Texas Mathematics

Mathematical Models with Applications

Adopted 2012

Mathematical process standards

1. The student uses mathematical processes to acquire and demonstrate mathematical understanding MMA.9-12.1

(A) apply mathematics to problems arising in everyday life, society, and the workplace MMA.9-12.1.A

(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 MMA.9-12.1.B

(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 MMA.9-12.1.C

(D) communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate MMA.9-12.1.D

(E) create and use representations to organize, record, and communicate mathematical ideas MMA.9-12.1.E

(F) analyze mathematical relationships to connect and communicate mathematical ideas MMA.9-12.1.F

(G) display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication MMA.9-12.1.G

Mathematical modeling in personal finance

2. The student uses mathematical processes with graphical and numerical techniques to study patterns and analyze data related to personal finance MMA.9-12.2

(A) use rates and linear functions to solve problems involving personal finance and budgeting, including compensations and deductions MMA.9-12.2.A

(B) solve problems involving personal taxes MMA.9-12.2.B

(C) analyze data to make decisions about banking, including options for online banking, checking accounts, overdraft protection, processing fees, and debit card/ATM fees MMA.9-12.2.C

(3) The student uses mathematical processes with algebraic formulas, graphs, and amortization modeling to solve problems involving credit MMA.9-12.3

(A) use formulas to generate tables to display series of payments for loan amortizations resulting from financed purchases MMA.9-12.3.A

(B) analyze personal credit options in retail purchasing and compare relative advantages and disadvantages of each option MMA.9-12.3.B

(C) use technology to create amortization models to investigate home financing and compare buying a home to renting a home MMA.9-12.3.C

(D) use technology to create amortization models to investigate automobile financing and compare buying a vehicle to leasing a vehicle MMA.9-12.3.D

(4) The student uses mathematical processes with algebraic formulas, numerical techniques, and graphs to solve problems related to financial planning MMA.9-12.4

(A) analyze and compare coverage options and rates in insurance MMA.9-12.4.A

(B) investigate and compare investment options, including stocks, bonds, annuities, certificates of deposit, and retirement plans MMA.9-12.4.B

(C) analyze types of savings options involving simple and compound interest and compare relative advantages of these options MMA.9-12.4.C

Mathematical modeling in science and engineering

5. The student applies mathematical processes with algebraic techniques to study patterns and analyze data as it applies to science MMA.9-12.5

(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 MMA.9-12.5.A

(B) use exponential models available through technology to model growth and decay in areas, including radioactive decay MMA.9-12.5.B

(C) use quadratic functions to model motion MMA.9-12.5.C

(6) The student applies mathematical processes with algebra and geometry to study patterns and analyze data as it applies to architecture and engineering MMA.9-12.6

(A) use similarity, geometric transformations, symmetry, and perspective drawings to describe mathematical patterns and structure in architecture MMA.9-12.6.A

(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 MMA.9-12.6.B

(C) use the Pythagorean Theorem and special right-triangle relationships to calculate distances MMA.9-12.6.C

(D) use trigonometric ratios to calculate distances and angle measures as applied to fields MMA.9-12.6.D

Mathematical modeling in fine arts

7. The student uses mathematical processes with algebra and geometry to study patterns and analyze data as it applies to fine arts MMA.9-12.7

(A) use trigonometric ratios and functions available through technology to model periodic behavior in art and music MMA.9-12.7.A

(B) use similarity, geometric transformations, symmetry, and perspective drawings to describe mathematical patterns and structure in art and photography MMA.9-12.7.B

(C) use geometric transformations, proportions, and periodic motion to describe mathematical patterns and structure in music MMA.9-12.7.C

(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 MMA.9-12.7.D

Mathematical modeling in social sciences

8. The student applies mathematical processes to determine the number of elements in a finite sample space and compute the probability of an event MMA.9-12.8

(A) determine the number of ways an event may occur using combinations, permutations, and the Fundamental Counting Principle MMA.9-12.8.A

(B) compare theoretical to empirical probability MMA.9-12.8.B

(C) use experiments to determine the reasonableness of a theoretical model such as binomial or geometric MMA.9-12.8.C

(9) The student applies mathematical processes and mathematical models to analyze data as it applies to social sciences MMA.9-12.9

(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 MMA.9-12.9.A

(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 MMA.9-12.9.B

(C) distinguish the purposes and differences among types of research, including surveys, experiments, and observational studies MMA.9-12.9.C

(D) use data from a sample to estimate population mean or population proportion MMA.9-12.9.D

(E) analyze marketing claims based on graphs and statistics from electronic and print media and justify the validity of stated or implied conclusions MMA.9-12.9.E

(F) use regression methods available through technology to model linear and exponential functions, interpret correlations, and make predictions MMA.9-12.9.F

(10) The student applies mathematical processes to design a study and use graphical, numerical, and analytical techniques to communicate the results of the study MMA.9-12.10

(A) formulate a meaningful question, determine the data needed to answer the question, gather the appropriate data, analyze the data, and draw reasonable conclusions MMA.9-12.10.A

(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 MMA.9-12.10.B