MA 313 - 2C – Patterns, Functions and Algebraic Reasoning

UAB Department of Mathematics - Fall 2024

Instructor: Dr. Tricia Phillips (she/her)
Email: tphilli2@uab.edu
Class Time: TR 11-12:15pm (Heritage Hall 226)
Office Hours: MW 11:30-12:15, TR 10-10:45, or by appointment (in-person or Zoom)
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	22.5
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:

Total Points	90-100	80-89	70-79	60-69	0-60
Letter Grade	A	B	C	D	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. 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.

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 turn in a paper copy at the beginning of class on the given due date.

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 and have perfect attendance prior to the Final Exam, 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:

Late Work: There are no make-ups for assignments and no late submissions are accepted – all deadlines are in Central Time. It is recommended that students work far in advance of deadlines to ensure they finish assignments on time.

Absences: For absences from class, it is the student's responsibility to email the instructor scans of any paper assignments due that day *prior* to class time in order to receive credit. In addition, students should obtain a copy of the work done in class from a peer in order to stay caught up in the course. In the case of an excused absence (e.g. DSS accommodations, documented illness, unsafe commute due to weather safety recommendations, military duty, jury duty, official UAB activities), the student must inform the instructor *prior* to their absence and must send the instructor a copy of the missed classwork via email from the day of their absence in order to receive participation credit that day. Excused absences do not count against perfect attendance in terms of criteria needed to be exempt from the Final Exam. *Note*: Students with an unexcused absence are still expected to stay caught up with work but do not receive participation credit for their absence.

If a student has an unplanned or emergency circumstance that temporarily prevents them from participating in the class for an extended period of time (e.g. documented hospitalization, mandated isolation for COVID-19, jury duty), then the instructor should be contacted to discuss.

Excessive Absences: Attendance is fundamental to course objectives and for interaction with the instructor and peers to thoroughly learn concepts. Missing 7 or more classes (25% or more) with unexcused absences will result in a grade of F for this course; note that excused absences (see list above) do not count toward the 7.

Inclement Weather:

Class will be canceled for weather only if UAB cancels classes as communicated through the university's official emergency notification system. Otherwise, class will be held as scheduled.

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.

Intellectual Property: My materials in this course are for your use only and may not be reproduced or distributed without my explicit written consent.

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, open Monday through Friday from first to last day of classes except 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:
UAB expects all members of its academic community to function according to the highest ethical and professional standards. This is outlined in the University's Academic Integrity Code found here.

Disability Support Services (DSS) 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/or Section 504 of the Rehabilitation Act, and you require accommodations, please contact Disability Support Services (call 205-934-4205, visit their website, or visit their office located in Hill Student Center Suite 409) 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 already registered with DSS, please contact them to discuss accommodations that may be necessary in this course.

Title IX Statement:
In accordance with Title IX, UAB does not discriminate on the basis of gender in any of its programs or services. The University is committed to providing an environment free from discrimination based on gender and expects individuals who live, work, teach, and study within this community to contribute positively to the environment and to refrain from behaviors that threaten the freedom or respect that every member of our community deserves. For more information about Title IX, policy, reporting, protections, resources, and supports, please visit the UAB Title IX webpage.

Student Counseling Services:
Student Counseling Services supports students in achieving personal, academic, and lifelong goals by providing individual and group mental health services, prevention and outreach programming, crisis and emergency support, and consultation services. Student Counseling Services advocates for safe and inclusive learning environments in the university community. Counseling is free and confidential. You can make an appointment by calling the Student Health and Wellness Center at 205-934-5816. Their office is open Monday-Friday, 8am-5pm and is located at 1714 9th Avenue South.

Divisive Concepts:
All University faculty, instructors and teaching staff have the academic freedom to explore, discuss, and provide instruction on a wide range of topics in an academic setting. This class may present difficult, objectionable, or controversial topics for consideration, but will do so through an objective, scholarly lens designed to encourage critical thinking. Though students may be asked to share their personal views in the academic setting, no student will ever be required to assent or agree with any concept considered "divisive" under Alabama law, nor penalized for refusing to support or endorse such a concept. All students are strongly encouraged to think independently and analytically about all material presented in class and may express their views in a time, place, and manner, consistent with class organization and structure, and in accordance with the University's commitment to free and open thought, inquiry, and expressions.

Shared Values Statement:
Collaboration, integrity, respect, and excellence are core values of our institution and affirm what it means to be a UAB community member. A key foundation of UAB is diversity. At UAB, everybody counts every day. UAB is committed to fostering a respectful, accessible and open campus environment. We value every member of our campus and the richly different perspectives, characteristics and life experiences that contribute to UAB's unique environment. UAB values and cultivates access, engagement and opportunity in our research, learning, clinical, and work environments. Our university aims to create an open and welcoming environment and to support the success of all UAB community members.

Tentative Schedule

Class #	Date	In-Class	Assignment Due
1	T: Aug 27	Course Intro Dot Image Group Task: Eric the Sheep Pre-Assessment	
2	R: Aug 29	Groups of 4 Rules Group Task: Pentominoes & Process	
3	T: Sep 3	Group Task: Tile Stacks/WISH Table Menu 1 Handed Out & Intro Menu 1 Work (Cowpens)	*Last Day to Drop/Add*
4	R: Sep 5	Process Cowpens Menu Demonstration & Expectations Group Task: Beans & Ways & Process	
5	T: Sep 10	Article Discussion Menu 1 Work (Bullpens) Navigating the Pentagon Intro	Article/Video Reflection #1
6	R: Sep 12	Process Bullpens Function Machine Group Task: Handshakes	
7	T: Sep 17	Process Handshakes Menu 1 Work (Robbie the Robot)	Menu 1: One Task
8	R: Sep 19	Process Robbie the Robot Menu 1 Work (Increasing Pattern #1)	
9	T: Sep 24	Group Task: Trains of 5 with Pascal's Triangle	
10	R: Sep 26	Process Increasing Pattern #1 Menu 1 Work (Polygon Perimeters)	
11	T: Oct 1	Process Polygon Perimeters Social vs Logico-Mathematical Knowledge Number Talk Intro Navigating the Pentagon - equation to all 4	
12	R: Oct 3	Group Task: Cuisenaire Rods	Menu 1: Remaining Tasks
13	T: Oct 8	Menu 1: Feedback & Sharing Ways of Seeing Midterm Review	
14	R: Oct 10	Midterm Assessment	
15	T: Oct 15	Midterm: Feedback & Sharing Ways of Seeing Menu 2 Handed Out & Intro Menu 2 Work (Cubes Pattern #1)	
16	R: Oct 17	Process Cubes Pattern #1 Navigating the Pentagon - table to equation Menu 2 Work (Increasing Pattern #7)	
-	F: Oct 18		*Last Day to Withdraw ("W")*
17	T: Oct 22	Navigating the Pentagon - table to geometric Process Increasing Pattern # 7 Discuss Ice Cream Cones&Diagonals on a Polygon Menu 2 Work (Cubes Pattern #2)	
18	R: Oct 24	Article Discussion Number Talk Process Cubes Pattern #2 Menu 2 Work (Cubes Pattern #4)	Article/Video Reflection #2

Class #	Date	In-Class	Assignment Due
19	T: Oct 29	Number Talk Process Cubes Pattern #4 Graphing Discussion Menu 2 Work (Increasing Pattern #3) Tennis Tournament Intro	
20	R: Oct 31	Process Increasing Pattern #3 Group Task: Tennis Tournament Menu 2 Work (Ice Cream Cones)	Menu 2: One Task
21	T: Nov 5	Number Talk Process Tennis Tournament Process Ice Cream Cones Navigating the Pentagon - graphing to all 4 Menu 2 Work (Increasing Pattern #5a)	
22	R: Nov 7	Process Increasing Pattern #5a Navigating the Pentagon - verbal to all 4 Menu 2 work (Diagonals on a Polygon) Portfolio Handed Out & Intro	
23	T: Nov 12	Navigating the Pentagon - table to all 4 Bowl a Fact Process Diagonals on a Polygon Menu 2 Work	
24	R: Nov 14	Navigating the Pentagon - equation to all 4 Group Task: Painted Cube Task Intro	Menu 2: Remaining Tasks
25	T: Nov 19	Menu 2: Feedback Group Task: Painted Cubes Pre- and Post-Assessments Handed Out	
26	R: Nov 21	Group Task: Painted Cubes & Poster	
27	T: Dec 3	IDEA Surveys Painted Cube Gallery Walk Painted Cube Self & Peer Evaluations Final Review	Mathematics Portfolio
28	R: Dec 5	Final Review Portfolio Discussion & Semester Reflections	
-	T: Dec 10	Final Assessment @ 10:45-1:15	

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.