MA 513 - 2C – Patterns, Functions and Algebraic Reasoning

UAB Department of Mathematics - Spring 2024

Instructor: Dr. Tricia Phillips
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Class Time: TR 11-12:15pm (Heritage Hall 221)
Office Hours: M 2:30-3:30, W 3:30-4:30, R 12:30-1:30, or by appointment
Office: University Hall 4053
Phone: 205-934-2154

Class Materials: You will need graph paper, scissors, a ruler, colored pencils or pens, and a binder or folder to organize handouts from class. There is no official textbook for this course.

Course Description: (3 semester hours). Problem solving experiences, inductive and deductive reasoning, patterns and functions, some concepts and applications of geometry for elementary and middle school teachers. Topics include linear and quadratic relations and functions and some cubic and exponential functions. Number sense with the rational number system including fractions, decimals, and percents will be developed in problem contexts. An emphasis will be on developing algebraic thinking and reasoning. *Prerequisite*: Minimum grade of C in MA 102, MA 105, MA 106, MA 107, MA 110, MA 125, or MA 225.

This course helps fulfill the math requirements for Early Childhood Education and Elementary Education majors, as well as for Mathematical Reasoning Track students.

Course Overview:
The focus of this course will be to help enhance your mathematics background so that you may teach a rich K-8 grade curriculum as specified by the National Council of Teachers of Mathematics' *Principles and Standards for School Mathematics and the Alabama State Course of Study: Mathematics.* This course will be taught differently from perhaps any mathematics course you have ever taken. It is guided by UAB's participation and collaboration in the Greater Birmingham Mathematics Partnership. This is a joint venture between UAB (Schools of Education, Engineering, and Department of Mathematics), Birmingham-Southern College, the Mathematics Education Collaborative (MEC), and several local school systems. The project has its foundations in the work of Dr. Ruth Parker of MEC and the constructivist view of learning. Constructivism is a theory of teaching and learning based on the work of Jean Piaget. It emphasizes the learner taking an active role in constructing her/his own learning as the learner interacts within an environment.

The goal of this course is that you become mathematically powerful students and that you become competent and confident problem-solvers. The content and experiences in this course will lead you toward this goal. My role as the instructor will be to provide guidance and support as you make sense of mathematics. True understanding will only come when you make sense of a situation. My role is not to tell you everything about the subject, nor is it to answer all of the questions that will arise as you engage in problem-solving. You will at times experience confusion and perhaps frustration. This is a natural part of the learning process. I will try to help you reflect and work your way out of confusion before your frustration becomes debilitating to your learning. Don't be afraid of wrong answers. Sometimes learning occurs by multiple attempts down wrong paths until you find a correct path.

The structure of the course encourages you to learn while working in groups and as an individual as you solve problems. Engaging with others in collaborative problem-solving will help you see several ways of solving a problem and appreciate a variety of points of view. In groups, you are not to 'teach' someone how to solve a problem and you are not to direct others to think in a certain way. Each person must think for themselves and make sense of the situation. For many problems, I will insist that you not be satisfied with simply finding one way to solve a problem. Instead, I will challenge you to solve problems in multiple ways. While getting the right answer is a goal in solving a problem, understanding how you got to the answer is also important, as is being able to communicate your understanding to others. While collaborative learning is desired, you are at the same time individually accountable for learning the material.

Learning Outcomes: Upon successful completion of this course, a student will be able to:

- apply inductive and deductive reasoning to problems;
- identify and solve problems involving patterns that form linear and quadratic functions;
- create and thoroughly explain expressions for patterns involving summations and/or figurate numbers;
- apply a variety of problem-solving strategies in order to solve both geometric and word problems involving patterns;
- identify patterns on Pascal's Triangle and write an expression that works for multiple patterns identified;
- identify properties of geometric figures and apply these in problems;
- demonstrate knowledge of concepts of number and number relationships, number systems, number theory, estimation, and computation in the context of problem solving;
- communicate mathematical ideas orally and in writing including making mathematically convincing arguments;
- demonstrate the ability to interact within groups, and with the class as a whole, while demonstrating cognizance of working with peers at different levels; and
- demonstrate a positive disposition toward persistence and reflection in doing mathematics.

Grades

Grade Components: All grades will be posted on Canvas.

Assignment	Percent
Attendance/Participation	5
Article Reviews	7.5
Menus	20
Desserts	2.5
Midterm Exam	25
Mathematics Portfolio	12.5
Final Exam	27.5

Final Grades: The final grade for this course will be assigned using the following scale for **MA 513 only:**

Total Points	92-100	82-91	72-81	0-71
Letter Grade	A	B	C	F

Specific grade cases:

- Earning an overall A on coursework prior to the Final Exam *and* having perfect attendance throughout the term will make the Final Exam optional.
- Missing 7 or more classes during the semester that are unexcused will result in an automatic F for the course.

Assignment Descriptions

Attendance/Participation:

Attendance and active participation in all class sessions is required. Missing 7 or more classes (25% or more) with unexcused absences will result in a grade of F for this course; note that official university activities, documented illness, and jury or military duty are excused. Attending class but not actively participating results in a score of 50% for that class session. Attending class and actively participating results in a score of 100% for that class session.

Article Reviews:

You will turn in a paper copy of a 1-1.5 page reflection at the beginning of class on the due date for each set of articles/videos assigned to read, watch, and think about. Participation in class discussions regarding the assignments are also required.

Menus:

Menus consist of a set of problems you will work on solving throughout the term and that which you will hand in a neatly written paper copy at the beginning of class on the given due dates. Using GoodNotes is a great option if you choose to write on a tablet but must be printed off and turned in via hard copy.

Desserts:

MA 513 only: Four desserts (particular problems) must be completed, two on each menu, to earn credit in this category. Other desserts completed accurately are considered bonus points.

Midterm Exam:

This will occur during our regularly scheduled class time and a set of problems will be given to solve.

Mathematics Portfolio:

This assignment will include tasks to demonstrate the development and growth of your conceptual understanding, use of processes and strategies, problem solving abilities, and abilities to communicate mathematically. You will hand in a neatly written paper copy at the beginning of class on the given due date. **MA 513 only** - as a part of the Portfolio, you must complete a final mathematics task to be included. This task will be distributed in class and is in addition to the Portfolio tasks described on Canvas.

Final Exam:

This will occur at the scheduled time in-person and a set of problems will be given to solve. Note: If you achieve an A in the course prior to the Final Exam and perfect attendance, you are not required to take the Final Exam.

Class Policies & Student Expectations

Class Preparation & Collaboration:

I expect you to show respect to the instructor and classmates by putting away distracting items

such as cell phones and coursework not related to our class. I ask that you have a positive and productive disposition toward yourself, your classmates, and mathematics and are respectful of fellow classmates and the instructor as you share ideas. During group work, I expect everyone to contribute to the discussion (if you don't know how to answer the question, then *ask* a question).

You are expected to spend a substantial amount of time working through the course activities and assignments every week. Please know that time management and self-motivation are key components for success in this course. Most students who take this course find it beneficial so please keep an open mind. In addition to class time, you should spend about 6 hours per week reading, studying, preparing for class discussions, and/or completing assignments and assessments.

You may collaborate with peers on solving menu tasks. However, it is imperative that you are able to solve problems on your own to be prepared for the exams. A good guideline is that after you have solved a problem, you should feel confident that you are able to explain your solution to the class.

Make-up Policy:

There are no make-ups for assignments and no late submissions are accepted. If a student has an unplanned, emergency circumstance that temporarily prevents them from participating in the class (such as a documented hospitalization or mandated isolation for Covid-19), then the instructor should be contacted to discuss.

Instructor Support - Emails & Office Hours:

I will respond to your emails as promptly as possible (usually within 24 hours, except on weekends). If you email me after 5pm, expect a response the next day unless it is over the weekend in which case I will respond the beginning of the following week. Please check your email and Canvas course regularly for announcements and updated class documents. Students are expected to check their UAB email daily and respond within 24 hours to instructor emails (with the exception of weekends). All students are required to obtain and use the UAB email address that is automatically assigned to them as UAB students, as official correspondence will be sent ONLY to your @UAB.edu email address.

During office hours, you may drop by without making an appointment to receive assistance on any assignment.

AI Tools:

The use of AI tools is strictly prohibited in this course. Academic misconduct is present in an academic work wherever AI assistance has been used when unauthorized. Such behavior is considered deceit and a violation of UAB's shared commitment to truth and academic integrity. Deceit constitutes academic misconduct and is subject to review according to UAB's Academic Integrity Code. The developments around AI are in flux and the rules that are expressed in this syllabus are subject to change on short notice.

Success Tips:

Hard work goes a long way and the more effort you put in, the more understanding you will have – that includes coming to class on time, fully participating in the activities of the day, and spending 6-8 hours each week outside of class on course material. Actively participating in

class dialogue, rather than simply observing, is essential for understanding. Most importantly, ask questions – inside the classroom, in office hours, or over email. The earlier on you ask questions, the better, since concepts in mathematics build upon each other. Although you are responsible for your own learning, I encourage you to communicate with me so I know best how to help you succeed. I offer the following pieces of advice for your consideration:

- Review notes and do math every day.
- Actively participate in class every day.
- Help each other.
- Go to office hours.
- Analyze and understand your mistakes.
- Ask plenty of questions.
- Don't let yourself get behind.
- Go to the Math Learning Lab.

UAB Policies & Resources:

Math Learning Lab (MLL):

Located in Heritage Hall 202, the MLL offers in-person tutoring (no appointment needed). Tutors will not help with graded assignments, solve all of your problems, or work with you for extended periods of time, but they will help guide you so that you can complete your work independently. Be sure to bring your class materials with you. The MLL is open Monday-Friday from the first day of class to the last day of class. Tutoring is not available during holidays, breaks, and Final Exam week. No food or drink is allowed except bottled water.

University Academic Success Center (UASC):

The UASC provides students with a host of free services and resources that include Tutoring and Supplemental Instruction. For more information, click here.

Academic Misconduct:

The University of Alabama at Birmingham expects all members of its academic community to function according to the highest ethical and professional standards. It will be important that you review and become familiar with the University's Academic Integrity Code found here.

Disability Support Services Accessibility Statement:

UAB is committed to providing an accessible learning experience for all students. If you are a student with a disability that qualifies under the Americans with Disabilities Act (ADA) and Section 504 of the Rehabilitation Act, and you require accommodations, please contact Disability Support Services for information on accommodations, registration, and procedures. Requests for reasonable accommodations involve an interactive process and consist of a collaborative effort among the student, DSS, faculty, and staff.

If you are registered with Disability Support Services, please contact them to discuss accommodations that may be necessary in this course. If you have a disability but have not contacted Disability Support Services, please call (205) 934-4205, visit their website, or visit their office located in Hill Student Center Suite 409.

Title IX Statement:

UAB is committed to providing an environment that is free from sexual misconduct, which includes gender-based assault, harassment, exploitation, dating and domestic violence, stalking, as well as discrimination based on sex, sexual orientation, gender identity, and gender expression. If you have experienced any of the aforementioned conduct we encourage you to report the incident through one of several avenues for reporting. For more information about Title IX, policy, reporting, protections, resources and supports, please visit the UAB Title IX

webpage for UAB's Title IX, UAB's Equal Opportunity, Anti-Harassment, Duty to Report, and Non-Retaliation policies.

Tentative Schedule

Class #	Date	In-Class	Assignment Due
1	T: Jan 9	Course Intro Dot Image Pre-Assessment	
2	R: Jan 11	Groups of 4 Rules Group Task: Pentominoes	
3	T: Jan 16	Tile Stacks/WISH Table Menu 1 Intro: Cowpens	*Last Day to Drop/Add*
4	R: Jan 18	Article Discussion Menu Work/Complete Work Process Cowpens/Discuss Complete Work	
5	T: Jan 23	Process Increasing Pattern #2 Discuss Complete Work Group Task: Beans and Ways to Menu 1 Process Beans and Ways	Article/Video Reflection #1
6	R: Jan 25	Bullpens: different ways to see Function Machine Group Task: Handshakes	
7	T: Jan 30	Process Handshakes Pentagon/Five Representations Intro Group: Graph Cowpens/Bullpens Process Increasing Pattern #1	Menu 1: One Task
8	R: Feb 1	Process Bullpen Graphing Process Robbie the Robot Graphing Menu 1	
9	T: Feb 6	Group Task: Trains of 5 with Pascal's Triangle	
10	R: Feb 8	Graph Polygon Perimeters Process Polygon Perimeters Menu 1	
11	T: Feb 13	Process Increasing Pattern #4 Navigating the Pentagon Intro Multiplication Number Talk	Menu 1: Remaining Items
12	R: Feb 15	Group Task: Cuisenaire Rods	
13	T: Feb 20	Return Menu 1, Midterm Review	
14	R: Feb 22	Midterm Exam - Linear Functions Task	
15	T: Feb 27	Return Midterm, Menu 2 Intro	
16	R: Feb 29	Menu 2 Instructions Discussion Process Cubes Pattern #1/Menu 2 Navigating the Pentagon - equation to geometric	
17	T: Mar 5	Article Discussion Navigating the Pentagon - graphing Process Increasing Pattern # 2/Menu 2 work	
18	R: Mar 7	Number Talk with geometric Navigating the Pentagon - equation to geometric Process Increasing Pattern # 3/Menu 2 work	Article/Video Reflection #2
-	Mar 11-17	*Spring Break - No Classes*	

Class #	Date	In-Class	Assignment Due
19	T: Mar 19	Process Cubes Pattern #2/Menu 2 work Assign Tennis Task	
20	R: Mar 21	Group Task: Tennis Tournament Process Increasing Pattern #1/Menu 2 work	Menu 2: One Task
-	F: Mar 22		*Last Day to Withdraw ("W")*
21	T: Mar 26	Discuss Tennis Tournament Navigating the Pentagon - graphing cont'd. Process Ice Cream Cones	
22	R: Mar 28	Process Increasing Pattern #5a/Menu 2 work Navigating the Pentagon - graph to expression Portfolio Intro	
23	T: Apr 2	Process Diagonals/Jordan's Pattern Bowl a Fact Navigating the Pentagon - table to geometric	
24	R: Apr 4	Process Cubes Pattern #3 Video Group Task: Painted Cube Task Intro	Menu 2: Remaining Items
25	T: Apr 9	Group Poster Painted Cubes	
26	R: Apr 11	Work on Painted Cubes Portfolio #4 Discuss	
27	T: Apr 15	Return Menu 2 Painted Cube Presentations & Gallery Walk	Mathematics Portfolio
28	R: Apr 18	Final Exam Review	
-	T: Apr 23	Final Exam @ 10:45-1:15pm	

Note: The course syllabus and schedule serve as a contract by which the student must comply. The syllabus and schedule are subject to changes through announcements made in class and/or email.