

Course number, Course CRN, COURSE TITLE
Math 3301-110, 80713, Number Theory

Fall 2021

Texas A&M University-Central Texas

COURSE DATES, MODALITY, AND LOCATION

This course is 100% online course, and uses the A&M-Central Texas Canvas Learning Management System:

<https://tamuct.instructure.com/>

and the Pearson mymathlab course materials:

www.mymathlab.com

The course will be taught from Aug 23, 2021 – Dec 10, 2021.

The class will meet online over Webex every Tuesday, starting August 24th from 6pm-7:15pm. Click on this link:

<https://tamuct.webex.com/meet/cdouglass>

*Student is also required to take a proctored midterm on **October 19th**. The midterm will be 3 hours long and can be taken anytime between 12pm-8pm. The midterm should be taken online by using the Proctorio software.*

*Student is also required to take a proctored final exam on **December 7th**. The final exam will be 3 hours long and can be taken anytime between 12pm-8pm. The final should be taken online by using the Proctorio software.*

INSTRUCTOR AND CONTACT INFORMATION

Instructor: Christy Douglass

Virtual office: <https://tamuct.webex.com/meet/cdouglass>

Phone: 254.371.6833

Email:

Preferred: Canvas Inbox

University Email: cdouglass@tamuct.edu

Office Hours

Office hours will be by appointment on Webex @ <https://tamuct.webex.com/meet/cdouglass>.

Student-instructor interaction

I will check messages once a day on the CANVAS inbox system and reply within 24 hours. Students are expected to check their CANVAS email and announcements daily.

WARRIOR SHIELD

Emergency Warning System for Texas A&M University-Central Texas

Warrior Shield is an emergency notification service that gives Texas A&M University-Central Texas the ability to communicate health and safety emergency information quickly via email, text message, and social media. All students are automatically enrolled in Warrior Shield through their myCT email account.

Connect to Warrior Shield by [911Cellular](https://www.tamuct.edu/police/911cellular.html) [https://www.tamuct.edu/police/911cellular.html] to change where you receive your alerts or to opt out. By staying enrolled in Warrior Shield, university officials can quickly pass on safety-related information, regardless of your location.

Fall 2021 Return to Campus Plan. For the most recent campus information regarding COVID-19 see the Texas A&M University-Central Texas [Fall 2021 Return to Campus Plan](https://www.tamuct.edu/covid19/) [https://www.tamuct.edu/covid19/]

COURSE INFORMATION

Course Overview and description

The study of congruence relations, rational integers, Diophantine equations, quadratic reciprocity law, linear forms, integral domains, and related topics.

Prerequisite(s): 6 hours of MATH including MATH 2413.

Course Objective or Goal

Student Learning Outcomes

After completing the course, students should be able to:

I. Numeration Systems

1. Represent numbers in various numeration systems (covered in Ch.3 HW, Ch.3 Quiz, Test 1, Midterm)
2. Represent a number in various bases (compose and decompose) (covered in Ch.3 HW, Ch.3 Quiz, Test 1, Midterm)
3. Convert a numeral from base ten to another base and vice versa (covered in Ch.3 HW, Ch.3 Quiz, Test 1, Midterm)
4. Perform arithmetic operations with numerals in bases other than ten (covered in Ch.3 HW, Ch.5 HW, Ch.3 Quiz, Ch.5 Quiz, Test 1, Midterm)

II. Operations with Natural Numbers, Whole Number, and Integers

1. Determine what properties hold for a set of numbers (covered in Ch.3 HW, Ch.5 HW, Ch.3 Quiz, Ch.5 Quiz, Test 1, Midterm)
2. Classify word problems by operation type (covered in Ch.1 HW, Ch.3 HW, Ch.5 HW, Ch.4 HW, Ch.3 Quiz, Ch.4 Quiz, Ch.5 Quiz, Test 1, Test 2, Midterm, Final)
3. Perform arithmetic operations with whole numbers, integers, and rational numbers (covered in Ch. 3 HW, Ch.5 HW, Ch.3 Quiz, Ch.5 Quiz, Test 1, Midterm)

4. Determine why particular algorithms work (addition, subtraction, multiplication, and division) (covered in Ch.3 HW, Ch.3 Quiz, Test 1, Midterm)
5. Solve problems using various mathematical strategies (covered in Ch.1 HW, Test 1, Midterm)

III. Number Theory

1. Use inductive and deductive reasoning in justifications (covered in Ch.1 HW, Test 1, Midterm)
2. Find all factors of a number (covered in Ch.4 HW, Ch.4 Quiz, Test 2, Final)
3. Write the prime factorization of a number (covered in Ch.4 HW, Ch.4 Quiz, Test 2, Final)
4. Classify a number by the number of its factors (covered in Ch.4 HW, Ch.4 Quiz, Test 2, Final)
5. Test whether one number is divisible by another number (covered in Ch.4 HW, Ch.4 Quiz, Test 2, Final)
6. Find the greatest common divisor (GCD) and least common multiple (LCM) of two or more numbers (covered in Ch.4 HW, Ch.4 Quiz, Test 2, Final)
7. Perform the Euclidean algorithm on Diophantine equations to find the GCD of two numbers (covered in Ch. 4 HW, Ch. 4 Quiz, Test 2, Final)
8. Create Cayley tables to represent outcomes in clock arithmetic (covered in Modular Arithmetic HW, Modular Arithmetic Quiz, Test 2, Final)
9. Perform arithmetic operations in modulo m (covered in Modular Arithmetic HW, Modular Arithmetic Quiz, Test 2, Final)
10. Solve linear congruences and applications (covered in Modular Arithmetic HW, Modular Arithmetic Quiz, Test 2, Final)
11. Represent figurate numbers symbolically (covered in Ch.1 HW, Ch.3 HW, Ch.3 Quiz, Test 1, Midterm)
12. Develop a spreadsheet in Excel and perform basic operations (covered in Spreadsheets HW, Project 2, Final)
13. Create graphs and charts using Excel spreadsheets (covered in Spreadsheets HW, Project 2, Final)
14. Use explicit and recursive formulas in Excel spreadsheets (covered in Spreadsheets HW, Project 2, Final)
15. Generate sequences and series in Excel spreadsheets (covered in Spreadsheets HW, Project 2, Final)
16. Perform the Euclidean algorithm on Diophantine equations using Excel spreadsheets (covered in Spreadsheets HW, Project 1, Final)
17. Encode and decode messages using simple encryption, as well as key exchange methods (covered in Cryptography HW, Project 2, Final)

Competency Goals Statements (certification or standards)

Students will satisfy the Texas competencies and standards as outlined below by the Texas Education Agency:

TEXES competencies and standards:

Standard I, II, and V:

Mathematics 7–12 Standard 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]) to prepare students to use mathematics.

Mathematics 7–12 Standard II

Patterns and Algebra: The mathematics teacher understands and uses patterns, relations, functions, algebraic reasoning, analysis and technology appropriate to teach the statewide curriculum (TEKS) to prepare students to use mathematics.

Mathematics 7–12 Standard V

Mathematical Processes: 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.

Competencies:

Domain I – 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 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.
- 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.

Domain II – Patterns and Algebra

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).

Required Reading and Textbook(s)



Student Registration Instructions for Canvas

First, enter your Canvas course

1. Sign in to Canvas and enter your Canvas course.
2. Do one of the following:
 - » Select any Pearson link from any module.
 - » Select a MyLab and Mastering link in the Course Navigation. Next, select **Open MyLab and Mastering** or a content link.

Next, get access to your Pearson course content

1. Enter your Pearson account **username** and **password** to **Link Accounts**.
You have an account if you have ever used a MyLab or Mastering product.
 - » If you don't have a Pearson account, select **Create** and follow the instructions.
2. Select an access option:
 - » Enter the access code that came with your textbook or that you purchased separately from the bookstore.
 - » If available for your course,
 - Buy access using a credit card or PayPal.
 - Get temporary access.

If you're taking another semester of a course, you skip this step.
3. From the You're Done page, select **Go to My Courses**.

Note: We recommend you always enter your MyLab Math course through Canvas.

Get your computer ready

For the best experience, check the system requirements for your product at <https://www.pearsonmylabandmastering.com/system-requirements/>

Need help?

For help with MyLab Math for Canvas, go to https://help.pearsoncmg.com/integration/cg/canvas/student/en/content/get_started.htm

COURSE REQUIREMENTS

Grading Criteria Rubric and Conversion

The student will be responsible for homework assignments, quizzes, 2 tests, a midterm and a final exam, 5 online discussions and 2 projects.

Homework assignments (8 x 12.5)	(100 points)	10%
Test (2 x 50)	(100 points)	10%
Midterm (Online Proctored)	(300 points)	30%
Online Discussions (5 x10)	(50 points)	5%
Projects (2 x 25)	(50 points)	5%
Quizzes (5x20)	(100 points)	10%
Final	(300 points)	30%
TOTAL	(1000 points)	100%

Posting of Grades

Student will receive instant feedback on homework assignments, quizzes, and minor tests on MyMathLab. Officially, grades will be posted in Canvas within one week of due dates. Please monitor grades regularly to ensure accuracy. Contact me immediately if discrepancies arise.

Grading Policies

NO LATE ASSIGNMENTS WILL BE ACCEPTED IN THIS CLASS.

Important University Dates

<https://www.tamuct.edu/registrar/academic-calendar.html>

COURSE OUTLINE AND CALENDAR

Week #	Meeting Dates	Topics	What's due? <small>(due by midnight unless otherwise noted)</small>
1	August 24th	Ch. 1 - Intro to Problem Solving	N/A
2	August 31st	Ch. 2 - Logic & Sets	8/31 – Discussion#1 9/5 – Ch1 HW
3	September 7th	Ch. 2 - Logic & Sets (cont.)	9/7 – Discussion#2
4	September 14th	Ch. 3 – Numeration Systems & Whole Number Operations	9/19 – Ch2 HW 9/20 – Ch2 Quiz
5	September 21st	Ch. 5 - Integers	9/26 – Ch3 HW 9/27 – Ch3 Quiz
6	September 28th	Ch. 4 – Number Theory	9/29 – TEST #1 (Ch1-3) 10/3 – Ch5 HW 10/4 – Ch5 Quiz
7	October 5th	Ch. 4 – Number Theory (cont.)	10/5 – Discussion#3
8	October 12th	Midterm Review	10/17 – Ch4 HW 10/18 – Ch4 Quiz
9	October 19th	MIDTERM (Ch 1-5)	10/19@6pm - MIDTERM
10	October 26th	EXCEL Spreadsheets	10/26 – Discussion#4
11	November 2nd	Modular Arithmetic	11/7 – EXCEL HW
12	November 9th	Modular Arithmetic (cont.)	11/14 - PROJ #1
13	November 16th	Cryptography	11/17 – TEST #2 11/21 – Mod Arithmetic HW 11/22 – Mod Arithmetic Quiz
14	November 23rd	Cryptography (cont.)	11/23 – Discussion#5
15	November 30th	FINAL EXAM REVIEW	12/5 – Crypt. HW
16	December 7th	FINAL EXAM	12/7@6pm – FINAL 12/8 – PROJ #2

TECHNOLOGY REQUIREMENTS AND SUPPORT

Technology Requirements

This course will use the A&M-Central Texas Instructure Canvas learning management system. **We strongly recommend the latest versions of Chrome or Firefox browsers. Canvas no longer supports any version of Internet Explorer.**

Logon to A&M-Central Texas Canvas [<https://tamuct.instructure.com/>] or access Canvas through the TAMUCT Online link in myCT [<https://tamuct.onecampus.com/>]. You will log in through our Microsoft portal.

Username: Your MyCT email address. Password: Your MyCT password

The student is also required to purchase an access code to MyMathLab. All homework assignments, quizzes, minor tests, lecture videos and e-book will be available on MyMathLab.

MyMathLab can be accessed at:

www.mymathlab.com

ALL synchronous meetings and office hours will be held on Webex. Please click on this link to access my office hours or synchronous meetings:

<https://tamuct.webex.com/meet/cdouglass>

Canvas Support

Use the Canvas Help link, located at the bottom of the left-hand menu, for issues with Canvas. You can select “Chat with Canvas Support,” submit a support request through “Report a Problem,” or call the Canvas support line: 1-844-757-0953.

For issues related to course content and requirements, contact your instructor.

Online Proctored Testing

A&M-Central Texas uses Proctorio for online identity verification and proctored testing. This service is provided at no direct cost to students. If the course requires identity verification or proctored testing, the technology requirements are: Any computer meeting the minimum computing requirements, plus web camera, speaker, and microphone (or headset). Proctorio also requires the Chrome web browser with their custom plug in.

Other Technology Support

For log-in problems, students should contact Help Desk Central, 24 hours a day, 7 days a week

Email: helpdesk@tamu.edu

Phone: (254) 519-5466

[Web Chat](http://hdc.tamu.edu): [<http://hdc.tamu.edu>]

Please let the support technician know you are an A&M-Central Texas student.

UNIVERSITY RESOURCES, PROCEDURES, AND GUIDELINES

Drop Policy

If you discover that you need to drop this class, you must complete the [Drop Request](#) Dynamic Form through Warrior Web.

[<https://dynamicforms.ngwebsolutions.com/casAuthentication.ashx?InstID=eaed95b9-f2be-45f3-a37d-46928168bc10&targetUrl=https%3A%2F%2Fdynamicforms.ngwebsolutions.com%2Fsubmit%2Fform%2Fstart%2F53b8369e-0502-4f36-be43-f02a4202f612>].

Faculty cannot drop students; this is always the responsibility of the student. The Registrar's Office will provide a deadline on the Academic Calendar for which the form must be completed. Once you submit the completed form to the Registrar's Office, you must go into Warrior Web and confirm that you are no longer enrolled. If you still show as enrolled, FOLLOW-UP with the Registrar's Office immediately. You are to attend class until the procedure is complete to avoid penalty for absence. Should you miss the drop deadline or fail to follow the procedure, you will receive an F in the course, which may affect your financial aid and/or VA educational benefits.

Academic Integrity

Texas A&M University-Central Texas values the integrity of the academic enterprise and strives for the highest standards of academic conduct. A&M-Central Texas expects its students, faculty, and staff to support the adherence to high standards of personal and scholarly conduct to preserve the honor and integrity of the creative community. Any deviation by students from this expectation may result in a failing grade for the assignment and potentially a failing grade for the course. All academic misconduct concerns will be referred to the Office of Student Conduct. When in doubt on collaboration, citation, or any issue, please contact your instructor before taking a course of action.

For more [information regarding the Student Conduct process](#), [<https://www.tamuct.edu/student-affairs/student-conduct.html>].

If you know of potential honor violations by other students, you may [submit a report](#), [https://cm.maxient.com/reportingform.php?TAMUCentralTexas&layout_id=0].

Academic Accommodations

At Texas A&M University-Central Texas, we value an inclusive learning environment where every student has an equal chance to succeed and has the right to a barrier-free education. The

Office of Access and Inclusion is responsible for ensuring that students with a disability receive equal access to the university's programs, services and activities. If you believe you have a disability requiring reasonable accommodations, please contact the Office of Access and Inclusion, WH-212; or call (254) 501-5836. Any information you provide is private and confidential and will be treated as such.

For more information, please visit our [Access & Inclusion](https://tamuct.instructure.com/courses/717) Canvas page (log-in required) [https://tamuct.instructure.com/courses/717]

Important information for Pregnant and/or Parenting Students

Texas A&M University-Central Texas supports students who are pregnant and/or parenting. In accordance with requirements of Title IX and related guidance from US Department of Education's Office of Civil Rights, the Dean of Student Affairs' Office can assist students who are pregnant and/or parenting in seeking accommodations related to pregnancy and/or parenting. Students should seek out assistance as early in the pregnancy as possible. For more information, please visit [Student Affairs](https://www.tamuct.edu/student-affairs/pregnant-and-parenting-students.html) [https://www.tamuct.edu/student-affairs/pregnant-and-parenting-students.html]. Students may also contact the institution's Title IX Coordinator. If you would like to read more about these [requirements and guidelines](http://www2.ed.gov/about/offices/list/ocr/docs/pregnancy.pdf) online, please visit the website [http://www2.ed.gov/about/offices/list/ocr/docs/pregnancy.pdf].

Title IX of the Education Amendments Act of 1972 prohibits discrimination on the basis of sex and gender—including pregnancy, parenting, and all related conditions. A&M-Central Texas is able to provide flexible and individualized reasonable accommodation to pregnant and parenting students. All pregnant and parenting students should contact the Associate Dean in the Division of Student Affairs at (254) 501-5909 to seek out assistance. Students may also contact the University's Title IX Coordinator.

Tutoring

Tutoring is available to all A&M-Central Texas students, on a remote online basis. Visit the Academic Support Community in Canvas to view schedules and contact information. Subjects tutored on campus include Accounting, Advanced Math, Biology, Finance, Statistics, Mathematics, and Study Skills. Student success coaching is available online upon request.

If you have a question regarding tutor schedules, need to schedule a tutoring session, are interested in becoming a tutor, success coaching, or have any other question, contact Academic Support Programs at (254) 501-5836, visit the Office of Student Success at 212F Warrior Hall, or by emailing studentsuccess@tamuct.edu.

Chat live with a tutor 24/7 for almost any subject from on your computer! Tutor.com is an online tutoring platform that enables A&M-Central Texas students to log in and receive online tutoring support at no additional cost. This tool provides tutoring in over 40 subject areas except writing support. Access Tutor.com through Canvas.

University Writing Center

University Writing Center: Located in Warrior Hall 416, the University Writing Center (UWC) at Texas A&M University–Central Texas (A&M–Central Texas) is a free service open to all A&M–

Central Texas students. For the Fall 2021 semester, the hours of operation are from 10:00 a.m.-5:00 p.m. Monday thru Thursday in Warrior Hall 416 (with online tutoring available every hour as well) with satellite hours available online only Monday thru Thursday from 6:00-9:00 p.m. and Saturday 12:00-3:00 p.m.

Tutors are prepared to help writers of all levels and abilities at any stage of the writing process. While tutors will not write, edit, or grade papers, they will assist students in developing more effective composing practices. By providing a practice audience for students' ideas and writing, our tutors highlight the ways in which they read and interpret students' texts, offering guidance and support throughout the various stages of the writing process. In addition, students may work independently in the UWC by checking out a laptop that runs the Microsoft Office suite and connects to WIFI, or by consulting our resources on writing, including all of the relevant style guides. Whether you need help brainstorming ideas, organizing an essay, proofreading, understanding proper citation practices, or just want a quiet place to work, the UWC is here to help!

Students may arrange a one-to-one session with a trained and experienced writing tutor by making an appointment via WOnline at <https://tamuct.mywconline.com/>. In addition, you can email Dr. Bruce Bowles Jr. at bruce.bowles@tamuct.edu if you have any questions about the UWC, need any assistance with scheduling, or would like to schedule a recurring appointment with your favorite tutor by making an appointment via WOnline at <https://tamuct.mywconline.com/>. In addition, you can email Dr. Bruce Bowles Jr. at bruce.bowles@tamuct.edu if you have any questions about the UWC, need any assistance with scheduling, or would like to schedule a recurring appointment with your favorite tutor.

University Library

The University Library provides many services in support of research across campus and at a distance. We offer over 200 electronic databases containing approximately 400,000 eBooks and 82,000 journals, in addition to the 96,000 items in our print collection, which can be mailed to students who live more than 50 miles from campus. Research guides for each subject taught at A&M-Central Texas are available through our website to help students navigate these resources. On campus, the library offers technology including cameras, laptops, microphones, webcams, and digital sound recorders.

Research assistance from a librarian is also available 24 hours a day through our online chat service, and at the reference desk when the library is open. Research sessions can be scheduled for more comprehensive assistance, and may take place virtually through WebEx, Microsoft Teams or in-person at the library. Assistance may cover many topics, including how to find articles in peer-reviewed journals, how to cite resources, and how to piece together research for written assignments.

Our 27,000-square-foot facility on the A&M-Central Texas main campus includes student lounges, private study rooms, group work spaces, computer labs, family areas suitable for all

ages, and many other features. Services such as interlibrary loan, TexShare, binding, and laminating are available. The library frequently offers workshops, tours, readings, and other events. For more information, please visit our [Library website](http://tamuct.libguides.com/index) [http://tamuct.libguides.com/index].

OPTIONAL POLICY STATEMENTS

A Note about Sexual Violence at A&M-Central Texas

Sexual violence is a serious safety, social justice, and public health issue. The university offers support for anyone struggling with these issues. University faculty are mandated reporters, so if someone discloses that they were sexually assaulted (or a victim of Domestic/Dating Violence or Stalking) while a student at TAMUCT, faculty members are required to inform the Title IX Office. If you want to discuss any of these issues confidentially, you can do so through Student Wellness and Counseling (254-501-5955) located on the second floor of Warrior Hall (207L).

Sexual violence can occur on our campus because predators often feel emboldened, and victims often feel silenced or shamed. It is incumbent on ALL of us to find ways to actively create environments that tell predators we don't agree with their behaviors and tell survivors we will support them. Your actions matter. Don't be a bystander; be an agent of change. For additional information on campus policy and resources visit the [Title IX webpage](https://www.tamuct.edu/compliance/titleix.html) [https://www.tamuct.edu/compliance/titleix.html].

Behavioral Intervention

Texas A&M University-Central Texas cares about the safety, health, and well-being of its students, faculty, staff, and community. If you are aware of individuals for whom you have a concern, please make a referral to the Behavioral Intervention Team. Referring your concern shows you care. You can complete the [referral](https://cm.maxient.com/reportingform.php?TAMUCentralTexas&layout_id=2) online [https://cm.maxient.com/reportingform.php?TAMUCentralTexas&layout_id=2].

Anonymous referrals are accepted. Please see the [Behavioral Intervention Team](https://www.tamuct.edu/bit) website for more information [https://www.tamuct.edu/bit]. If a person's behavior poses an imminent threat to you or another, contact 911 or A&M-Central Texas University Police at 254-501-5800.

OTHER POLICIES

Copyright Notice

Students should assume that all course material is copyrighted by the respective author(s). Reproduction of course material is prohibited without consent by the author and/or course instructor. Violation of copyright is against the law and Texas A&M University-Central Texas' Code of Academic Honesty. All alleged violations will be reported to the Office of Student Conduct.

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