

# TTUISD - TEKS Tracker

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<b>TTUISD: Mathematical Models with Applications, Second Semester (MTHMOD 1B) v.3.0</b>						
<b>TEKS: §111.38 - Mathematics, High School</b>						
<b>Timmons, Daniel L., et al. <i>Mathematical Models with Applications</i>, 2nd ed. Cengage Learning. ISBN 978-1-305-09669-1</b>						
<b>TEKS Requirement (High School)</b>		<b>Sem. B</b>	<b>Lesson #</b>	<b>Textbook Chapter/Page #</b>	<b>Bloom's Taxonomy</b>	
TEKS: §111.43. Mathematical Models with Applications, Adopted 2012.						
<i>Source: The provisions of this §111.43 adopted to be effective September 10, 2012, 37 TexReg 7109.</i>						
(a) General requirements. Students can be awarded one-half to one credit for successful completion of this course. Prerequisite: Algebra I. This course must be taken before receiving credit for Algebra II.						
(b) Introduction.						
(1) The desire to achieve educational excellence is the driving force behind the Texas essential knowledge and skills for mathematics, guided by the college and career readiness standards. By embedding statistics, probability, and finance, while focusing on fluency and solid understanding, Texas will lead the way in mathematics education and prepare all Texas students for the challenges they will face in the 21st century.						
(2) The process standards describe ways in which students are expected to engage in the content. The placement of the process standards at the beginning of the knowledge and skills listed for each grade and course is intentional. The process standards weave the other knowledge and skills together so that students may be successful problem solvers and use mathematics efficiently and effectively in daily life. The process standards are integrated at every grade level and course. When possible, students will apply mathematics to problems arising in everyday life, society, and the workplace. Students will 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. Students will select appropriate tools such as real objects, manipulatives, paper and pencil, and technology and techniques such as mental math, estimation, and number sense to solve problems. Students will effectively communicate mathematical ideas, reasoning, and their implications using multiple representations such as symbols, diagrams, graphs, and language. Students will use mathematical relationships to generate solutions and make connections and predictions. Students will analyze mathematical relationships to connect and communicate mathematical ideas. Students will display, explain, or justify mathematical ideas and arguments using precise mathematical language in written or oral communication.						
(3) Mathematical Models with Applications is designed to build on the knowledge and skills for mathematics in Kindergarten-Grade 8 and Algebra I. This mathematics course provides a path for students to succeed in Algebra II and prepares them for various post-secondary choices. Students learn to apply mathematics through experiences in personal finance, science, engineering, fine arts, and social sciences. Students use algebraic, graphical, and geometric reasoning to recognize patterns and structure, model information, solve problems, and communicate solutions. Students will select from tools such as physical objects; manipulatives; technology, including graphing calculators, data collection devices, and computers; and paper and pencil and from methods such as algebraic techniques, geometric reasoning, patterns, and mental math to solve problems.						
(4) In Mathematical Models with Applications, students will use a mathematical modeling cycle to analyze problems, understand problems better, and improve decisions. A basic mathematical modeling cycle is summarized in this paragraph. The student will:						
(A) represent:						
(i) identify the variables in the problem and select those that represent essential features; and						
(ii) formulate a model by creating and selecting from representations such as geometric, graphical, tabular, algebraic, or statistical that describe the relationships between the variables;						
(B) compute: analyze and perform operations on the relationships between the variables to draw conclusions;						

TEKS Requirement (High School)		Sem. B	Lesson #	Textbook Chapter/Page #	Bloom's Taxonomy
(C) interpret: interpret the results of the mathematics in terms of the original problem;					
(D) revise: confirm the conclusions by comparing the conclusions with the problem and revising as necessary; and					
(E) report: report on the conclusions and the reasoning behind the conclusions.					
(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.					
(c) Knowledge and skills.					
(1) Mathematical process standards. The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to:					
(A) apply mathematics to problems arising in everyday life, society, and the workplace;			1,2,3,4,5	Ch 5-8	Apply
(B) 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;			1,2,3,4,5	Ch 5-8	Create
(C) 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;			1,2,3,4,5	Ch 5-8	Apply
(D) communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;			1,2,3,4,5	Ch 5-8	Create
(E) create and use representations to organize, record, and communicate mathematical ideas;			1,2,3,4,5	Ch 5-8	Create
(F) analyze mathematical relationships to connect and communicate mathematical ideas; and			1,2,3,4,5	Ch 5-8	Analyze
(G) display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication.			1,2,3,4,5	Ch 5-8	Evaluate
(2) Mathematical modeling in personal finance. The student uses mathematical processes with graphical and numerical techniques to study patterns and analyze data related to personal finance. The student is expected to:					
(A) use rates and linear functions to solve problems involving personal finance and budgeting, including compensations and deductions;			1,2,5	Sec 5-8 p 258-266; Sec 6-3 p 292-301	Apply
(B) solve problems involving personal taxes; and			1,5	Sec 5-1 p 212-217; Sec 5-7 p 252-258; Sec 5-8 p 258-26	Analyze
(C) analyze data to make decisions about banking, including options for online banking, checking accounts, overdraft protection, processing fees, and debit card/ATM fees.			1,5	Sec 5-2 p 218-226; Sec 5-3 p 226-232; Sec 5-4 p 233-239;	Analyze
(3) Mathematical modeling in personal finance. The student uses mathematical processes with algebraic formulas, graphs, and amortization modeling to solve problems involving credit. The student is expected to:					
(A) use formulas to generate tables to display series of payments for loan amortizations resulting from financed purchases;			1,5	Sec 5-4 p 233-239; Sec 5-5 p 239-245	Apply
(B) analyze personal credit options in retail purchasing and compare relative advantages and disadvantages of each option;			1,5	Sec 5-3 p 226-33-239; Sec 5-4 p 233-239; Sec 5-5 p 239-245	Analyze
(C) use technology to create amortization models to investigate home financing and compare buying a home to renting a home; and			1,5	Sec 5-5 p 239-245	Apply
(D) use technology to create amortization models to investigate automobile financing and compare buying a vehicle to leasing a vehicle			1,5	Sec 5-4 p 233-239	Create
(4) Mathematical modeling in personal finance. The student uses mathematical processes with algebraic formulas, numerical techniques, and graphs to solve problems related to financial planning. The student is expected to:					
(A) analyze and compare coverage options and rates in insurance;			1,5	Sec 5-6 p 246-251	Analyze

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(B) investigate and compare investment options, including stocks, bonds, annuities, certificates of deposit, and retirement plans; and			1,5	Sec 5-2 p 218-226; Sec 5-6 p 246-251;	Evaluate
(C) analyze types of savings options involving simple and compound interest and compare relative advantages of these options.			1,5	Sec 5-2 p 218-226; Sec 5-4 p 232-239	Analyze
(5) Mathematical modeling in science and engineering. The student applies mathematical processes with algebraic techniques to study patterns and analyze data as it applies to science. The student is expected to:					
(A) use proportionality and inverse variation to describe physical laws such as Hook's Law, Newton's Second Law of Motion, and Boyle's Law;					
(B) use exponential models available through technology to model growth and decay in areas including radioactive decay; and					
(C) use quadratic functions to model motion.					
(6) Mathematical modeling in science and engineering. The student applies mathematical processes with algebra and geometry to study patterns and analyze data as it applies to architecture and engineering. The student is expected to:					
(A) use similarity, geometric transformations, symmetry, and perspective drawings to describe mathematical patterns and structure in architecture;					
(B) 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;					
(C) use the Pythagorean Theorem and special right-triangle relationships to calculate distances; and					
(D) use trigonometric ratios to calculate distances and angle measures as applied to fields.					
(7) Mathematical modeling in fine arts. The student uses mathematical processes with algebra and geometry to study patterns and analyze data as it applies to fine arts. The student is expected to:					
(A) use trigonometric ratios and functions available through technology to model periodic behavior in art and music;					
(B) use similarity, geometric transformations, symmetry, and perspective drawings to describe mathematical patterns and structure in art and photography;					
(C) use geometric transformations, proportions, and periodic motion to describe mathematical patterns and structure in music; and					
(D) 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.					
(8) Mathematical modeling in social sciences. The student applies mathematical processes to determine the number of elements in a finite sample space and compute the probability of an event. The student is expected to:					
(A) determine the number of ways an event may occur using combinations, permutations, and the Fundamental Counting Principle;			3,5	Sec 7-4 p 330-334; Sec 7-8 p 348-355	Apply
(B) compare theoretical to empirical probability; and			3,5	Sec 7-3 p 324-330	Analyze
(C) use experiments to determine the reasonableness of a theoretical model such as binomial or geometric.			3,5	Sec 7-3 p 324-330	Apply
(9) Mathematical modeling in social sciences. The student applies mathematical processes and mathematical models to analyze data as it applies to social sciences. The student is expected to:					
(A) 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;			4,5	Sec 8-1 p 364-371; ec 8-2 p 372-380; Sec 8-4 p 385-391; Sec 8-6 p396-409; Sec 8-7 p 409-416	Evaluate
(B) 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;			4,5	Sec 8-4 p 385-391; Sec 8-5 p 391-396	Analyze

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(C) distinguish the purposes and differences among types of research, including surveys, experiments, and observational studies;			3,4,5	Sec 7-1 p 312-315; Sec 7-2 p 316-324; Sec 7-3 p 324-330; Sec 8-1 p 364-371; Sec 8-2 p 372-380; Sec 8-4 p 385-391	Evaluate
(D) use data from a sample to estimate population mean or population proportion;			3,5	Sec 7-2 p 316-324	Apply
(E) analyze marketing claims based on graphs and statistics from electronic and print media and justify the validity of stated or implied conclusions; and			4,5	Sec 8-2 p 372-380	Analyze
(F) use regression methods available through technology to model linear and exponential functions, interpret correlations, and make predictions.			4,5	Sec 8-7 p 409-416	Analyze
(10) Mathematical modeling in social sciences. The student applies mathematical processes to design a study and use graphical, numerical, and analytical techniques to communicate the results of the study. The student is expected to:					
(A) formulate a meaningful question, determine the data needed to answer the question, gather the appropriate data, analyze the data, and draw reasonable conclusions; and			4,5	Chap 8 p 364-426	Create
(B) 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 multi-media presentation.			4,5	Sec 8-1 p 364-371; Sec 8-2 p 372-380; Sec 8-3 p 380-385; Sec 8-4 p 385-391; Sec 8-5 p 391-396	Evaluate
Source: The provisions of this §111.43 adopted to be effective September 10, 2012, 37 TexReg 7109; amended to be effective August 24, 2015, 40 TexReg 5330.					