MAT 1010: Introduction to Mathematics

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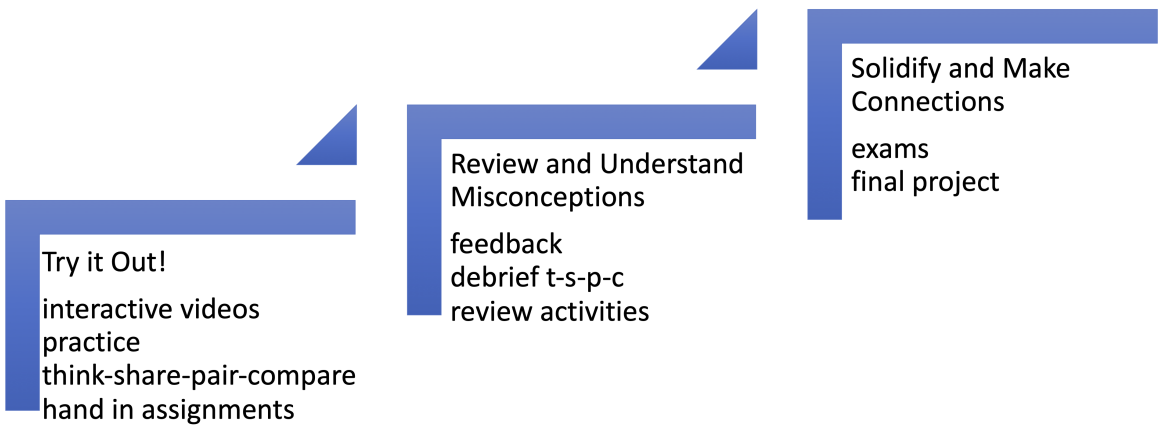
Contents

1.1 Required Resources

- *The Heart of Mathematics: An Invitation to Effective Thinking* by Edward Burger and Michael Starbird available for rental
- scientific calculator which can do powers (y^x or x^y or ^ symbol).
- scanning handwritten work: for worksheet hand-ins and exams, the course is designed so that you'll collate handwritten work into a single PDF. You can electronically annotate a PDF using a stylus, or write on paper/print the PDF to write on and collate handwritten work into a single PDF, like by using Adobe Scan or CamScanner from a phone. See `https://www.youtube.com/watch?v=2G02RJdAwLs`.
- reliable access to technology, software, and high speed connectivity

  Because this course is online, most of the work you're going to do you'll be accessing though your internet connection with a device, so it will be really important to have a dependable high-speed internet connection, a good computer that can run everything we'll need, and a camera to scan written work in. You'll need a scientific calculator with a power or exponent key, but the other software is free, including Microsoft Excel, because any faculty, staff or student with a valid Appstate email address can access Office 365. We will need the Excel version that runs on a computer for some of the functions. We'll also use Zoom videoconference software. If you don't already have one you'll also need a webcam, headphones or speakers and a microphone . Flexible browsers that will play common media formats from various sources such as from webpages, Google Drive, YouTube, and ASULearn, including interactive videos, are also something we'll use regularly. We'll also access some free software such as a Torus Games app, a Birthday Simulation, and more. You may need some flexibility in browsers so that if one browser is incompatible, you can try another. Online students are expected to have or acquire proficient computer skills and to resolve their own technology problems related to computers or internet access. `http://Support.appstate.edu` can help with some issues.
- measuring tape, string, and a round object

1.2 Assignment Types, Grades, and Policies



- Effective ASULearn Engagement 60%

  There is daily work each day at your own pace. Checkmarks may be ones where you can manually mark the activity as completed or are earned when you access an activity or receive a proficient grade by a deadline. The percentage of checkmarks (handwritten hand ins count double) determines the overall engagement grade (to accommodate for emergencies, the lowest 3 checkmark assignments are dropped) and includes:

  interactive video activities, repeatable. To earn credit you'll watch the entire video and submit the correct answers—you'll use the check feature on interactive questions in order to help you so you can redo the responses until you get them correct. Videos can be completed up until the exam on that material.

  practice with instantaneous feedback check from me, repeatable until the deadline to obtain a checkmark. The point is to practice and examine the feedback to make sure you understand rather than obtain a perfect score. I only use the checks, not the specific score. If you weren't able to succeed then a second chance will open after the deadline, but the checkmark is easier to obtain when it was originally due (70% instead of 90%). The second chance can be completed up until the exam on that material.

  rental book readings, webpages, PDF, files, videos, glossaries, surveys, or other course activities. You self-report the checkmark in solid boxes and dashed boxes earn a checkmark. Some may have specific cut off deadlines and others can be completed up until the exam on that material.

  hand in and I'll respond with feedback. Some items are designed to be handwritten, preferably on the handouts I give you, and collated into one single PDF for submission. See the individual assignment for such instructions. You can revise and resubmit before the deadline as needed if you have earned a Padawan. We'll employ Star Wars terminology as a metaphor—Padawans are training to one day become a Jedi. Jedi Knight is a rank within the Jedi Order, referring to Jedi who complete their training and pass the Jedi Trials to become full members. As a Jedi Master leader you have demonstrated exceptional achievement. Both Jedi and Jedi Master ratings earn a checkmark.

  The following 10 handwritten hand ins count double:
  handwrite Benjamin Franklin's financial legacy hand in PDF
  handwrite lottery hand in PDF
  handwrite home decisions hand in PDF
  handwrite car decisions hand in PDF
  handwrite geom intro hand in PDF
  handwrite 2D universes hand in PDF
  handwrite universe hand in PDF
  handwrite probability hand in PDF
  handwrite inferences hand in PDF
  handwrite case studies hand in PDF

  You can revise and resubmit them after seeing my feedback, as per the following schedule:

work day	due by
Mon	Tues 9am
Tues	Wed 9am
Thur	Fri 9am

  These must be completed on or before the cut-off date.* I recommend that you work on handwritten hand ins during Zoom hours.

  think-share-pair-compare to (1) respond to the questions with your own thoughts and (2) respond separately to at least two classmate's posts with something new that justifies your position on (at least) one of the questions. Don't just say, "Yeah, I agree." Instead, say, "Yes, but we also need to consider..." Or, "I don't agree because..." You might also pose questions, answer questions, extend ideas, or compare and contrast your responses and summarize what you chose and why. Be sure to use your classmates preferred names. All the posts must be rated as Jedi for a checkmark (you can revise as needed by

completing/revisiting the instructions).  debrief, where you compare with solutions and reflect, earns its own checkmark, so overall the think-share-pair-compare counts double.

Appalachian's General Education Program prepares students to employ various modes of communication that can help communities reach consensus or respectful disagreement: successful communicators interact effectively with people of both similar and different experiences and values and in this class you will practice oral and written communication during class by interacting with your peers and me. Regardless of gender, political party, race, religion, sexuality, or more this class is to be a welcoming environment, and so I want you to be sensitive and respectful to each other in upcoming discussions. Part of the welcoming environment is to keep an open mind as you engage in our class activities and explore current mathematical/scientific consensus. Performing activities that detract from this welcoming environment will result in a lowered grade. If you expect to miss more than 10% of class activities due to university sponsored or other activities then I advise you to drop the course. Any student who wants to obtain an "excused absence" must meet certain responsibilities, including providing official documentation and making up the work in advance.

- Exams 30%
  There are three handwritten exams. To encourage exams as a learning experience, accommodate for emergencies, and help solidify your knowledge, you can turn in revisions on one exam. Otherwise, no late tests allowed.*

- Final Project 10%
  To reflect more broadly about the course themes as we tie the segments together. You can choose a topic you are interested in and research how mathematics relates to it or you can design a creative review of what we covered in class. You will communicate your expertise in a video presentation and learn from your classmates. As on `https://facultyhandbook.appstate.edu/sites/default/files/facultyhandbook2020final.pdf` "an instructor may NOT change the date or time of an examination without permission of the departmental chair and dean... Permission is granted only in case of emergency."

* Accommodations in the determination of your final grade will be made for extenuating circumstances that are officially documented to prevent you from completing work early/on time.

The grading scale is: $A \geq 93; 90 \leq A- < 93; 87 \leq B+ < 90$...

1.3 Academic Affairs Policies

We adhere to the University-wide syllabus and policy statements:
`https://academicaffairs.appstate.edu/resources/syllabi-policy-and-statement-information`

1.4 Course Communication and Policies

- Zoom Hours and ASULearn Need Help Forum: My Zoom availability is typically 4-4:45pm Mon, Tues, and Thur. I'll start each targeted Zoom with a summary and you can ask me questions. Next, you can work on the course activities in breakout rooms. After I've been around to the breakout rooms to check in with you, you may continue working with others, mute yourself to work, or leave, but I'll be on the entire time until 4:45 (internet allowing!). I can also set up individual breakout rooms for private conversation with me. Zoom is especially recommended for handwrite assignments.

  If you can't make it to Zoom, please send me a private ASULearn forum message in the Need Help forum to let me know how everything is going. I strive to answer individual forum posts at least once a day, including the weekends, although I may respond within a class announcement. I prefer that you use Zoom hours as it is easier to discuss material in person.

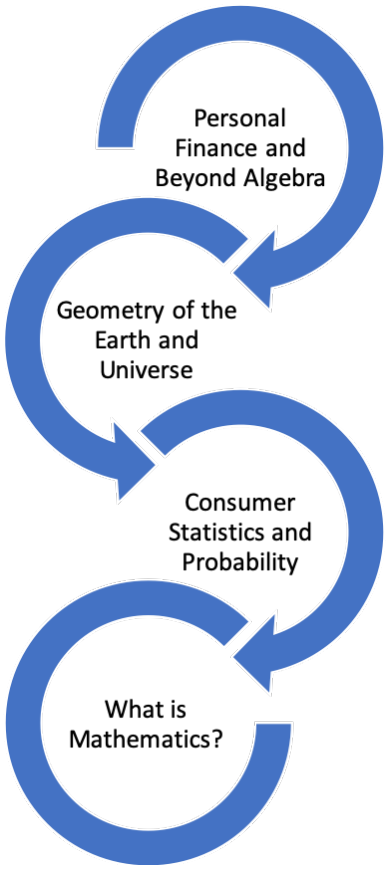
- Check ASULearn daily for work.

- Communicating about Excused Absences: If there is some reason you must miss an assignment, then keep me informed, with any appropriate documentation, and obtain the assignments and class activities from the web pages to turn the work in early or on time, if possible.

- Inclement weather: If the university cancels classes, check the class web pages for updated info, which may include plans for the missed class such as additional readings, problems, video meetings, Chat, and/or Forum sessions in ASULearn. Work may still be due on ASULearn.

1.5 Course Goals

You'll receive full general education quantitative literacy credit while developing a liberal arts appreciation of mathematics via an interdisciplinary and thematically linked format and a focus on local to global connections as you develop creative inquiry skills, research techniques, and communication skills. You'll also develop an appreciation of what mathematics is, has to offer, how it is useful, how it contributes to an understanding of truth and consequences, and the diverse ways that people can be successful and impact mathematics (including you!), as we study:



- *Personal Finance and Beyond Algebra* How we apply algebra to interest formulas and decisions we make about our own lives.
- *Geometry of our Earth and Universe* How we measure and view the world around us and decide what is the nature of reality.
- *Consumer Statistics and Probability* How probability and statistical techniques allow us to recognize the misrepresentations of studies and make public and private policy decisions.
- *What is Mathematics?* To reflect more broadly about the course themes as we tie the segments together. You can choose a topic you are interested in and research how mathematics relates to it or you can design a creative review of what we covered in class. You will communicate your expertise in a poster presentation session.
- *Interdisciplinary*: Each segment is explored through the lenses of numerous disciplines, which we will compare, contrast and connect to mathematical and statistical thinking. These include:

  - Algebra: business, economics, ethics, history, mathematics, philosophy, statistics
  - Geometry: art, astronomy, geography, history, mathematics, philosophy, physics, religion, statistics, visualization
  - Statistics and Probability: ethics, communications, history, medicine, political science, psychology, sociology, visualization

- *Thematically Linked Format*: The segments are tied together through the following themes:
  - what mathematics is, what it has to offer and how it is useful
  - the diverse ways that people succeed in and impact mathematics
  - truth and consequences-what is truth? When are we convinced? What are the consequences of certain truths? What is the role of chance and probability?

- *Local to Global Connections*: We'll identify quantitative connections within local and global geographical regions, including:
  - Financial economic indicators: local: individual and North Carolina; global: US and world
  - Geometry: local: small piece of land; global: earth and universe
  - Statistics and Probability: local: personal and NC; global: US and world, such as "math gene" idea in US but not in Asia

  We'll also compare and contrast small-scale and large-scale mathematical regions, such as:
  - Finance: local: simple interest; global: compound interest
  - Geometry: local: Euclidean; global: earth and universe
  - Statistics: local: summary statistics; global: scatterplot

- Catalog description: A course in mathematical problem solving for students who are not required to take calculus. Emphasis is on the development of students' quantitative literacy and number sense rather than computational drill. Computational tools such as spreadsheets will be used to solve a variety of real world problems. All sections cover basic consumer statistics and probability, with additional topics drawn from a variety of fields such as art, music, finance, physical or biological science, geometry, cryptology, measurement, and election theory.

- QL Curricular Components:
  - Communicate quantitative ideas and concepts using a variety of representations, including numerical, graphical, and algebraic
  - Demonstrate number sense and recognize quantitatively reasonable and unreasonable solutions to problems
  - Recognize situations where quantitative methods can be used to model and solve problems, and employ appropriate tools (specifically technology) in formulating, analyzing and solving those problems
  - Recognize and draw upon connections between the mathematical sciences and other disciplines, and between the mathematical sciences and life experiences
  - Collect and interpret quantitative data in order to draw appropriate inferences, understand the role of chance in data collection and statistical inference, and question and validate assumptions.
  - Develop the ability to think critically and creatively about the relationship between local regions and global issues, processes, trends, and systems

- Learning Outcomes: We will communicate quantitative information, including graphs, tables, and mathematics and statistics formulas in written documents or presentations. This course poses almost every mathematical problem in a real-world context. In addition, many of the problems are open-ended, allowing

for several paths to a solution. We will develop skills in recognizing patterns in mathematical information, and become logical, flexible, critical thinkers and problem solvers who thoughtfully consider the reasonableness of their solutions. We will develop skills in recognizing patterns and similarities in numerical, algebraic, and graphical representations and using those representations to solve real-world problems and employ technology such as spreadsheets, scientific calculators and graphing software, and statistical and mathematical programs. We will explore applications of mathematics and statistics in everyday life and examine course topics through a combination of theoretical derivations, problem solving and analysis, and real-life connections. We will compare and contrast small-scale and large-scale mathematical regions and identify benefits, limitations, similarities, differences, or connections in course discussions, assignments, exams, or projects. We will identify quantitative connections within local and global geographical regions and study similarities, differences, or connections during class work, discussions, or activities.

1.6 Tentative Calendar

Details are on ASULearn

- Tues May 26
  Begin Personal Finance and Beyond
- daily work each day at your own pace all due at or before 9am the next day M-F
  Excel intro
  lump sum payments
  Benjamin Franklin's financial legacy
  periodic payments
  loan payments
  review
- Wed Jun 3
  Exam 1
  Begin Geometry of the Earth and Universe
- daily work each day at your own pace all due at or before 9am the next day M-F
  geometry intro
  2-D universes
  earth
  universe
  review
- Fri Jun 12
  Exam 2
  Begin Consumer Statistics and Probability
- daily work each day at your own pace all due at or before 9am the next day M-F
  probability
  data analysis
  inferences
  policy decisions and case studies
  review

- Tues Jun 23

  Exam 3

  Begin What is Mathematics?

- daily work each day at your own pace all due at or before 9am the next day M-F

- Fri Jun 26

  Final Presentations on What is Mathematics?

1.7 Where to Get Help and Additional Policies

The CBMS published a statement titled "Active Learning in Post-Secondary Mathematics Education" about the importance of "classroom practices that engage students in activities, such as reading, writing, discussion, or problem solving, that promote higher-order thinking" and our classroom is modeled after that. The purpose of engagement is to learn and practice computational strategies, concepts, and develop critical thinking and problem-solving skills, so you should first try problems on your own. This course focuses on mathematics in context. Real-life considerations can be ill-defined and have multifaceted aspects. Whether it is counting the number of stars, understanding why the Franklin funds never earns 5%, or many of the other concepts we will consider, many cases require the critical and creative analysis of a variety of interpretations in order to fully consider the implications. I understand that this can feel frustrating and uncomfortable and I am here to help you. In return, you are expected to contribute to discussions and activities in a meaningful way. Making mistakes is integral to the learning process—the key is to try to continue to engage rather than give up—and this course is to be an environment in which you ask questions and offer good guesses. It is on purpose that there are problems that don't look exactly like what we did previously in order to provide you with rich settings to explore in order to learn deeply. Even if you achieved a check you might still have some errors, so be sure to use my feedback to help solidify your understanding. Asking questions, and explaining things to others, in or out of class, is one of the best ways to improve your understanding of the material and I am always happy to help.

I believe that each of you has the capability to succeed in this course. Since you were able to register for the class, you have somehow showed that you have the required algebraic and other skills, via placement test or other indicators. Yet, sometimes, in order to succeed, we must change certain behaviors, study habits, and/or emotional reactions. We'll see that everyone (including Dr. Sarah and other mathematicians) struggles with mathematics. Success in mathematics is not determined by whether it comes naturally or seems "clear". Instead, success in mathematics is all about learning to use mistakes and material we are struggling with in order to grow.

You should expect to put in the necessary time outside of class in order to complete assignments on time. As per the University-wide Statement on Student Engagement with Courses you can expect to spend (on average) 2–3 hours outside of class for each hour in class. In this course, this means spending approximately 2–3 hours between each class on average. You can expect to spend this time outside of class per week on assignments and reviewing material. If you find that you are spending fewer hours than these guidelines suggest, you can probably improve your understanding and grade by studying more. If you are (on average) spending more hours than these guidelines suggest, you may be studying inefficiently; in that case, you should come see me.

Many activities are designed to be completed during class and you are responsible for all material covered and all announcements and assignments made at each class, whether you are present or not. You are also responsible for announcements made on the web pages, so check them often.

I also want you to be informed about your choices regarding what you tell me about certain types of sensitive information. In situations where students disclose experiencing an act of interpersonal violence to their instructor, faculty are required to report what students tell us to the campus Title IX Coordinator, who then reaches out to the student by email offering support services. I care about you and want you to get the resources you need. I'm happy to talk with you if you decide you want that, but please be aware that if instead you'd like to explore options with someone who can keep your information totally confidential, I highly recommend the Counseling Center at 828-262-3180. They offer walk-in hours as well as after-hours coverage: `http://counseling.appstate.edu`.

- Appalachian Cares is a place to find updates about matters of student health and safety. It also functions

as the most up-to-date clearinghouse of information, resources and support available. http://appcares.appstate.edu/.

- Any student who has difficulty affording groceries or accessing sufficient food to eat every day, or who lacks a safe and stable place to live, and believes this may affect their performance in the course, is urged to contact the Dean of Students, 324 Plemmons Student Union, for a list of resources and support. The ASU Food Pantry and Free Store is a free resource with pantry and personal care items, located in the Office of Sustainability on the bottom floor of East Hall.
- The library offers Research Advisory Program (RAP) sessions. http://library.appstate.edu/gethelp/rap
- The Learning Assistance Program provides core services including University Tutorial Services, Academic Strategy Instruction, As-U-R, ACCESS, Student Support Services, and Academic Services for Student Athletes/ http://lap.appstate.edu/welcome-learning-assistance-program-1
- AppSync is your one-stop connection to engagement and leadership opportunities at Appalachian State. https://appsync.appstate.edu/

Academic integrity is a fundamental part of the course, which includes meeting deadlines, regular communication, and giving proper reference where it is due. These are essential to course integrity. Feel free to talk to me or each other if you are stuck, but when writing up work, be sure to give acknowledgment where it is due. Submitting someone else's work as your own (PLAGIARISM) is a serious violation of the University's Academic Integrity Code, which defines: "Plagiarism includes, but is not limited to, borrowing, downloading, cutting and pasting, and paraphrasing without acknowledgement, including from online sources, or allowing an individual's academic work to be submitted as another's work."

Use of interactive technology is allowed only when it is related to our class. Otherwise put cell phones away or place them face down and set them to vibrate. Photos or video or audio recordings may not be taken in class without prior permission. Food and beverages are allowed as long as they aren't distracting, but e-cigs, chewing tobacco/spit cups and other products are not allowed.

In this course, you will be challenged with problems that you have never seen before. I do not expect you to be able to solve all the issues immediately. Instead, I want to see what you can do on your own. Out in the real world, this is important, since no matter what job you have, you will be expected to seek out information and answers to new topics you have not seen before. This may feel uncomfortable and frustrating. I understand this and want to help you through the process. It helps to remember that there are no mathematical dead-ends! Each time we get stuck, it teaches us something about the problem we are working on, and leads us to a deeper understanding of the mathematics. In the real world though, you are not expected to face your work alone. You will be allowed to talk to other people and you may even be expected to work with other people. In this class, you are also not expected to face your work alone. I am always happy to help you and will try to give you hints and direction to help you understand the material. At times though, to encourage the exploration process, I may direct you to rethink a problem and to come back to discuss it with me again afterwards. This occurs when I believe that the struggle to understand is imperative for your deep understanding of the material.

1.8 Advice from Prior Students

- Get ahead!! That's really it. This isn't a class to be lazy in because it is a very fast pace class.
- Don't wait until the day of to do the homework because sometimes it will take longer than you think and it might close before you get to it.
- Ask Dr. Sarah for help. She is here to help YOU understand the material and do the best you possibly can. Take notes. Seriously, TAKE NOTES.
- Work ahead
- Do the practice tests and make good reference sheets. Take quizzes multiple times, it will benefit you on the tests.
- Make sure you take your time to review and ask any questions you have because Dr. Sarah will really help when it comes to that and typically highlights things that will be on the tests. Lastly, do the homework! It always comes up later and is actually important to the class.

- Expect to spend several hours on Math a day if you are keeping up.
- Do the homework it kills your grade if you don't
- I would suggest not to procrastinate and to really appreciate the theories in the course.
- Make sure you know how each topic relates to local and global concepts and the big idea. Before a test, I would recommend redoing homework and the practice tests because they are usually pretty similar to the actual test and are very helpful.
- if you are working a job while doing this PLEASE be mindful of the hours you are taking and just know that you will be exhausted when you get home if you take long shifts. It is much harder to do school work when you are sleep deprived.
- Do your work ahead and make a good reference sheet the night before.
- Always stay on track with the homework/ at home classroom work. It is very easy to do so, but you may lag behind if you miss an assignment.
- Do the class work, because it is a big part of your grade.
- Critical thinking is important in each lesson so be able to apply the knowledge. Dr. Sarah will answer any questions you may have.
- Make the time to do the work, it helps on the test
- Make sure you set aside at least 3 hours a day for homework.
- Just do the work on time.
- Do you homework, review packet, and ask questions!
- Take extensive notes. This class is not your normal math class, there will not be a whole lot of computational equations to remember (although there will be some). I was not really a "math note taker" before this class because it was typically just scratch work and such but this class has a lot more writing than you may expect so take notes because they will help you make your reference sheet for the tests. Also, taking notes is just a good idea in general because it requires you be attentive while Dr. Sarah teaches.
- Stay on top of the readings
- I would recommend writing everything down. Anything Dr. Sarah says or writes down, you write down. All the information becomes relevant at some point.
- Don't drop out if the first day mostly scares you like it did to me. Just keep going and after a lot of researching, studying, and by asking as many questions as you can, everything will start to make sense.
- Know how to upload assignments.
- My suggestions would be to definitely follow through with the order that Dr. Sarah has the assignments in because more often then not the videos help with the practices and the practices help with the hand ins! Work at a consistent pace that is best for you and don't give up. The way that Dr. Sarah incorporated real-life situations into learning mathematics made the experience that much more enjoyable!

1.9 Instructor Bio

I am a full Professor of Mathematics, and I am also an affiliate of Gender, Women's and Sexuality Studies (GWS), investigating the connections between mathematics and society. My PhD is from the University of Pennsylvania. I am married to the bassist Joel Landsberg. In our spare time, we like to travel, hike and conduct genealogy research. In addition to my own personal genealogy, I like to give back to the broader community, and in this context, I am affiliated with ASU's center for Judaic, Holocaust and Peace Studies. Some of what I like about mathematics is also what I enjoy about genealogy—the sense of exploration, discovery and aha moments that come with lots of patience and effort.