



Mathematical Models with Applications (MTHMOD) 1A Syllabus

Course Name

MTHMOD 1A

Mathematical Models with Applications – Semester A

Course Information

MTHMOD 1A is the first semester of this two-semester course.

Welcome to Math Models 1A! Mathematical Models with Applications is a course that will build on your previous math courses, including Algebra 1. Emphasis will be placed on the mathematical relationships that you encounter in the real world. You will learn how to solve problems, communicate mathematically, create and interpret mathematical representations and models, and use technology efficiently and appropriately to solve problems.

We all learn mathematics best by doing mathematics within a meaningful context. You will be asked to solve problems in realistic situations. This course will help you to develop independence and take responsibility for your own mathematical models that you will use to solve meaningful problems. Appropriate technology will be used throughout the course to allow you to interpret real-life data verbally, numerically, symbolically, and graphically.

The TI-84 Plus graphing calculator will be used in this course; therefore, it is very important that you have access to one. You may use another model if you choose, but all instructions given in the course will be for the TI-84 Plus. This course is not to teach you how to use the graphing calculator, but rather to teach how it can be used as a reference tool, so don't lose the owner's manual for your calculator.

It is very important that you read the course material before beginning each lesson in the textbook. The textbook has nine chapters: a review chapter and chapters 1-8. We will cover Chapter R through Chapter 4 in MTHMOD 1A and Chapters 5 through 8 in MTHMOD 1B.

This course, MTHMOD 1A, has a total of five lessons and a final exam. At the end of each chapter in the textbook, you will find a Chapter Summary, Chapter Review Problems, and a Chapter Test.

Keep a positive attitude, study hard, read all assignments in your textbook and course, and never be afraid to ask for help or clarification. Your textbook and this course are meant to be used together. Do not attempt to work the assignment problems without reading the assigned sections(s) in the textbook and corresponding discussion in the course. Before beginning the lessons, take the time to read through and study the design of your textbook. Read the Preface on pages vii-xiv.

My goal for this course is to empower each student with the knowledge and skills necessary to be successful in high school and college. I believe that having a strong mathematical background is one of the most powerful assets that you can possess.

Course Delivery Method

Online

Contacting Your Instructor

You may contact your instructor through the Blackboard messaging system. Technical support is available 24/7 at www.k12.ttu.edu.

Course Objectives

After completing this course, you should be able to:

1. identify the variables in the problem and select those that represent essential features;
2. formulate a model by creating and selecting from representations such as geometric, graphical, tabular, algebraic, or statistical that describe the relationships between the variables;
3. **compute:** analyze and perform operations on the relationships between the variables to draw conclusions;
4. **interpret:** interpret the results of the mathematics in terms of the original problem;
5. **revise:** confirm the conclusions by comparing the conclusions with the problem and revising as necessary;
6. **report:** report on the conclusions and the reasoning behind the conclusions;
7. apply mathematics to problems arising in everyday life, society, and the workplace;
8. use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution;

9. select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate, and techniques, including mental math, estimation, and number sense as appropriate, to solve problems;
10. communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;
11. create and use representations to organize, record, and communicate mathematical ideas;
12. analyze mathematical relationships to connect and communicate mathematical ideas;
13. display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication;
14. use rates and linear functions to solve problems involving personal finance and budgeting, including compensations and deductions;
15. solve problems involving personal taxes;
16. analyze data to make decisions about banking, including options for online banking, checking accounts, overdraft protection, processing fees, and debit card/ATM fees;
17. use formulas to generate tables to display a series of payments for loan amortizations resulting from financed purchases;
18. analyze personal credit options in retail purchasing and compare relative advantages and disadvantages of each option;
19. use technology to create amortization models to investigate home financing and compare buying a home to renting a home;
20. use technology to create amortization models to investigate automobile financing and compare buying a vehicle to leasing a vehicle;
21. analyze and compare coverage options and rates in insurance;
22. investigate and compare investment options, including stocks, bonds, annuities, certificates of deposit, and retirement plans;
23. analyze types of savings options involving simple and compound interest and compare relative advantages of these options;
24. use proportionality and inverse variation to describe physical laws such as Hook's Law, Newton's Second Law of Motion, and Boyle's Law;
25. use exponential models available through technology to model growth and decay in areas, including radioactive decay;
26. use quadratic functions to model motion;
27. use similarity, geometric transformations, symmetry, and perspective drawings to describe mathematical patterns and structure in architecture;
28. use scale factors with two-dimensional and three-dimensional objects to demonstrate proportional and non-proportional changes in surface area and volume as applied to fields;
29. use the Pythagorean Theorem and special right-triangle relationships to calculate distances;

30. use trigonometric ratios to calculate distances and angle measures as applied to fields;
31. use trigonometric ratios and functions available through technology to model periodic behavior in art and music;
32. use similarity, geometric transformations, symmetry, and perspective drawings to describe mathematical patterns and structure in art and photography;
33. use geometric transformations, proportions, and periodic motion to describe mathematical patterns and structure in music;
34. use scale factors with two-dimensional and three-dimensional objects to demonstrate proportional and non-proportional changes in surface area and volume as applied to fields;
35. determine the number of ways an event may occur using combinations, permutations, and the Fundamental Counting Principle;
36. compare theoretical to empirical probability;
37. use experiments to determine the reasonableness of a theoretical model such as binomial or geometric;
38. interpret information from various graphs, including line graphs, bar graphs, circle graphs, histograms, scatterplots, dot plots, stem-and-leaf plots, and box and whisker plots, to draw conclusions from the data and determine the strengths and weaknesses of conclusions;
39. analyze numerical data using measures of central tendency (mean, median, and mode) and variability (range, interquartile range or IQR, and standard deviation) in order to make inferences with normal distributions;
40. distinguish the purposes and differences among types of research, including surveys, experiments, and observational studies;
41. use data from a sample to estimate population mean or population proportion;
42. analyze marketing claims based on graphs and statistics from electronic and print media and justify the validity of stated or implied conclusions;
43. use regression methods available through technology to model linear and exponential functions, interpret correlations, and make predictions;
44. formulate a meaningful question, determine the data needed to answer the question, gather the appropriate data, analyze the data, and draw reasonable conclusions; and
45. communicate methods used, analyses conducted, and conclusions drawn for a data-analysis project through the use of one or more of the following: a written report, a visual display, an oral report, or a multimedia presentation.

MTHMOD addresses the required Texas Essential Knowledge and Skills (TEKS). These can be found at the [Texas Education Agency](https://www.tea.texas.gov/essential-knowledge-and-skills) website.

continued →

Textbook and Materials

Textbook(s)

The required textbook for this course is:

- Timmons, Daniel L., et al. *Mathematical Models with Applications*, 2nd ed. Cengage Learning. ISBN: 978-1-305-09669-1

This textbook was written at an appropriate level of rigor, with solid examples and lots of practice problems.

Materials

- lined notebook paper
- pencils and erasers
- graph paper
- spiral notebook
- straight edge (ruler)
- TI-83 Plus or TI-84 Plus graphing calculator or better

Submitting Assignments

You will submit all lessons for this course electronically. Your work for each lesson will need to be saved as a PDF in order to submit the lesson for grading. See **Requirements for Creating PDFs** in the Syllabus section of your course for information on PDF-creation options.

Be sure to follow the instructions below when preparing your lesson assignments for grading:

- All assignments for this course will be submitted online.
- Begin each lesson's assignment on a clean sheet of notebook paper. Do **not** use frayed spiral notebook paper.
- Complete your work in pencil. Make certain the marks are dark enough for a scanner or camera to pick up the text.
- Do **not** write on the back of your notebook paper.
- Show your work down the paper, not across. However, you may make two columns.
- Skip a line after each problem and circle the answer(s).

- **Submit your completed work, following the instructions in each lesson. Each lesson must be on notebook paper. Graphs must be on graph paper.**
- Don't go too fast through a lesson or you will miss important information. *Remember! Math takes time and much practice, so don't give up.*

You will find a **Sample Lesson Assignment** in the **Resources** section of the course. Look at this sample before you begin Lesson One. Refer to it each time you begin a lesson until you are familiar with the format.

Technical Requirements

- Internet access – preferably high speed (for accessing Blackboard)
- Email
- Word processing software such as Microsoft Word
- Adobe Reader (download from Adobe.com)
- Audio and video capabilities (for watching/listening to course content)
- PDF app (free options available)

Technical Skill Requirements

Be comfortable with the following:

- using a word processor
- Internet search engines and browsers
- creating PDFs (see **Requirements for Creating PDFs** in the Syllabus section of your course)

Course Organization

This course consists of five lessons and a final examination. Each lesson contains the following:

- Introduction and Instructions
- Learning Objectives
- Learning Activities
- Assignments

Each lesson includes several activities that present content knowledge. Each lesson also includes multiple graded assignments to ensure that you learn the content that has been presented in the activities. Be sure you read all instructions carefully and ask your instructor for help if something is not clear.

For each lesson, you should read the Introduction and Lesson Objectives, which will explain the skills and concepts you'll learn from the lesson. Follow carefully the step-by-

step instructions in *How to Proceed* to complete your lesson. Test your skills with the **Q&A** that you will see periodically throughout the guide, and make sure you grasp the concept before reading any further. Answers are provided for each question. When you finish the **Lesson Summary** for a part of the lesson, do the **Practice Exercises**. These questions are *for your own use* and are designed to be a study guide. You should work these problems in your spiral notebook and check your own answers with the key in the back of your textbook. When you have finished the course, they will help you review for the final exam.

Course Outline

Please note that some assignments will be hidden from you when you start the course. As you move through the lessons and complete assignments, more will unlock for you.

Lesson	Topic	Approximate Time for Completion
Lesson 1	A Review of Algebra Fundamentals	Three weeks
Lesson 2	Fundamentals of Mathematical Modeling	Three weeks
Lesson 3	Applications of Algebraic Modeling	Three weeks
Lesson 4	Graphing	Three weeks
Lesson 5	Functions	Four weeks
Final Exam		

Assignment Schedule

Each of the following must be completed to complete the course. Items with an asterisk (*) indicate that these are summative assessments for the course.

Lesson	Weeks	Assignments
1	1-3	Checkpoint 1 (Non-graded) Lesson 1.1 Assignment Upload Lesson 1.2 Assignment Upload Lesson 1.3 Assignment Upload Lesson 1.4 Assignment Upload *Lesson 1 Exam (Review Chapter)
2	4-6	(There is no assignment for Lesson 2.1.) Lesson 2.2 Assignment Upload Lesson 2.3 Assignment Upload Lesson 2.4 Assignment Upload *Lesson 2 Exam (Chapter 1)

Lesson	Weeks	Assignments
3	7-9	Lesson 3.1 Assignment Upload Lesson 3.2 Assignment Upload Lesson 3.3 Assignment Upload Lesson 3.4 Assignment Upload Lesson 3.5 Assignment Upload Lesson 3.6 Assignment Upload *Lesson 3 Exam (Chapter 2) Checkpoint 2 (Non-graded)
4	10-12	Lesson 4.1 Assignment Upload Lesson 4.2 Assignment Upload Lesson 4.3 Assignment Upload Lesson 4.4 Assignment Upload Lesson 4.5 Assignment Upload
5	13-16	Lesson 5.1 Assignment Upload Lesson 5.2 Assignment Upload Lesson 5.3 Assignment Upload Lesson 5.4 Assignment Upload Lesson 5.5 Assignment Upload Lesson 5.6 Assignment Upload *Lesson 5 Exam (Chapter 4) Checkpoint 3 (Non-graded)
		Final Exam

Course Credit

The course grade will be calculated as follows:

- 50% coursework average;
- 50% summative assessment average, including the final exam;
- A passing course grade is 70 or higher.

Students must attempt all assignments in the course. The final exam will not be available until all assignments have been accepted and graded by the teacher.

Students who score below 70% on the final exam will be eligible for one re-exam opportunity.

Coursework

The graded assignments within each lesson are formative in nature. This means that they are designed to assist you in applying and demonstrating the lesson concepts, as

well as identifying areas in which you need additional review. You may use all the lesson's learning activities to assist you as you complete the graded assignments.

Summative Assessments

Summative assessments are those that allow you to demonstrate mastery of the course objectives. For summative assessments, you will NOT be allowed to use the learning materials. These are opportunities for you to show what you have learned by that point in the course. Summative assessments may be proctored using the online proctoring system Proctorio. Information about Proctorio is provided in **Remote Proctoring** in the Syllabus section of your course. The summative assessments for this course are as follows:

- **Summative Assessments (20% of Course Grade)**
 - Lesson 1 Exam (Review Chapter) (52 points)
 - Lesson 2 Exam (Chapter 1) (29 points)
 - Lesson 3 Exam (Chapter 2) (20 points)
 - Lesson 4 Exam (Chapter 3) (64 points)
 - Lesson 5 Exam (Chapter 4) (48 points)
- **Summative Final Exam (30% of Course Grade)**

Course Completion

- Students may not complete the course in less than 30 days.
- All courses expire six months after the enrollment date.

Academic Integrity

It is the aim of the faculty of Texas Tech University to foster a spirit of complete honesty and high standard of integrity. The attempt of students to present as their own any work not honestly performed is regarded by the faculty and administration as a most serious offense and renders the offenders liable to serious consequences, possibly suspension.

“Scholastic dishonesty” includes, but is not limited to, cheating, plagiarism, collusion, falsifying academic records, misrepresenting facts, and any act designed to give unfair academic advantage to the student (such as, but not limited to, submission of essentially the same written assignment for two courses without the prior permission of the instructor) or the attempt to commit such an act.

Student Expectations

You will be expected to log into the Blackboard course regularly to be aware of possible announcements/reminders and to pace your progress in the course.

Students are expected to maintain an online environment conducive to learning, which includes “netiquette” (Internet etiquette). Please review the basic rules for [Online](#)

[Discussion Netiquette](#). Ensure that your email messages, discussion board postings, and other electronic communications are thoughtful and respectful. Diverse opinions are welcome in this course, and you are expected to demonstrate an open mind and courtesy when responding to the thoughts and ideas of others.

The following are prohibited:

- making offensive remarks in email or the discussion board;
- using inappropriate language or discussing inappropriate topics online;
- spamming;
- hacking;
- using TTU or Blackboard email or discussion boards for commercial purposes;
- using all caps (considered shouting in online communications); and
- cyber-bullying or online harassment of any type.

Inappropriate behavior shall result in consequences ranging from a request to correct the problem, to removal from the course or even the university, depending on the severity of the behavior. Disciplinary actions will be taken according to the TTU K-12 Student Handbook.

Communication

- You can expect a reply from your instructor within 2 business days.
- Use the Blackboard Course Messages tool for sending messages to your instructor.

Submitting Assignments

You will submit all assignments through the Blackboard Assignment Tool, rather than by mail or email.

Technical Difficulties

Getting Help

For student assistance with Blackboard, visit [TTU K-12 Support](#).

Computer Problems

A working computer is necessary for online coursework. Computer problems will not be accepted as a valid reason for failure to complete course activities within the allotted time frame. Identify a second computer, before the course begins, that you can use if you experience computer problems.

Server Problems

When the Blackboard server needs to be taken down for maintenance, the Blackboard administrator will post an announcement in your course informing you of the time and

date. If the server experiences unforeseen problems, your course instructor will notify you.

Lost or Corrupted Files

You must keep/save a copy of every project/assignment on an external disk or personal computer. In the event of any kind of technology failure (e.g., Blackboard server crash or virus infection, students' own computer problems, loss of files in cyberspace, etc.) or any disputes, the instructor may request or require you to resubmit the files. In some instances, the instructor may need to open another attempt within Blackboard, so communication with your instructor is critical in these circumstances.