test; b. Pre/Post-survey; and c. Reflections</td>
</tr>
<tr>
<td>V, VI Improve their ability to manage and assess their pupils’ mathematics learning. Discover innovative methods of instruction to increase effectiveness and pupils’ engagement, learning, and thinking.</td>
<td>a. Class and online interactive discussions/presentations; b. Quizzes and exams; c. Pre/Post-Test, Pre/Post-survey; and d. Reflections</td>
</tr>
<tr>
<td>ALL Improve their capacity to think reflectively and creatively about their teaching of mathematics.</td>
<td>a. Class and online interactive discussions/presentations b. Quizzes and exams; c. Pre/Post-Test, Pre/Post-survey; and d. Reflections</td>
</tr>
<tr>
<td>ALL Increase their capacity to become an agent of change in the field of mathematics education through effective teaching and communication.</td>
<td>a. Pre/Post-Test; b. Pre/Post-survey; c. Class Discussions and Presentations; and d. Reflections</td>
</tr>
<tr>
<td>ALL Develop knowledge and strategies to design curriculum at classroom and school levels.</td>
<td>a. Class and online interactive discussions/presentations; b. Quizzes and exams; c. Pre/Post-Test, Pre/Post-survey; and d. Research and Reflections</td>
</tr>
</tbody>
</table>

Assessment and Grading:
If you maintain high expectations of your students as an educator, students will rise to those expectations. I have high expectations of each and every student, particularly those students who are pursuing a career as a professional educator. Each of you has the ability to meet these expectations, as long as you see yourself pursuing a profession that critically impacts the lives of our children! Notice I stated ‘profession’ not a ‘job’; being an educator is one of the most important roles you can play in our society today!

Your grade will be determined by the level you fulfill the following requirements. There are five benchmarks for this course. Your success in fulfilling these benchmarks will determine your grade for the course:

Grade "A": Student meets all the requirements, completes all assignments, and turns in all assignments (including tests) on time. The average grade for assignments (including all extra credit)
and tests is A.

Grade "B": Student meets all the requirements, but does not complete all assignments, submits some assignments after the due date, has excessive absences. The average grade for assignments (including all extra credit) and tests is B.

Grade "C": Student does not meet all of the benchmarks, does not complete all assignments, submits most assignments after the due date, and has excessive absences. The average grade for assignments (including all extra credit) and tests is C.

Requirements for course success:
1. You should become an expert in working with UTEP Library electronic database.
2. You should become knowledgeable and proficient in working with Blackboard.
3. You will work as a cooperative member of the community of learners that comprises this class.

Grading
I will provide graded feedback on your performance (the special grading schedule is explained below). Every week I will select randomly several submissions, and grade them and provide feedback to students (if necessary).

Grade Distribution
Active Participation/Positive Attitude/ Attendance  15%
Reflections/Quizzes  15%
Video Presentation/ Lesson Facilitation  35%
Online Discussions  10%
Exams  25%
100%

<table>
<thead>
<tr>
<th>GRADE</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>90 - 100</td>
</tr>
<tr>
<td>B</td>
<td>85 - 89</td>
</tr>
<tr>
<td>C</td>
<td>75 - 84</td>
</tr>
<tr>
<td>D</td>
<td>65 - 74</td>
</tr>
<tr>
<td>F</td>
<td>0 - 64</td>
</tr>
</tbody>
</table>

Academic Integrity
The University of Texas at El Paso prides itself on its standards of academic excellence. In all matters of intellectual pursuit, UTEP faculty and students must strive to achieve based on the quality of work produced by their individual. In the classroom and in all other academic activities, students are expected to uphold the highest standards of academic integrity. Any form of scholastic dishonesty is an affront to the pursuit of knowledge and jeopardizes the quality of the degree awarded to all graduates of UTEP. It is imperative, therefore, that all faculty, insist on adherence to these standards.
As teachers and future teachers, you should be especially aware that cheating, plagiarism and collusion in dishonest activities are serious acts which erode the university’s purpose and integrity and cheapen the learning experience for us all. It is expected that individual work you submit will represent your own effort and will not involve copying from or accessing unauthorized resources.

It is expected that work you submit will represent your own effort (or your own group’s effort, if it is a group project), will not involve copying from or accessing unauthorized resources or people (e.g., from a previous year’s class), and will appropriately acknowledge allowable references that you do consult. Violations are unacceptable and will be referred to the Dean of Students Office for possible disciplinary action.

Don’t resubmit work completed for other classes without specific acknowledgment and permission from me.

For Group Work: Within a group, members are allowed to divide up subsets of the project for which individuals will take the initial responsibility for coordinating efforts, but it is assumed that by the time a group turns in a write-up that all members have read, discussed, and understand all parts of what is being turned in. Group members may even discuss general ideas and strategies with members of other groups, but NOT share parts of actual written work.

If you have or suspect a disability and need accommodations you should contact The Center for Accommodations and Support Services (CASS) at 747-5148 or at cass@utep.edu or go by Room 106 Union East Building.

Students with disabilities: If you have or believe that you have a disability, you may wish to self-identify. You can do this by contacting the Center for Accommodations and Support Services (CASS) to show documentation of a disability or to register to receive testing and services. CASS provides the following services: note taking, sign language, interpreter, reader and/or scribe services, priority registration, adaptive technology, diagnostic testing for learning disabilities, assistance with learning strategies/tutoring, alternative testing location and format, and advocacy. All information provided to CASS is kept with the strictest rules of confidentiality.

It is responsibility of any student desiring to drop the course to turn in necessary drop forms. The instructor will not drop students who are no longer attending the class. The instructor will not drop a student after the last day to drop. You are responsible for your own record. The instructor can drop any student any time a student violates the written rules/requirements for remaining in good standing in the course. I hold the right to drop a student from a course after two absences.

The course instructor reserves the right to adjust the course syllabus or change assignments as needed.
Table 2. Tentative Course Schedule

<table>
<thead>
<tr>
<th>TeXes</th>
<th>Date</th>
<th>Assignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>V, VI</td>
<td>Aug. 25, 2014</td>
<td><strong>Lab</strong>: Read “Adventures in Teaching: A Professor Goes to High School to Learn about Teaching Math”, Darryl Young. [Copy Provided or can be retrieved from <a href="http://www.ams.org/notices/201210/rtx121001408p.pdf">http://www.ams.org/notices/201210/rtx121001408p.pdf</a>]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>With a partner <strong>Prepare</strong> commentary [5-10 sentences] about a salient point the author makes that you feel is most important to teaching high school mathematics – explain why you think it is important and give specific examples. Commentary will be shared in class for further class review and turned in for participation points.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>In-Class Review</strong>: Lab Reading and Commentary. Walk-about in pairs.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Introduction: syllabus, course content.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Presentation of materials posted on Blackboard. Pre-survey.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Homework</strong>: Due August 31st at 11:59 pm.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Read</strong> syllabus and calendar and <strong>send</strong> to instructor two questions (<strong>by-email on Blackboard</strong>) about the class and/or syllabus;</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Read</strong> Introduction from &quot;How Students Learn&quot; (the url address is provided in the syllabus, pp 1-26). <a href="http://www.nap.edu/catalog.php?record_id=11101">http://www.nap.edu/catalog.php?record_id=11101</a>; and</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Discussion Board participation</strong>: please, follow assignment guidelines posted in the Blackboard Topic &quot;Week 1&quot; (if available).</td>
</tr>
<tr>
<td></td>
<td>Sept 2, 2014</td>
<td><strong>Holiday No Class</strong></td>
</tr>
<tr>
<td>TeXes</td>
<td>Date</td>
<td>Assignment</td>
</tr>
<tr>
<td>-------</td>
<td>-----------------------------</td>
<td>-------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>V, VI</td>
<td>Week 3 Sept 8, 2014 F2F/Online</td>
<td>In-Class Presentation: “Tools, Tasks, and Strategies” – Dr. Brian Giza</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Homework:</strong> Due September 14th at 11:59 pm.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reflections/Discussions on Week 1 readings. Read Articles on ‘Blended Learning’ and ‘Flipped Classrooms’ as posted on Blackboard.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Review the Syllabus and Rubric for guidelines and grading. Respond to the prompt: “How does blended learning benefit or not benefit teachers and students”.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Submit</strong> your work in the Discussion Folder with your name. Subject of your message: &quot;Week 3 Reflection&quot;.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Discussion Board participation: please, follow assignment guidelines posted in the Blackboard Topic &quot;Week 2&quot; (if available). Online Discussion (read at least two other students reflections, and reply).</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Homework:</strong> Due Sept. 21st at 11:59 pm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Review the Syllabus and Rubric for guidelines and grading. Respond to the prompt: “How does blended learning benefit or not benefit teachers and students”.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Submit</strong> your work in the Discussion Folder with your name. Subject of your message: &quot;Week 3 Reflection&quot;.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Online Discussion (read at least two other students reflections, and reply).</td>
</tr>
<tr>
<td>TeXes</td>
<td>Date</td>
<td>Assignment</td>
</tr>
<tr>
<td>--------</td>
<td>------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>I, V, VI</td>
<td>Sep 22, 2014</td>
<td><strong>In-Class Review:</strong> Chapter 1, Soebel &amp; Maletsky – The Art of Teaching. Popcorn out Sections of Chapter from group readings. Complete Activity 5 on page 31, Chapter 2, Soebel &amp; Maletsky – Motivating Mathematical Learning. Chapter 3, Soebel &amp; Maletsky – Motivating Problem Solving Instruction</td>
</tr>
<tr>
<td>I, V, VI</td>
<td>F2F/O-L/Lab</td>
<td><strong>Homework:</strong> Due Sept. 28th at 11:59 pm</td>
</tr>
<tr>
<td>I, V, VI</td>
<td>Technology Quest</td>
<td>- Find 3 websites that provides interactive high school mathematics learning opportunities to share with the class. Using rubric, write a review/evaluation of the websites and post on Blackboard in discussion board provided. Include sources/websites for articles.</td>
</tr>
<tr>
<td>I, V, VI</td>
<td>Online Discussion</td>
<td>(read at least two other students reflections, and reply).</td>
</tr>
<tr>
<td>I, V, VI</td>
<td>ALL – Technol.</td>
<td><strong>Lab:</strong> In-Class Review: Review of definitions of a “learner-ready” teacher and Takeaway teaching methods Lab Reading and Commentary. Popcorn-out discussion.</td>
</tr>
<tr>
<td>II: HW</td>
<td>Week 6</td>
<td><strong>In-Class Review:</strong> Chapter 4, Soebel &amp; Maletsky – Activities with Numerical Concepts</td>
</tr>
<tr>
<td>II: HW</td>
<td>Sep 29, 2014</td>
<td><strong>Homework:</strong> Due October 5th at 11:59 pm</td>
</tr>
<tr>
<td>II: HW</td>
<td>F2F/O-L/Lab</td>
<td><strong>Read</strong> Knowledge of Algebra for Teaching: A Framework of Knowledge and Practices, McCrory, et. Al. [Handout]</td>
</tr>
<tr>
<td>II, V, VI</td>
<td>Write</td>
<td>reflections on your readings: (1page, Times New Roman, double space, 12 pt. font, save in pdf format) Review the Syllabus and Rubric for guidelines and grading. <strong>Submit</strong> your work in the Discussion Folder with your name. Subject of your message: “Week 5 Reflection”. Online Discussion (read at least two other students reflections, and reply).</td>
</tr>
<tr>
<td>II, V, VI</td>
<td>Week 7</td>
<td><strong>Lab:</strong> Read For ELLS: Vocabulary Beyond the Definitions, Roberts &amp; Truxaw and What’s the Big Deal About Vocabulary?, Dunston &amp; Tyminski [Handouts]</td>
</tr>
<tr>
<td>II, V, VI</td>
<td>Oct 6, 2014</td>
<td><strong>In-Class Review:</strong> Addressing the needs of English Language Learners in Teaching Mathematics.</td>
</tr>
<tr>
<td>II, V, VI</td>
<td>F2F/O-L/Lab</td>
<td><strong>Homework Due October 12th at 11:59 pm</strong></td>
</tr>
<tr>
<td>II, V, VI</td>
<td>Post preliminary Lesson Plan and draft videotape for initial review.</td>
<td></td>
</tr>
<tr>
<td>TeXes</td>
<td>Date</td>
<td>Assignment</td>
</tr>
<tr>
<td>-------</td>
<td>------</td>
<td>------------</td>
</tr>
<tr>
<td>ALL</td>
<td>Week 8</td>
<td>Oct 13, 2014</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>III, VI</td>
<td>Week 9</td>
<td>Oct 20, 2014</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IV, VI</td>
<td>Week 10</td>
<td>Oct 27, 2014</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TeXes</td>
<td>Date</td>
<td>Assignment</td>
</tr>
<tr>
<td>-------</td>
<td>------</td>
<td>------------</td>
</tr>
<tr>
<td>ALL</td>
<td>Week 11&lt;br&gt;Nov 3, 2014&lt;br&gt;F2F/O-L</td>
<td>In-Class Review: 4 Student Presentations&lt;br&gt;Complete and turn in peer review worksheets.&lt;br&gt;<strong>Homework:</strong> Due November 9th at 11:59 pm&lt;br&gt;Read Chapter 7 – Activities in Probability and Statistics.&lt;br&gt;Submit Cornell Notes</td>
</tr>
<tr>
<td>V, VI</td>
<td>Week 12&lt;br&gt;Nov 10, 2014&lt;br&gt;F2F/O-L</td>
<td>In-Class Review: 4 Student Presentations&lt;br&gt;Complete and turn in peer review worksheets.&lt;br&gt;<strong>Homework:</strong> Due Nov. 16th at 11:59 pm&lt;br&gt;Read Chapter 8 – Iteration Activities and Fractal Patterns.</td>
</tr>
<tr>
<td>V, VI</td>
<td>Week 13&lt;br&gt;Nov 17, 2014&lt;br&gt;F2F/O-L</td>
<td>In-Class Review: 4 Student Presentations&lt;br&gt;Complete and turn in peer review worksheets.&lt;br&gt;<strong>Homework:</strong> Due Nov. 23rd at 11:59 pm&lt;br&gt;Develop your ideal grading system and explain how you would implement it when teaching high school and why it would be appropriate.&lt;br&gt;<strong>Resources:</strong>&lt;br&gt;Leading to Change / Effective Grading Practices&lt;br&gt;Douglas B. Reeves February 2008</td>
</tr>
</tbody>
</table>
### TeXes
<table>
<thead>
<tr>
<th>TeXes</th>
<th>Date</th>
<th>Assignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALL</td>
<td>Week 14&lt;br&gt;Nov 24, 2014&lt;br&gt;F@F/Online</td>
<td>In-Class Review: 5 Student Presentations&lt;br&gt;Complete and turn in peer review worksheets.</td>
</tr>
<tr>
<td>ALL</td>
<td>December 4, 2014</td>
<td>Course Drop Deadline</td>
</tr>
<tr>
<td>ALL</td>
<td>Week 15&lt;br&gt;Dec 1, 2014&lt;br&gt;F2F/O-L/Lab</td>
<td>In-Class Review: Integration of Summative Assessment and Data Mining for Effective Teaching; Wiggins. How to Write Forms of Assessment Items. From the lesson you presented create [not copy or reinvent] two assessment items in any format – open-ended, multiple choice, vocabulary, etc. The question may relate to math content or pedagogy. The question may be in any format: open-ended (short answer, fill in the blank(s)), matching, multiple choice - any format you choose Trade and Solve. Submit in Class.</td>
</tr>
<tr>
<td>ALL</td>
<td>Week 16&lt;br&gt;Dec 8, 2014&lt;br&gt;Online</td>
<td>Online: Complete Final Exam Review [All Chapters, All Readings, All Classroom discussion &amp; activities] Homework: Complete and Submit Final Exam. Final Exam on Blackboard: Due Dec 8th at 11:59 PM. Opens Dec 2nd. One Attempt</td>
</tr>
</tbody>
</table>

### Final Word

I reserve the right to adjust the course syllabus or change assignments as needed. Remember that our course syllabus and class schedule are living documents and can change.
## Grading Rubric for Online Discussion

<table>
<thead>
<tr>
<th>Points</th>
<th>5</th>
<th>3-4</th>
<th>1-2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Analysis / Interpretation</strong></td>
<td>The message uses sources, including outside as well as required reading. In addition, it demonstrates that the student has gained new understanding of the topic.</td>
<td>Some messages do analysis or interpretation well, but a significant number do not. This might be because the analysis was not done well or because it was not attempted (that is, was simply opinion).</td>
<td>Messages generally show little evidence of analysis, consisting instead of opinion and feelings and impressions.</td>
</tr>
<tr>
<td><strong>Writing Skill</strong></td>
<td>Sentences are clear and wording is unambiguous. Correct word choice, correct spelling, and correct grammar. Writing style can still be conversational rather than formal. The writing does not have to be flawless, but it will be better than average writing.</td>
<td>Ordinary, good writing. Lapses are regular and patterned, but do not undermine the communication or the persuasiveness of the argument.</td>
<td>Grammar, spelling, and/or word choice errors are frequent enough that the sense of the message is lost or muddled.</td>
</tr>
<tr>
<td><strong>Participation</strong></td>
<td>Messages contribute to ongoing conversations, as replies to questions or comments, or as new questions or comments. Messages that originate a thread usually generate responses. Student does not start a topic or pose a question and then abandon it.</td>
<td>Some messages contribute to ongoing conversations, but others are disconnected. If the student starts a new thread, sometimes there is follow-up but sometimes there isn't. Student tries to further the class discussion but is not successful a significant number of times. Or, student posts a significant (though still a minority) number of messages that are off-the-cuff and do not contribute substantively.</td>
<td>Messages are unconnected with what others are saying, as if there is no conversation. No replies to other messages. Student never answers someone else's question. When student asks a question, there's no acknowledgment to any responses.</td>
</tr>
</tbody>
</table>
### Grading Rubric for Short Reflection

<table>
<thead>
<tr>
<th>Category</th>
<th>Exceeds Standard</th>
<th>Meets Standard</th>
<th>Does not Meet Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The piece is thoughtful, engaging, and clearly written. The piece shows</td>
<td>Shows adequate reflection along with some level of thoughtfulness, and may or</td>
<td>Does not adequately address the question or prompt, and shows limited</td>
</tr>
<tr>
<td></td>
<td>careful consideration of the topic at hand. It responds directly to</td>
<td>may not have responded directly to the</td>
<td>thoughtfulness.</td>
</tr>
<tr>
<td></td>
<td>the question or prompts and makes meaningful connections with the readings and</td>
<td>question or prompt. It also contain grammatical or sentence structure errors</td>
<td></td>
</tr>
<tr>
<td></td>
<td>course content. The piece has been proofread.</td>
<td>that disrupt the flow of the narrative.</td>
<td></td>
</tr>
<tr>
<td>Points</td>
<td>(10-8)</td>
<td>(7-4)</td>
<td>(3-1)</td>
</tr>
</tbody>
</table>

### Grading Rubric for Presentation

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Good (10-8 pts)</th>
<th>Fair (7-4 pts)</th>
<th>Poor (3-1 pts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge of Content and Summary</td>
<td>Solid knowledge and understanding of the topic to be presented is demonstrated. The presentation is clear and understandable.</td>
<td>Good knowledge and understanding of the topic to be presented is demonstrated. The presentation is clear and understandable, but some important points are not addressed.</td>
<td>Weak knowledge and understanding of the topic to be presented is demonstrated. The presentation is unclear.</td>
</tr>
<tr>
<td>Critical Thinking and Argumentation (this is applicable only if presenting the review of the article).</td>
<td>Strengths and weaknesses that are central to the key points of the article are addressed. The discussion of strengths and weaknesses take up the majority of the assignment.</td>
<td>Strengths and weaknesses that are peripheral to the article are addressed. The discussion of strengths and weaknesses take up the majority of the assignment.</td>
<td>Strengths and weaknesses are addressed peripherally or not at all. The discussion of strengths and weaknesses take up only a small part of the assignment.</td>
</tr>
<tr>
<td>Organization and Communication Accuracy</td>
<td>The presentation is well organized, has a very clear intro, body and conclusion. The purpose of the presentation is clear from the very beginning. There are no grammatical errors or typos. APA and page length requirements (if applicable for the assignment) are met.</td>
<td>The presentation is organized, has an intro, body and conclusion. The purpose of the paper becomes clear within the paper. There are few grammatical errors or typos. APA and page length requirements (if applicable for the assignment) are met.</td>
<td>The presentation is not well organized, has an unclear or non-existent intro, body and conclusion. The purpose of the paper is unclear. There are many grammatical errors and/or typos. APA and page length requirements (if applicable for the assignment) are not met.</td>
</tr>
</tbody>
</table>
Participation Rubric

Throughout the semester students are expected to:

- Be present (in mind and body) and be well prepared for class.
- Participate fully in class and online activities and assignments – take an active part in the work of small and large group; participate in discussions and attend class face-to-face sessions. Understand your roles and responsibilities in acquiring Student Learning Outcomes for this class.
- Make insightful comments, informed by required reading and your own critical thinking. Demonstrate reflections on your readings. Come to class with questions, comments and thoughts on readings.
- Treat class activities, group discussions as important components of the course, showing respect for fellow classmates and the course material.

Participation points will be assigned based on the extent to which students meet the above criteria.

<table>
<thead>
<tr>
<th>Description of performance</th>
<th>Points earned</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student <strong>exceptionally and consistently</strong> demonstrates the criterion throughout the semester</td>
<td>4</td>
</tr>
<tr>
<td>Student <strong>proficiently and frequently</strong> demonstrates the criterion throughout the semester</td>
<td>3</td>
</tr>
<tr>
<td>Student <strong>satisfactory and intermittently</strong> demonstrates the criterion throughout the semester</td>
<td>2</td>
</tr>
<tr>
<td>Student <strong>inadequately and sporadically</strong> demonstrates the criterion throughout the semester</td>
<td>1</td>
</tr>
<tr>
<td>Student <strong>does not</strong> demonstrates the criterion throughout the semester</td>
<td>0</td>
</tr>
</tbody>
</table>
COMPETENCIES: MATHEMATICS 8-12

COMPETENCIES

DOMAIN 1 — NUMBER CONCEPTS

COMPETENCY 001

THE TEACHER UNDERSTANDS THE REAL NUMBER SYSTEM AND ITS STRUCTURE, OPERATIONS, ALGORITHMS AND REPRESENTATIONS.

The beginning teacher:

A. Understands the concepts of place value, number base and decimal representations of real numbers.

B. Understands the algebraic structure and properties of the real number system and its subsets (e.g., real numbers as a field, integers as an additive group).

C. Describes and analyzes properties of subsets of the real numbers (e.g., closure, identities).

D. Selects and uses appropriate representations of real numbers (e.g., fractions, decimals, percents, roots, exponents, scientific notation) for particular situations.

E. Uses a variety of models (e.g., geometric, symbolic) to represent operations, algorithms and real numbers.

F. Uses real numbers to model and solve a variety of problems.

G. Uses deductive reasoning to simplify and justify algebraic processes.

H. Demonstrates how some problems that have no solution in the integer or rational number systems have solutions in the real number system.
COMPETENCY 002
THE TEACHER UNDERSTANDS THE COMPLEX NUMBER SYSTEM AND ITS STRUCTURE, OPERATIONS, ALGORITHMS AND REPRESENTATIONS.

The beginning teacher:
A. Demonstrates how some problems that have no solution in the real number system have solutions in the complex number system.
B. Understands the properties of complex numbers (e.g., complex conjugate, magnitude/modulus, multiplicative inverse).
C. Understands the algebraic structure of the complex number system and its subsets (e.g., complex numbers as a field, complex addition as vector addition).
D. Selects and uses appropriate representations of complex numbers (e.g., vector, ordered pair, polar, exponential) for particular situations.
E. Describes complex number operations (e.g., addition, multiplication, roots) using symbolic and geometric representations.

COMPETENCY 003
THE TEACHER UNDERSTANDS NUMBER THEORY CONCEPTS AND PRINCIPLES AND USES NUMBERS TO MODEL AND SOLVE PROBLEMS IN A VARIETY OF SITUATIONS.

The beginning teacher:
A. Applies ideas from number theory (e.g., prime numbers and factorization, the Euclidean algorithm, divisibility, congruence classes, modular arithmetic, the fundamental theorem of arithmetic) to solve problems.
B. Applies number theory concepts and principles to justify and prove number relationships.
C. Compares and contrasts properties of vectors and matrices with properties of number systems (e.g., existence of inverses, non-commutative operations).
D. Uses properties of numbers (e.g., fractions, decimals, percents, ratios, proportions) to model and solve real-world problems.
E. Applies counting techniques such as permutations and combinations to quantify situations and solve problems.
F. Uses estimation techniques to solve problems and judges the reasonableness of solutions.
COMPETENCY 004
THE TEACHER USES PATTERNS TO MODEL AND SOLVE PROBLEMS AND FORMULATE CONJECTURES.

The beginning teacher:
A. Recognizes and extends patterns and relationships in data presented in tables, sequences or graphs.
B. Uses methods of recursion and iteration to model and solve problems.
C. Uses the principle of mathematical induction.
D. Analyzes the properties of sequences and series (e.g., Fibonacci, arithmetic, geometric) and uses them to solve problems involving finite and infinite processes.
E. Understands how sequences and series are applied to solve problems in the mathematics of finance (e.g., simple, compound and continuous interest rates; annuities).

COMPETENCY 005
THE TEACHER UNDERSTANDS ATTRIBUTES OF FUNCTIONS, RELATIONS AND THEIR GRAPHS.

The beginning teacher:
A. Understands when a relation is a function.
B. Identifies the mathematical domain and range of functions and relations and determines reasonable domains for given situations.
C. Understands that a function represents a dependence of one quantity on another and can be represented in a variety of ways (e.g., concrete models, tables, graphs, diagrams, verbal descriptions, symbols).
D. Identifies and analyzes even and odd functions, one-to-one functions, inverse functions and their graphs.
E. Applies basic transformations [e.g., \( k f(x), f(x) + k, f(x - k), f(kx), |f(x)| \)] to a parent function, \( f \), and describes the effects on the graph of \( y = f(x) \).
F. Performs operations (e.g., sum, difference, composition) on functions, finds inverse relations and describes results symbolically and graphically.
G. Uses graphs of functions to formulate conjectures of identities [e.g., \( y = x^2 - 1 \) and \( y = (x - 1)(x + 1) \), \( y = \log x^3 \) and \( y = 3 \log x \), \( y = \sin \left( x + \frac{\pi}{2} \right) \) and \( y = \cos x \)].
COMPETENCY 006
THE TEACHER UNDERSTANDS LINEAR AND QUADRATIC FUNCTIONS, ANALYZES THEIR ALGEBRAIC AND GRAPHICAL PROPERTIES AND USES THEM TO MODEL AND SOLVE PROBLEMS.

The beginning teacher:
A. Understands the concept of slope as a rate of change and interprets the meaning of slope and intercept in a variety of situations.
B. Writes equations of lines given various characteristics (e.g., two points, a point and slope, slope and y-intercept).
C. Applies techniques of linear and matrix algebra to represent and solve problems involving linear systems.
D. Analyzes the zeros (real and complex) of quadratic functions.
E. Makes connections between the \( y = ax^2 + bx + c \) and the \( y = a(x - h)^2 + k \) representations of a quadratic function and its graph.
F. Solves problems involving quadratic functions using a variety of methods (e.g., factoring, completing the square, using the quadratic formula, using a graphing calculator).
G. Models and solves problems involving linear and quadratic equations and inequalities using a variety of methods, including technology.
COMPETENCY 007
THE TEACHER UNDERSTANDS POLYNOMIAL, RATIONAL, RADICAL, ABSOLUTE
VALUE AND PIECEWISE FUNCTIONS, ANALYZES THEIR ALGEBRAIC AND GRAPHICAL
PROPERTIES AND USES THEM TO MODEL AND SOLVE PROBLEMS.

The beginning teacher:

A. Recognizes and translates among various representations (e.g., written, tabular,
graphical, algebraic) of polynomial, rational, radical, absolute value and piecewise
functions.

B. Describes restrictions on the domains and ranges of polynomial, rational, radical,
absolute value and piecewise functions.

C. Makes and uses connections among the significant points (e.g., zeros, local
extrema, points where a function is not continuous or not differentiable) of a
function, the graph of the function and the function’s symbolic representation.

D. Analyzes functions in terms of vertical, horizontal and slant asymptotes.

E. Analyzes and applies the relationship between inverse variation and rational
functions.

F. Solves equations and inequalities involving polynomial, rational, radical, absolute
value and piecewise functions using a variety of methods (e.g., tables, algebraic
methods, graphs, use of a graphing calculator) and evaluates the reasonableness of
solutions.

G. Models situations using polynomial, rational, radical, absolute value and piecewise
functions and solves problems using a variety of methods, including technology.
COMPETENCY 008
THE TEACHER UNDERSTANDS EXPONENTIAL AND LOGARITHMIC FUNCTIONS,
ANALYZES THEIR ALGEBRAIC AND GRAPHICAL PROPERTIES AND USES THEM TO
MODEL AND SOLVE PROBLEMS.

The beginning teacher:
A. Recognizes and translates among various representations (e.g., written, numerical,
tabular, graphical, algebraic) of exponential and logarithmic functions.
B. Recognizes and uses connections among significant characteristics (e.g., intercepts,
asymptotes) of a function involving exponential or logarithmic expressions, the
graph of the function and the function’s symbolic representation.
C. Understands the relationship between exponential and logarithmic functions and
uses the laws and properties of exponents and logarithms to simplify expressions
and solve problems.
D. Uses a variety of representations and techniques (e.g., numerical methods, tables,
graphs, analytic techniques, graphing calculators) to solve equations, inequalities
and systems involving exponential and logarithmic functions.
E. Models and solves problems involving exponential growth and decay.
F. Uses logarithmic scales (e.g., Richter, decibel) to describe phenomena and solve
problems.
G. Uses exponential and logarithmic functions to model and solve problems involving
the mathematics of finance (e.g., compound interest).
H. Uses the exponential function to model situations and solve problems in which the
rate of change of a quantity is proportional to the current amount of the quantity
[i.e., \( f'(x) = k f(x) \)].
COMPETENCY 009
THE TEACHER UNDERSTANDS TRIGONOMETRIC AND CIRCULAR FUNCTIONS, ANALYZES THEIR ALGEBRAIC AND GRAPHICAL PROPERTIES AND USES THEM TO MODEL AND SOLVE PROBLEMS.

The beginning teacher:

A. Analyzes the relationships among the unit circle in the coordinate plane, circular functions and the trigonometric functions.

B. Recognizes and translates among various representations (e.g., written, numerical, tabular, graphical, algebraic) of trigonometric functions and their inverses.

C. Recognizes and uses connections among significant properties (e.g., zeros, axes of symmetry, local extrema) and characteristics (e.g., amplitude, frequency, phase shift) of a trigonometric function, the graph of the function and the function’s symbolic representation.

D. Understands the relationships between trigonometric functions and their inverses and uses these relationships to solve problems.

E. Uses trigonometric identities to simplify expressions and solve equations.

F. Models and solves a variety of problems (e.g., analyzing periodic phenomena) using trigonometric functions.

G. Uses graphing calculators to analyze and solve problems involving trigonometric functions.

COMPETENCY 010
THE TEACHER UNDERSTANDS AND SOLVES PROBLEMS USING DIFFERENTIAL AND INTEGRAL CALCULUS.

The beginning teacher:

A. Understands the concept of limit and the relationship between limits and continuity.

B. Relates the concept of average rate of change to the slope of the secant line and relates the concept of instantaneous rate of change to the slope of the tangent line.

C. Uses the first and second derivatives to analyze the graph of a function (e.g., local extrema, concavity, points of inflection).

D. Understands and applies the fundamental theorem of calculus and the relationship between differentiation and integration.

E. Models and solves a variety of problems (e.g., velocity, acceleration, optimization, related rates, work, center of mass) using differential and integral calculus.

F. Analyzes how technology can be used to solve problems and illustrate concepts involving differential and integral calculus.
DOMAIN III — GEOMETRY AND MEASUREMENT

COMPETENCY 01.1
THE TEACHER UNDERSTANDS MEASUREMENT AS A PROCESS.

The beginning teacher:

A. Applies dimensional analysis to derive units and formulas in a variety of situations (e.g., rates of change of one variable with respect to another) and to find and evaluate solutions to problems.

B. Applies formulas for perimeter, area, surface area and volume of geometric figures and shapes (e.g., polygons, pyramids, prisms, cylinders, cones, spheres) to solve problems.

C. Recognizes the effects on length, area or volume when the linear dimensions of plane figures or solids are changed.

D. Applies the Pythagorean theorem, proportional reasoning and right triangle trigonometry to solve measurement problems.

E. Relates the concept of area under a curve to the limit of a Riemann sum.

F. Uses integral calculus to compute various measurements associated with curves and regions (e.g., area, arc length) in the plane, and measurements associated with curves, surfaces and regions in three-space.

COMPETENCY 01.2
THE TEACHER UNDERSTANDS GEOMETRIES, IN PARTICULAR EUCLIDEAN GEOMETRY, AS AXIOMATIC SYSTEMS.

The beginning teacher:

A. Understands axiomatic systems and their components (e.g., undefined terms, defined terms, theorems, examples, counterexamples).

B. Uses properties of points, lines, planes, angles, lengths and distances to solve problems.

C. Applies the properties of parallel and perpendicular lines to solve problems.

D. Uses properties of congruence and similarity to explore geometric relationships, justify conjectures and prove theorems.

E. Describes and justifies geometric constructions made using compass and straightedge, reflection devices and other appropriate technologies.

F. Demonstrates an understanding of the use of appropriate software to explore attributes of geometric figures and to make and evaluate conjectures about geometric relationships.

G. Compares and contrasts the axioms of Euclidean geometry with those of non-Euclidean geometry (i.e., hyperbolic and elliptic geometry).
COMPETENCY 013

THE TEACHER UNDERSTANDS THE RESULTS, USES AND APPLICATIONS OF EUCLIDEAN GEOMETRY.

The beginning teacher:

A. Analyzes the properties of polygons and their components.
B. Analyzes the properties of circles and the lines that intersect them.
C. Uses geometric patterns and properties (e.g., similarity, congruence) to make generalizations about two- and three-dimensional figures and shapes (e.g., relationships of sides, angles).
D. Computes the perimeter, area and volume of figures and shapes created by subdividing and combining other figures and shapes (e.g., arc length, area of sectors).
E. Analyzes cross-sections and nets of three-dimensional shapes.
F. Uses top, front, side and corner views of three-dimensional shapes to create complete representations and solve problems.
G. Applies properties of two- and three-dimensional shapes to solve problems across the curriculum and in everyday life.
COMPETENCY 014
THE TEACHER UNDERSTANDS COORDINATE, TRANSFORMATIONAL AND VECTOR GEOMETRY AND THEIR CONNECTIONS.

The beginning teacher:
A. Identifies transformations (i.e., reflections, translations, glide-reflections, rotations, dilations) and explores their properties.
B. Uses the properties of transformations and their compositions to solve problems.
C. Uses transformations to explore and describe reflectional, rotational and translational symmetry.
D. Applies transformations in the coordinate plane.
E. Applies concepts and properties of slope, midpoint, parallelism, perpendicularity and distance to explore properties of geometric figures and solve problems in the coordinate plane.
F. Uses coordinate geometry to derive and explore the equations, properties and applications of conic sections (i.e., lines, circles, hyperbolas, ellipses, parabolas).
G. Relates geometry and algebra by representing transformations as matrices and uses this relationship to solve problems.
H. Explores the relationship between geometric and algebraic representations of vectors and uses this relationship to solve problems.

COMPETENCY 016
THE TEACHER UNDERSTANDS CONCEPTS AND APPLICATIONS OF PROBABILITY.

The beginning teacher:
A. Understands how to explore concepts of probability through sampling, experiments and simulations and generates and uses probability models to represent situations.
B. Uses the concepts and principles of probability to describe the outcomes of simple and compound events.
C. Determines probabilities by constructing sample spaces to model situations.
D. Solves a variety of probability problems using combinations and permutations.
E. Solves a variety of probability problems using ratios of areas of geometric regions.
F. Calculates probabilities using the axioms of probability and related theorems and concepts such as the addition rule, multiplication rule, conditional probability and independence.
G. Understands expected value, variance and standard deviation of probability distributions (e.g., binomial, geometric, uniform, normal).

H. Applies concepts and properties of discrete and continuous random variables to model and solve a variety of problems involving probability and probability distributions (e.g., binomial, geometric, uniform, normal).

COMPETENCY 017
THE TEACHER UNDERSTANDS THE RELATIONSHIPS AMONG PROBABILITY THEORY, SAMPLING AND STATISTICAL INFERENCE AND HOW STATISTICAL INFERENCE IS USED IN MAKING AND EVALUATING PREDICTIONS.

The beginning teacher:

A. Applies knowledge of designing, conducting, analyzing and interpreting statistical experiments to investigate real-world problems.

B. Analyzes and interprets statistical information (e.g., the results of polls and surveys) and recognizes misleading as well as valid uses of statistics.

C. Understands random samples and sample statistics (e.g., the relationship between sample size and confidence intervals, biased or unbiased estimators).

D. Makes inferences about a population using binomial, normal and geometric distributions.

E. Describes and analyzes bivariate data using various techniques (e.g., scatterplots, regression lines, outliers, residual analysis, correlation coefficients).

F. Understands how to transform nonlinear data into linear form in order to apply linear regression techniques to develop exponential, logarithmic and power regression models.

G. Uses the law of large numbers and the central limit theorem in the process of statistical inference.

H. Estimates parameters (e.g., population mean and variance) using point estimators (e.g., sample mean and variance).

I. Understands principles of hypotheses testing.
DOMAIN V — MATHEMATICAL PROCESSES AND PERSPECTIVES

COMPETENCY 018
THE TEACHER UNDERSTANDS MATHEMATICAL REASONING AND PROBLEM SOLVING.

The beginning teacher:
A. Understands the nature of proof, including indirect proof, in mathematics.
B. Applies correct mathematical reasoning to derive valid conclusions from a set of premises.
C. Uses inductive reasoning to make conjectures and uses deductive methods to evaluate the validity of conjectures.
D. Uses formal and informal reasoning to justify mathematical ideas.
E. Understands the problem-solving process (i.e., recognizing that a mathematical problem can be solved in a variety of ways, selecting an appropriate strategy, evaluating the reasonableness of a solution).
F. Evaluates how well a mathematical model represents a real-world situation.

COMPETENCY 019
THE TEACHER UNDERSTANDS MATHEMATICAL CONNECTIONS BOTH WITHIN AND OUTSIDE OF MATHEMATICS AND HOW TO COMMUNICATE MATHEMATICAL IDEAS AND CONCEPTS.

The beginning teacher:
A. Recognizes and uses multiple representations of a mathematical concept (e.g., a point and its coordinates, the area of a circle as a quadratic function of the radius, probability as the ratio of two areas, area of a plane region as a definite integral).
B. Understands how mathematics is used to model and solve problems in other disciplines (e.g., art, music, science, social science, business).
C. Translates mathematical ideas between verbal and symbolic forms.
D. Communicates mathematical ideas using a variety of representations (e.g., numeric, verbal, graphical, pictorial, symbolic, concrete).
E. Understands the use of visual media, such as graphs, tables, diagrams and animations, to communicate mathematical information.
F. Uses appropriate mathematical terminology to express mathematical ideas.
DOMAIN VI — MATHEMATICAL LEARNING, INSTRUCTION AND ASSESSMENT

COMPETENCY 020
THE TEACHER UNDERSTANDS HOW CHILDREN LEARN MATHEMATICS AND PLANS, ORGANIZES AND IMPLEMENTS INSTRUCTION USING KNOWLEDGE OF STUDENTS, SUBJECT MATTER AND STATEWIDE CURRICULUM (TEXAS ESSENTIAL KNOWLEDGE AND SKILLS [TEKS]).

The beginning teacher:

A. Applies research-based theories of learning mathematics to plan appropriate instructional activities for all students.

B. Understands how students differ in their approaches to learning mathematics.

C. Uses students’ prior mathematical knowledge to build conceptual links to new knowledge and plans instruction that builds on students’ strengths and addresses students’ needs.

D. Understands how learning may be enhanced through the use of manipulatives, technology and other tools (e.g., stop watches, scales, rulers).

E. Understands how to provide instruction along a continuum from concrete to abstract.

F. Understands a variety of instructional strategies and tasks that promote students’ abilities to do the mathematics described in the TEKS.

G. Understands how to create a learning environment that provides all students, including English-language learners, with opportunities to develop and improve mathematical skills and procedures.

H. Understands a variety of questioning strategies to encourage mathematical discourse and to help students analyze and evaluate their mathematical thinking.

I. Understands how to relate mathematics to students’ lives and to a variety of careers and professions.
COMPETENCY 021
THE TEACHER UNDERSTANDS ASSESSMENT AND USES A VARIETY OF FORMAL AND INFORMAL ASSESSMENT TECHNIQUES TO MONITOR AND GUIDE MATHEMATICS INSTRUCTION AND TO EVALUATE STUDENT PROGRESS.

The beginning teacher:
A. Understands the purpose, characteristics and uses of various assessments in mathematics, including formative and summative assessments.

B. Understands how to select and develop assessments that are consistent with what is taught and how it is taught.

C. Understands how to develop a variety of assessments and scoring procedures consisting of worthwhile tasks that assess mathematical understanding, common misconceptions and error patterns.

D. Understands the relationship between assessment and instruction and knows how to evaluate assessment results to design, monitor and modify instruction to improve mathematical learning for all students, including English-language learners.