

MTH 420 Re-examining Mathematical Foundations for Teachers

Fall 2019

Instructor: Nicole Hersey

Office Location: Chafee 712

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Office Hours: Monday/Wednesday 8:00 am – 9:00 am; by appointment

Class Days/Time: Mondays 4:00PM - 6:30PM

Classroom: Beaupre 215

Prerequisites: The prerequisite for this class is MTH 316, Abstract Algebra

Course Description

In this course, designed for teachers, connections are made among concepts covered in college level math courses and between topics taught in secondary and middle school. In this way, teachers develop a deeper understanding of the math that they teach.

The course is project based. Participants will revisit standard topics in mathematics to find relationships among them and draw the connections to what they teach in 7-12.

Course Goals

This is a capstone course for teachers of mathematics at the secondary school, or middle school level. In this course, you will

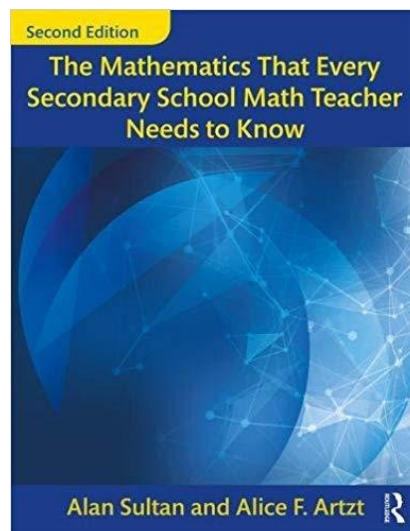
1. Develop your own personal mathematics knowledge base, to develop an understanding of how you think about different topics. You will also analyze the interconnectedness of various subjects in mathematics and see the numerous connections between them.
2. See a connection between what you learned as a math major in college with what is taught in middle and high school by analyzing PARCC questions and participating in classroom discussions.
3. Review and consider the Common Core content areas of – Counting and cardinality, Operations and algebraic thinking, Number and operations in base 10, Measurement and data, Geometry, Ratios and proportional relationships, the Number system, Expressions and equations, Functions, and Statistics and probability
4. Present problems from homework of classwork to become more proficient at verbal explanations while using appropriate mathematics terminology.
5. Engage in class discussion as well as develop a CCSS lesson plan that may include the use of some form of technology.

Measureable Student Learning Outcomes

1. Recognize connections between topics - such as Algebra, Numbers and operations, and polynomials.
2. Explain single concepts from different viewpoints – such as the value of Pi or the definition of e.
3. Compare familiar number systems with abstract systems – such as polynomials, matrices, finite fields, and Galois fields.
4. Identify the use of number theory, abstract algebra, and probability in understanding the underlying mathematics of topics found in secondary schools.
5. Cite specific standards (CCSS) that relate to concepts being discussed.
6. Develop a lesson that is both developmentally appropriate and that has a strong basis in higher level mathematics courses.
7. Explain your work – within groups in class and at the board
8. Determine resources available and incorporate technology into a mathematics classroom lesson.

Required Text

A SULTAN AND A F ARTZT. 2017. The Mathematics That Every Secondary School Math Teacher Needs to Know (2nd edition). New York, NY: Routledge. This text is aligned with the recently released Common Core State Standards, and is ideally suited for a capstone mathematics course in a secondary mathematics certification program. You may use a calculator any time during this course.



Sakai

You are required to check the Sakai course worksite to keep current with assignments and announcements. Your grades will be stored there for you to see. Be sure to ask me if you see any discrepancy with your recorded grades. You must submit your homework through Sakai up to midnight of the due dates, which will be on Fridays.

Policies

I will not accept late homework for any reason. All homework assignments will be submitted through Sakai. The usual rules apply to makeup exams. You may make up an exam only in exceptional circumstances. Both of these rules will be strictly enforced.

Assignments and Grading Policy

Homework will be assigned weekly - approximately 10 assignments. Include your name, homework assignment number, and date at the top of the front page. These assignments will help you become proficient in learning outcomes 1-4, 7, & 8. When homework is returned to you, with less than full credit, you should find out what you did wrong. It is suggested that you either type, scan, or take pictures of your homework and submit all the pages as ONE document. I suggest CamScanner (APP) that “scans” your document by taking pictures. (25% of grade)

Exams will be given in class. You will be expected to solve problems similar to the homework problems and material covered in class. One midterm and one final will be given – see schedule below. This will assess your proficiency in learning outcomes 1-4 & 7. You will not have to make conjectures during exams, nor have an oral exam. 1 midterm (10% of grade) and a final (15% of grade)

Resource Evaluation will require you to select two resources, compare and contrast them, and evaluate their accuracy, effectiveness, appropriateness, and accessibility. A cover sheet is to be completed for the each resource selected that includes your ranking in each category AND your rationale for your ranking. In addition, identifying what higher level math skills you would need to know to implement the concepts, describe what prior knowledge and experiences your future students will need in order to be successful with the material presented, how you would teach the literacy skills in order to mathematize (decode) this material, and what changes would you make. (15% of grade)

Oral presentation opportunities will be provided throughout the semester. These will be based on selected problems from homework assignment. I will occasionally ask you to present one of the problems, which you solved correctly. You will become more and more proficient at explaining your work verbally as the semester progresses. You must present a minimum of 3 times throughout the semester. This addresses learning outcome 5-8. (10% of grade)

Class work will give you opportunities to explain your work to others in an informal setting. This helps to improve your skills at explaining your work, verbally. Group assignments will be given during class and collected. Problems where you make conjectures will be given. These assignments address learning outcomes 1 & 7. (10% of your grade)

CCSS Presentation will ask you to select a CCSS and develop a mini-lesson that you would use in their future classroom. For this mini- lesson, you should incorporate either current, appropriate technology or develop your own for use (graphing calculators, mathematica, google docs, videos, tutorials, apps, etc.). You will sign up for a chapter, select a standard pertinent to that chapter, and present at the start of class. After your presentation you will write a short reflection about it and your experience (15% of your grade)

Challenge problems will be indicated on each homework assignments. You do not have to do them, but for those that you do correctly, you will accumulate points toward your final exam.

Grade scale:

A	A-	B+	B	B-	C+	C	C-	D+	D	F
100-94	93-90	89-87	86-83	82-80	79-77	76-73	72-70	69-67	66-60	<60

MTH 420 Math Foundations, Fall 2019, Course Schedule

The following schedule is subject to change with fair notice given in the announcements.

Week	Date	Topics and exam dates	HW Assignment due (by midnight)	HW Assignment	Extra Credit Assignment
1	9/9	Overview Ch1 - Intuition and Proof; Ch 2 - Basics of Number Theory	9/13	Assignment 1 Ch 1: Pg 13 #1a, 4, 10, 24, 25 Ch 2: Pg 34 #9, 10, 13 Pg 40 #3, 13, 14	Extra Credit 1 Pg 34 - #6, 20
2	9/16	Ch 2 - Basics of Number Theory; Ch 3 -Theory of Equations	9/20	Assignment 2 Ch 2 Pg 47: #10, 19 Pg 51: #1, 2, 4, 6 Pg 58: #5 Pg 60: #1, 2a Pg 65: #3, 7 Pg 71: #2a, 4, 5	Extra Credit 2 Pg 65: #5
3	9/23	Ch 3 - Theory of Equations; Ch 4 - Measurement	9/27	Assignment 3 Ch 3 Pg 83: #3a Pg 84: # 6a,b, 7a, 8, 16 Pg 89: #1, 3 Pg 94: #1, 2, 3, 8 Pg 98: #2a, 2b, 5a Pg 102: #4, 5, 8 Pg 119: #1a, 1e	Extra Credit 3 Pg 102: #3c, 11
4	9/30	Ch 4 – Measurement; Ch 5 - The Triangle	10/4	Assignment 4 Ch 4 Pg 145: #4, #5 Pg 147: #11 Pg 172: #2 Ch 5 Pg 180: #1 Pg 183: #1 Pg 188: #2 & 11 Pg 193: #5 Pg 202: #1 Pg 204: #18, 20a-d	Extra Credit 4 Pg 293: #3

5	10/7	Midterm (on chapters 1-5)			
	10/14	No Class- Columbus Day			
6	10/21	Ch 7 – Constructions and Three Problems of Antiquity Ch 8 - Building Real Numbers	10/25	Assignment 5 Ch 8: Pg. 273: #1, 6a Pg. 277: #4, 7 Pg. 284: #10 Pg. 296: #9, 13 Pg. 307: # 1, 12, 13a&b Pg. 313: # 6, 7a, 9b Pg. 320: #5, 10 (a, b, d, f) Pg. 329: #3, 7	Extra Credit 5: Pg. 284: #5 Pg. 288: #5 & 7
7	10/28	Ch 9 - Building the Complex Numbers; Ch 10 - Functions and Modeling	11/1	Assignment 6 Ch 9: Pg. 365: #2 Pg. 375: #1 Pg. 384 #6a Ch 10: Pg. 417 # 5(b-f), 13 Pg. 429: #1 & 2 Pg. 451: #2a Pg. 460 #5	Extra Credit 6 N/A
8	11/4	Ch 11 - Geometric Transformations Fractals?	11/8	Assignment 7 Ch 11: Pg. 504: #1 & 2 (both all) Pg. 512: #1b, 2, 4, 5, 6, & 8 Pg. 530: #3, 9, 10	Extra Credit 7 N/A
9	Tues 11/12	Ch 12 - Trigonometry	11/15	Assignment 8 Ch 12: Pg. 573: #3, 4b Pg. 596: #16 Pg. 604: #1 Pg. 593: #2 Pg. 620: #1a&b, 4(a, b, d, g, h)	Extra Credit 8 Pg. 594: #5 Pg. 622: #11
10	11/18	Ch 13 – Data, Analysis, and Probability	11/22	Assignment 9 Ch 13: Pg. 658: #3 & 6 Pg. 665: #3 Pg. 672: #2 & 18 Pg. 680: #8 & 13 Pg. 690 #4 & 5	Extra Credit 9 Pg. 672: #9 Pg. 681: #14

11	11/25	No class- Work on your Resource Evaluation
12	12/2	Resource Evaluation Due; Presentations in class
13	12/9	Final Exam Review
Final Exam	TBA	Final (on chapters 7-13)

DISABILITY ACCOMMODATIONS AND OPPORTUNITIES

Any student with a documented disability is welcome to contact me as early in the semester as possible so that we may arrange reasonable accommodations. As part of this process, please be in touch with Disability Services for Students Office at 330 Memorial Union, 401-874-2098.

ACADEMIC HONESTY

All submitted work must be your own. If you consult other sources (class readings, articles or books from the library, articles available through internet databases, or websites) these **MUST** be properly documented, or you will be charged with plagiarism and will receive an F for the paper. In some cases, this may result in a failure of the course as well. In addition, the charge of academic dishonesty will go on your record in the Office of Student Life. If you have any doubt about what constitutes plagiarism, visit <http://gervaseprograms.georgetown.edu/hc/plagiarism.html> the URI Student Handbook, and UNIVERSITY MANUAL sections on Plagiarism and Cheating at <http://www.uri.edu/facsen/8.20-8.27.html> - cheating.

STANDARDS OF BEHAVIOR

Students are responsible for being familiar with and adhering to the published "Community Standards of Behavior: University Policies and Regulations" which can be accessed in the University Student Handbook. If you must come in late, please do not disrupt the class. Please turn off all cell phones, pagers, or any electronic devices.

RELIGIOUS HOLIDAYS

It is the policy of the University of Rhode Island to accord students, on an individual basis, the opportunity to observe their traditional religious holidays. Students desiring to observe a holiday of special importance must provide written notification to each instructor.