Mathematics TEKS
SUPPORTING INFORMATION

Algebra I

Texas Education Agency

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TEKS	Supporting Information
(a) General requirements. Students shall be awarded one credit for successful completion of this course. This course is recommended for students in Grade 8 or 9. Prerequisite: Mathematics, Grade 8 or its equivalent.	The TEKS include descriptions of prerequisite coursework. Grade 8 mathematics or its equivalent is a required prerequisite.
(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.	A well-balanced mathematics curriculum includes the Texas College and Career Readiness Standards (CCRS). A focus on mathematical fluency and solid understanding allows for rich exploration of the key ideas of Algebra I.
(b) Introduction. (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.	This paragraph occurs second in the TEKS, preceding the content descriptions. This highlights the emphasis of student use of the mathematical process standards to acquire and demonstrate mathematical understanding. The concepts of generalization and abstraction in the text from A(1)(B) included in the introductory paragraphs from elementary TEKS may be considered subsumed in this language. Computer programs may be included under technology in the text from A(1)(C). This introductory paragraph states, “Students will use mathematical relationships to generate solutions and make connections and predictions,” instead of the text from A(1)(E).
(b) Introduction. (3) In Algebra I, students will build on the knowledge and skills for mathematics in Grades 6-8, which provide a foundation in linear relationships, number and operations, and proportionality. Students will study linear, quadratic, and exponential functions and their related transformations, equations, and associated solutions. Students will connect functions and their associated solutions in both mathematical and real-world situations. Students will use technology to collect and explore data and analyze statistical relationships. In addition, students will study polynomials of degree one and two, radical expressions, sequences, and laws of exponents. Students will generate and solve linear systems with two equations and two variables and will create new functions through transformations.	Specifics about Algebra I mathematics content is summarized in this paragraph. This summary follows the paragraph about the mathematical process standards. This supports the notion that the TEKS should be learned in a way that integrates the mathematical process standards in an effort to develop fluency. The paragraph also connects the key concepts found in Algebra I to prior content and the CCRS.
(b) Introduction. (4) 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.	The State Board of Education approved the retention of some “such as” statements within the TEKS for clarification of content. The phrases “including” and “such as” should not be considered as limiting factors for the student expectations (SEs) in which they reside.

Additional Resources are available online including

[Interactive Mathematics Glossary]

[Vertical Alignment Charts]

[Texas College and Career Readiness Standards]

TEKS: Mathematical Process Standards.	Supporting Information
A(1)(A) **Mathematical process standards.** The student uses mathematical processes to acquire and demonstrate mathematical understanding. **The student is expected to apply mathematics to problems arising in everyday life, society, and the workplace.**	This SE emphasizes application. The opportunities for application have been consolidated into three areas: everyday life, society, and the workplace. This SE, when paired with a content SE, allows for increased relevance through connections within and outside mathematics. *Example:* When paired with A(2)(H), students may be expected to develop a linear inequality given a real-world situation.
A(1)(B) **Mathematical process standards.** The student uses mathematical processes to acquire and demonstrate mathematical understanding. **The student is expected to 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.**	This process standard applies the same problem-solving model and is included in the TEKS for kindergarten through grade 12. This is the traditional problem-solving process used in mathematics and science. Students may be expected to use this process in a grade appropriate manner when solving problems that can be considered difficult relative to mathematical maturity.
A(1)(C) **Mathematical process standards.** The student uses mathematical processes to acquire and demonstrate mathematical understanding. **The student is expected to 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.**	The phrase "as appropriate" indicates that students are assessing which tools and techniques to apply rather than trying only one or all of those listed. *Example:* When paired with A(5)(C), the student may be expected to choose an appropriate tool and technique to solve a system of equations.
A(1)(D) **Mathematical process standards.** The student uses mathematical processes to acquire and demonstrate mathematical understanding. **The student is expected to communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate.**	Students may be expected to address three areas: mathematical ideas, reasoning, and implications of these ideas and reasoning. Communication can be through the use of symbols, diagrams, graphs, or language. The phrase "as appropriate" implies that students may be expected to assess which communication tool to apply rather than trying only one or all of those listed. The use of multiple representations includes translating and making connections among the representations. *Example:* When paired with A(7)(B), the student may be expected to communicate the relationship between linear factors of quadratic expressions and the zeros of their associated quadratic functions using symbols, graphs, and language as appropriate.
A(1)(E) **Mathematical process standards.** The student uses mathematical processes to acquire and demonstrate mathematical understanding. **The student is expected to create and use representations to organize, record, and communicate mathematical ideas.**	The expectation is that students use representations for three purposes: to organize, record, and communicate mathematical ideas. Representations include verbal, graphical, tabular, and algebraic representations. As students create and use representations, the students will evaluate the effectiveness of the representations to ensure that those representations are communicating mathematical ideas with clarity. *Example:* When paired with A(4)(C), students may be expected to create and use tables or graphs in order to organize data, determine an algebraic model that fits the data, and communicate the implications of the data and their model.
A(1)(F) **Mathematical process standards.** The student uses mathematical processes to acquire and demonstrate mathematical understanding. **The student is expected to analyze mathematical relationships to connect and communicate mathematical ideas.**	Students may be expected to analyze relationships and form connections with mathematical ideas. Students may form conjectures about mathematical representations based on patterns or sets of examples and non-examples. Forming connections with mathematical ideas extends past conjecturing to include verification through a deductive process. *Example:* When paired with A(12)(D), students may be expected to look for the mathematical relationship between the terms of a sequence to determine patterns that connect to mathematical ideas and algebraic generalizations.
A(1)(G) **Mathematical process standards.** The student uses mathematical processes to acquire and demonstrate mathematical understanding. **The student is expected to display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication.**	The expectation is that students speak and write with precise mathematical language to explain and justify the work. This includes justifying a solution. *Example:* When paired with A(7)(C), the students may be expected to explain the effects of the transformation on the intercepts.

TEKS: Linear Functions, Equations, and Inequalities.	Supporting Information
A(2)(A) **Linear functions, equations, and inequalities.** The student applies the mathematical process standards when using properties of linear functions to write and represent in multiple ways, with and without technology, linear equations, inequalities, and systems of equations. **The student is expected to determine the domain and range of a linear function in mathematical problems; determine reasonable domain and range values for real-world situations, both continuous and discrete; and represent domain and range using inequalities.**	Functions should be linear. Students may be expected to determine the domain and range for a line segment or ray, but piecewise functions are listed in Precalculus [P(2)(F) and (I)]. Functions can be represented as relations, graphs, or equations. Inequalities can be represented using words. Notation for domain and range is extended in Algebra II to include interval and set notation [2A(7)(I)]. When paired with A(1)(A), students may be expected to determine the domain and range of a linear function for a given real-world situation.
A(2)(B) **Linear functions, equations, and inequalities.** The student applies the mathematical process standards when using properties of linear functions to write and represent in multiple ways, with and without technology, linear equations, inequalities, and systems of equations. **The student is expected to write linear equations in two variables in various forms, including $y = mx + b$, $Ax + By = C$, and $y - y_1 = m(x - x_1)$, given one point and the slope and given two points.**	Specificity has been included regarding the forms of linear equations. When writing linear equations, students are expected to use the form which makes the most sense for the given information. Students may also be expected to be able to manipulate the results to the other forms. For example, when provided a point and the slope of the line, using the point-slope form of a line, $y - y_1 = m(x - x_1)$, may be more efficient. The slope of the line and a point on the line could be provided explicitly or implicitly. Traditionally, for the standard form of a line ($Ax + By = C$), A is an integer greater than or equal to 0. However, this is custom and not rule. The TEKS do not specify any limitations on the standard form. In some real-world applications, any of the constants may be irrational. For example, the equation of the circumference of a circle in standard form could be $\pi d - C = 0$. Providing both the x- and y-intercept is sufficient to write the equation of the line as the values needed to determine slope and a point on the line are implicit within the intercepts.
A(2)(C) **Linear functions, equations, and inequalities.** The student applies the mathematical process standards when using properties of linear functions to write and represent in multiple ways, with and without technology, linear equations, inequalities, and systems of equations. **The student is expected to write linear equations in two variables given a table of values, a graph, and a verbal description.**	The use of multiple representations for linear relationships begins in middle school [6(6)(C); 7(7)(A); 8(5)(A), (B), and (I)]. Students may be expected to use the representations listed in the mathematical process standards to acquire and demonstrate mathematical understanding [A(1)(D), (E), and (G)]. A verbal description may be a mathematical description. When paired with A(1)(A), the verbal description may be a description of a real-world context.
A(2)(D) **Linear functions, equations, and inequalities.** The student applies the mathematical process standards when using properties of linear functions to write and represent in multiple ways, with and without technology, linear equations, inequalities, and systems of equations. **The student is expected to write and solve equations involving direct variation.**	Students are expected to represent and solve problems involving proportional relationships including finding the constant of proportionality in grade 7 [7(4)(A), (B), (C), and (D)].
A(2)(E) **Linear functions, equations, and inequalities.** The student applies the mathematical process standards when using properties of linear functions to write and represent in multiple ways, with and without technology, linear equations, inequalities, and systems of equations. **The student is expected to write the equation of a line that contains a given point and is parallel to a given line.**	This SE includes the use of parallel relationships between the slopes as a means for determining the slope of a line. In previous grades, students were introduced to slope and the meaning of parallel separately. The relationship between the slopes of two lines that are parallel will be new. This SE builds upon G(2)(B), where students may be expected to verify geometric relationships, including parallel and perpendicular lines of geometric figures on a coordinate plane. This SE may include lines parallel to lines with a slope of zero or an undefined slope.

TEKS: Linear Functions, Equations, and Inequalities.	Supporting Information
A(2)(F) **Linear functions, equations, and inequalities.** The student applies the mathematical process standards when using properties of linear functions to write and represent in multiple ways, with and without technology, linear equations, inequalities, and systems of equations. **The student is expected to write the equation of a line that contains a given point and is perpendicular to a given line.**	This SE includes the use of perpendicular relationships between the slopes as a means for determining the slope of a line. In previous grades, students were introduced to slope and the meaning of perpendicular separately. The relationship between the slopes of two lines that are perpendicular will be new. This SE builds to G(2)(B), where students may be expected to verify geometric relationships, including parallel and perpendicular lines of geometric figures on a coordinate plane. This SE may include lines perpendicular to lines with a slope of zero or an undefined slope.
A(2)(G) **Linear functions, equations, and inequalities.** The student applies the mathematical process standards when using properties of linear functions to write and represent in multiple ways, with and without technology, linear equations, inequalities, and systems of equations. **The student is expected to write an equation of a line that is parallel or perpendicular to the X or Y axis and determine whether the slope of the line is zero or undefined.**	This SE includes the use of parallel and perpendicular relationships between the slopes as a means for determining the slope of a line. In previous grades, students were introduced to slope and the meaning of parallel and perpendicular separately. The relationship between the slopes of two lines that are parallel or perpendicular will be new. This SE builds to G(2)(B), where students may be expected to verify geometric relationships, including parallel and perpendicular lines of geometric figures on a coordinate plane. This SE explicitly includes lines other than the *x*- and *y*-axis that are parallel and perpendicular to lines with a slope of zero or an undefined slope.
A(2)(H) **Linear functions, equations, and inequalities.** The student applies the mathematical process standards when using properties of linear functions to write and represent in multiple ways, with and without technology, linear equations, inequalities, and systems of equations. **The student is expected to write linear inequalities in two variables given a table of values, a graph, and a verbal description.**	This SE emphasizes writing linear inequalities from multiple representations, which reinforces writing equations given specified representations [A(2)(C)]. This SE extends using one-variable inequalities to solve problems from grade 8 [8(8)(A) and (B)]. The use of multiple representations for linear relationships begins in middle school [6(6)(C); 7(7)(A); 8(5)(A), (B), and (I)]. Students may be expected to use the representations listed in the mathematical process standards to acquire and demonstrate mathematical understanding [A(1)(D), (E), and (G)]. A verbal description may be a mathematical description. When paired with A(1)(A), the verbal description may be a description of a real-world context. A table could consist of points which satisfy the boundary line, which may be a solid or dashed line, or that satisfy the inequality. To determine the inequality, students would also need points that do not satisfy the inequality. Otherwise, there is the potential for multiple correct inequalities that could represent the table.
A(2)(I) **Linear functions, equations, and inequalities.** The student applies the mathematical process standards when using properties of linear functions to write and represent in multiple ways, with and without technology, linear equations, inequalities, and systems of equations. **The student is expected to write systems of two linear equations given a table of values, a graph, and a verbal description.**	This SE emphasizes writing systems of linear equations from multiple representations, which reinforces writing equations given specified representations [A(2)(C)]. The use of multiple representations for linear relationships begins in middle school [6(6)(C); 7(7)(A); 8(5)(A), (B), and (I)]. Students may be expected to use the representations listed in the mathematical process standards to acquire and demonstrate mathematical understanding [A(1)(D), (E), and (G)]. A verbal description may be a mathematical description. When paired with A(1)(A), the verbal description may be a description of a real-world context. Writing systems of equations is extended to writing a system of inequalities with two variables and writing systems of equations with three variables in Algebra II.

TEKS: Linear Functions, Equations, and Inequalities.	Supporting Information
A(3)(A) **Linear functions, equations, and inequalities.** The student applies the mathematical process standards when using graphs of linear functions, key features, and related transformations to represent in multiple ways and solve, with and without technology, equations, inequalities, and systems of equations. **The student is expected to determine the slope of a line given a table of values, a graph, two points on the line, and an equation written in various forms, including $y = mx + b$, $Ax + By = C$, and $y - y_1 = m(x - x_1)$.**	Slope is introduced in grade 8 through the use of proportionality using similar triangles, making connections between slope and proportional relationships, and determining slope from tables and graphs in 8(4)(A), (B), and (C). Specificity is given through the identified forms of linear equations. Although specific forms are provided, students may be expected to manipulate any linear equation to identify key characteristics, such as slope and *y*-intercept.
A(3)(B) **Linear functions, equations, and inequalities.** The student applies the mathematical process standards when using graphs of linear functions, key features, and related transformations to represent in multiple ways and solve, with and without technology, equations, inequalities, and systems of equations. **The student is expected to calculate the rate of change of a linear function represented tabularly, graphically, or algebraically in context of mathematical and real-world problems.**	Slope is introduced in grade 8 through the use of proportionality using similar triangles, making connections between slope and proportional relationships, and determining slope from tables and graphs in 8(4)(A), (B), and (C). Students may be expected to demonstrate an understanding of rate of change and its connection to slope through multiple representations. The SE focuses on calculating the rate of change and interpreting the rate of change for a linear function. When paired with A(1)(A), students may be expected to interpret the meaning of the rate of change of linear functions. Piecewise linear graphs could be provided for students to calculate and compare the rate of change over specified intervals of the graph. Students are not expected to write functions to represent these piecewise linear graphs. Piecewise functions are listed in Precalculus [P(2)(F) and (I)].
A(3)(C) **Linear functions, equations, and inequalities.** The student applies the mathematical process standards when using graphs of linear functions, key features, and related transformations to represent in multiple ways and solve, with and without technology, equations, inequalities, and systems of equations. **The student is expected to graph linear functions on the coordinate plane and identify key features, including *x*-intercept, *y*-intercept, zeros, and slope, in mathematical and real-world problems.**	When paired with A(1)(D) and (E), students may be expected to graph linear functions from each of the multiple representations, including tables and algebraic representations, and to connect the key features to the multiple representations. When paired with A(1)(A) and (G), students may be expected to explain the meaning of attributes such as the slope or *y*-intercept in the context of the problem.
A(3)(D) **Linear functions, equations, and inequalities.** The student applies the mathematical process standards when using graphs of linear functions, key features, and related transformations to represent in multiple ways and solve, with and without technology, equations, inequalities, and systems of equations. **The student is expected to graph the solution set of linear inequalities in two variables on the coordinate plane.**	Students may be expected to determine the region of the graph that represents the solution to the inequality. Students may be expected to determine if the coordinates of a point satisfy the inequality.

TEKS: Linear Functions, Equations, and Inequalities.	Supporting Information
A(3)(E) **Linear functions, equations, and inequalities.** The student applies the mathematical process standards when using graphs of linear functions, key features, and related transformations to represent in multiple ways and solve, with and without technology, equations, inequalities, and systems of equations. **The student is expected to determine the effects on the graph of the parent function *f(x) = x* when *f(x)* is replaced by *af(x), f(x) + d, f(x - c), f(bx)* for specific values of *a*, *b*, *c,* and *d*.**	Students may be expected to determine changes in slope and *y*-intercept using a transformational approach and function notation. This transformational approach to graphing functions is introduced in Algebra I with linear and quadratic functions and extended to additional functions in Algebra II. The SE includes the effects of parameter changes on the parent function with horizontal transformations as $f(x - c)$ and $f(bx)$ for specific values of b and c. Recognizing the effects of the horizontal parameter changes of a linear function represented with function notation is new to Algebra I. Care should be given as vertical and horizontal transformations may yield the same function such as $2f(x) = f(2x)$ if $f(x) = x$. Students may be expected to apply combinations of transformation, such as $af(x) + d$, to the linear parent function. These combinations allow teachers to tie transformations of the parent function to other linear functions and their associated attributes. When paired with A(1)(A) and (D), students may be expected to examine the effects of parameter changes on graphs representing applied situations as well as the effects of parameter changes depicted through multiple representations.
A(3)(F) **Linear functions, equations, and inequalities.** The student applies the mathematical process standards when using graphs of linear functions, key features, and related transformations to represent in multiple ways and solve, with and without technology, equations, inequalities, and systems of equations. **The student is expected to graph systems of two linear equations in two variables on the coordinate plane and determine the solutions if they exist.**	This SE builds on the recognition of the point of intersection as a point which satisfies both of the graphed linear equations in grade 8 [8(9)].
A(3)(G) **Linear functions, equations, and inequalities.** The student applies the mathematical process standards when using graphs of linear functions, key features, and related transformations to represent in multiple ways and solve, with and without technology, equations, inequalities, and systems of equations. **The student is expected to estimate graphically the solutions to systems of two linear equations with two variables in real-world problems.**	Students may be expected to use the scales on the graph and estimate the solution. The coordinates of the solution may be rational numbers. Scales on the graphs may include rational numbers.
A(3)(H) **Linear functions, equations, and inequalities.** The student applies the mathematical process standards when using graphs of linear functions, key features, and related transformations to represent in multiple ways and solve, with and without technology, equations, inequalities, and systems of equations. **The student is expected to graph the solution set of systems of two linear inequalities in two variables on the coordinate plane.**	Students may be expected to determine the region of the graph that represents the solution to the system of inequalities. Students may also be expected to determine if the coordinates of a point satisfy the system of inequalities. The SE extends to formulating a system of inequalities for a given situation in Algebra II.

TEKS: Linear Functions, Equations, and Inequalities.	Supporting Information
A(4)(A) **Linear functions, equations, and inequalities.** The student applies the mathematical process standards to formulate statistical relationships and evaluate their reasonableness based on real-world data. **The student is expected to calculate, using technology, the correlation coefficient between two quantitative variables and interpret this quantity as a measure of the strength of the linear association.**	Students may be expected to calculate, using technology, and interpret the correlation coefficient as a measure of the strength of linear association. Students may be expected to use the language of positive, negative, and no correlation as they describe the strength of the linear association.
A(4)(B) **Linear functions, equations, and inequalities.** The student applies the mathematical process standards to formulate statistical relationships and evaluate their reasonableness based on real-world data. **The student is expected to compare and contrast association and causation in real-world problems.**	Students may be expected to compare and contrast associations within real-world situations. Two variables are said to have a causation relationship if the change in one variable arguably can cause a change in a second variable. Two variables are said to have an association if a change in one variable corresponds to a change in the other variable. This change may be caused by either variable (causation) or by a third "lurking" variable.
A(4)(C) **Linear functions, equations, and inequalities.** The student applies the mathematical process standards to formulate statistical relationships and evaluate their reasonableness based on real-world data. **The student is expected to write, with and without technology, linear functions that provide a reasonable fit to data to estimate solutions and make predictions for real-world problems.**	In grade 8, students begin constructing and interpreting scatterplots of bivariate data as linear, non-linear, and having no association [8(11)(A)]. When paired with A(1)(A) and (E), students may be expected to collect data in order to formulate lines of best fit. Writing linear functions with technology may include use of the calculator to perform linear regression among other techniques of finding the line of best fit. Writing equations that are a reasonable fit for data has been distributed among A(4)(C), A(8)(B), and A(9)(E). Specificity regarding the use of technology has been added. When paired with A(1)(C), students may be expected to write functions using algebraic methods and technology.

TEKS: Linear Functions, Equations, and Inequalities.	Supporting Information
A(5)(A) **Linear functions, equations, and inequalities.** The student applies the mathematical process standards to solve, with and without technology, linear equations and evaluate the reasonableness of their solutions. **The student is expected to solve linear equations in one variable, including those for which the application of the distributive property is necessary and for which variables are included on both sides.**	Students are expected to use the distributive property to generate equivalent expressions in grade 6 [6(7)(D)]. Students are expected to solve linear equations with variables on both sides of the equal sign in grade 8 [8(8)(C)].
A(5)(B) **Linear functions, equations, and inequalities.** The student applies the mathematical process standards to solve, with and without technology, linear equations and evaluate the reasonableness of their solutions. **The student is expected to solve linear inequalities in one variable, including those for which the application of the distributive property is necessary and for which variables are included on both sides.**	This SE does not specify the methods for solving inequalities. This SE builds on solving linear equations and inequalities from grades 6, 7, and 8 [6(10)(A) and (B); 7(11)(A), (B), and (C); 8(8)(C)]. When paired with A(1)(C) and (D), students may be expected to use manipulatives, concrete models, graphs, and properties of equality to solve linear equations and inequalities.
A(5)(C) **Linear functions, equations, and inequalities.** The student applies the mathematical process standards to solve, with and without technology, linear equations and evaluate the reasonableness of their solutions. **The student is expected to solve systems of two linear equations with two variables for mathematical and real-world problems.**	Methods of solution may include substitution, elimination, and graphing. This SE builds on solving linear equations from grades 6, 7, and 8 [6(10)(A) and (B); 7(11)(A), (B), and (C); 8(8)(C); and 8(9)]. When paired with A(1)(B), students may be expected to verify their solution. When paired with A(1)(C), students may be expected to use tools such as concrete models to solve the problems. When paired with A(1)(G), students may be expected to justify their solution.

TEKS: Quadratic Functions and Equations.	Supporting Information
A(6)(A) **Quadratic functions and equations.** The student applies the mathematical process standards when using properties of quadratic functions to write and represent in multiple ways, with and without technology, quadratic equations. **The student is expected to determine the domain and range of quadratic functions and represent the domain and range using inequalities.**	Specificity is provided with writing the domain and range as inequalities. These inequalities may be expressed verbally. Functions may be represented as relations, graphs, or equations. Functions should be quadratic. Students may be expected to find the domain and range of a piece of a quadratic function, but piecewise functions are listed in Precalculus [P(2)(F) and (I)]. When paired with A(1)(A), students may be expected to determine the domain and range of a quadratic function for a given real-world situation. Notation is extended to include interval notation and set notation in Algebra II [2A(7)(I)].
A(6)(B) **Quadratic functions and equations.** The student applies the mathematical process standards when using properties of quadratic functions to write and represent in multiple ways, with and without technology, quadratic equations. **The student is expected to write equations of quadratic functions given the vertex and another point on the graph, write the equation in vertex form ($f(x) = a(x - h)^2 + k$), and rewrite the equation from vertex form to standard form ($f(x) = ax^2 + bx + c$).**	This SE extends to rewriting from standard form to vertex form in Algebra II [2A(4)(D)].
A(6)(C) **Quadratic functions and equations.** The student applies the mathematical process standards when using properties of quadratic functions to write and represent in multiple ways, with and without technology, quadratic equations. **The student is expected to write quadratic functions when given real solutions and graphs of their related equations.**	This SE is closely related to A(7)(B). Both the real solutions and the graph are required to determine a unique quadratic function. The SE extends to writing quadratic functions from any three points in Algebra II [2A(4)(A)].

TEKS: Quadratic Functions and Equations.	Supporting Information
A(7)(A) **Quadratic functions and equations.** The student applies the mathematical process standards when using graphs of quadratic functions and their related transformations to represent in multiple ways and determine, with and without technology, the solutions to equations. **The student is expected to graph quadratic functions on the coordinate plane and use the graph to identify key attributes, if possible, including *x*-intercept, *y*-intercept, zeros, maximum value, minimum values, vertex, and the equation of the axis of symmetry.**	Specificity is provided by listing some of the attributes of a quadratic function. When paired with A(1)(E) and A(1)(F), students may be expected to analyze graphs of quadratic functions to draw conclusions. Students may be expected to graph a function other than the parent function, $f(x) = x^2$. Students could be given points or attributes to define a quadratic function and be asked to identify additional attributes of that quadratic function.
A(7)(B) **Quadratic functions, and equations.** The student applies the mathematical process standards when using graphs of quadratic functions and their related transformations to represent in multiple ways and determine, with and without technology, the solutions to equations. **The student is expected to describe the relationship between the linear factors of quadratic expressions and the zeros of their associated quadratic functions.**	Academic language includes "linear factors." This SE is closely related to A(6)(C). When paired with A(1)(D), (E), and (F), the students may be expected to use multiple representations to describe the connections between the linear factors and the zeros of the associated quadratic functions.
A(7)(C) **Quadratic functions, and equations.** The student applies the mathematical process standards when using graphs of quadratic functions and their related transformations to represent in multiple ways and determine, with and without technology, the solutions to equations. **The student is expected to determine the effects on the graph of the parent function $f(x) = x^2$ when $f(x)$ is replaced by $af(x)$, $f(x) + d$, $f(x - c)$, $f(bx)$ for specific values of *a*, *b*, *c*, and *d*.**	Students may be expected to determine changes of attributes including the *x*- and *y*-intercept(s) using a transformational approach and function notation. This transformational approach to graphing functions is introduced in Algebra I with linear and quadratic functions and extended to additional functions in Algebra II. The SE includes the effects of parameter changes on the parent function with horizontal transformations, $f(x – c)$ and $f(bx)$. Recognizing the effects of the horizontal parameter changes of a quadratic function represented with function notation is new to Algebra I. Students may be expected to apply combinations of transformation, such as $af(x) + d$, to the quadratic parent function. These combinations enable teachers to tie transformations to the vertex form of a quadratic function and its associated attributes. When paired with A(1)(A) and (D), students may be expected to examine the effect of parameter changes on graphs representing applied situations as well as the effects of parameter changes depicted through multiple representations.

TEKS: Quadratic Functions and Equations.	Supporting Information
A(8)(A) **Quadratic functions, and equations.** The student applies the mathematical process standards to solve, with and without technology, quadratic equations and evaluate the reasonableness of their solutions. The student formulates statistical relationships and evaluates their reasonableness based on real-world data. **The student is expected to solve quadratic equations having real solutions by factoring, taking square roots, completing the square, and applying the quadratic formula.**	Specificity is provided with the inclusion of algebraic methods used to solve quadratic equations. When paired with A(1)(C) and (D), students may be expected to solve quadratic equations using concrete models, tables, and graphs. This SE is extended in Algebra II to include imaginary solutions and quadratic inequalities [2A(4)(F)]. Students may be presented with a trinomial that cannot be factored over the real numbers. The solutions if any should be real numbers.
A(8)(B) **Quadratic functions and equations.** The student applies the mathematical process standards to solve, with and without technology, quadratic equations and evaluate the reasonableness of their solutions. The student formulates statistical relationships and evaluates their reasonableness based on real-world data. **The student is expected to write, using technology, quadratic functions that provide a reasonable fit to data to estimate solutions and make predictions for real-world problems.**	The students may be expected to use tools involving regression. This SE specifies using technology to write quadratic functions that provide a reasonable fit to data.

TEKS: Exponential Functions and Equations.	Supporting Information
A(9)(A) **Exponential functions, and equations.** The student applies the mathematical process standards when using properties of exponential functions and their related transformations to write, graph, and represent in multiple ways exponential equations and evaluate, with and without technology, the reasonableness of their solutions. The student formulates statistical relationships and evaluates their reasonableness based on real-world data. **The student is expected to determine the domain and range of exponential functions of the form $f(x) = ab^x$ and represent the domain and range using inequalities.**	Functions should be exponential. Students may be asked to determine the domain and range of a piece of an exponential function, but piecewise functions are listed in Precalculus [P(2)(F) and (I)]. Functions can be represented as relations, graphs, or equations. When paired with A(1)(A), students may be expected to determine the domain and range of an exponential function for a given situation. Inequalities can be represented using words. Notation for domain and range is extended in Algebra II to include interval and set notation [2A(7)(I)].
A(9)(B) **Exponential functions and equations.** The student applies the mathematical process standards when using properties of exponential functions and their related transformations to write, graph, and represent in multiple ways exponential equations and evaluate, with and without technology, the reasonableness of their solutions. The student formulates statistical relationships and evaluates their reasonableness based on real-world data. **The student is expected to interpret the meaning of the values of *a* and *b* in exponential functions of the form $f(x) = ab^x$ in real-world problems.**	Typically, *a* represents an initial value or amount, and *b* is the growth factor or factor of decay, but these constants are not restricted to these meanings. The growth rate or rate of decay can be found through calculation: • Growth rate is $b - 1$ • The rate of decay is $1 - b$ For example: If the growth rate is 5%, then the growth factor would be 1.05. Rates of continuous growth and decay are included in Algebra II and Precalculus.
A(9)(C) **Exponential functions and equations.** The student applies the mathematical process standards when using properties of exponential functions and their related transformations to write, graph, and represent in multiple ways exponential equations and evaluate, with and without technology, the reasonableness of their solutions. The student formulates statistical relationships and evaluates their reasonableness based on real-world data. **The student is expected to write exponential functions in the form $f(x) = ab^x$ (where *b* is a rational number) to describe problems arising from mathematical and real-world situations, including growth and decay.**	Specificity includes interpreting the meaning of the values of *a* and *b* as well as writing functions in the form $f(x) = ab^x$ (where *b* is a positive rational number).
A(9)(D) **Exponential functions, and equations.** The student applies the mathematical process standards when using properties of exponential functions and their related transformations to write, graph, and represent in multiple ways exponential equations and evaluate, with and without technology, the reasonableness of their solutions. The student formulates statistical relationships and evaluates their reasonableness based on real-world data. **The student is expected to graph exponential functions that model growth and decay and identify key features, including *y*-intercept and asymptote, in mathematical and real-world problems.**	Specificity is provided to graphical representations of exponential growth and decay to include key features such as the *y*-intercept and asymptote.
A(9)(E) **Exponential functions and equations**. The student applies the mathematical process standards when using properties of exponential functions and their related transformations to write, graph, and represent in multiple ways exponential equations and evaluate, with and without technology, the reasonableness of their solutions. The student formulates statistical relationships and evaluates their reasonableness based on real-world data. **The student is expected to write, using technology, exponential functions that provide a reasonable fit to data and make predictions for real-world problems.**	The students may be expected to use tools involving regression including the use of technology to write exponential functions that provide a reasonable fit to data. When paired with A(1)(C) and (D), students may be expected to solve exponential equations using concrete models and tables as problem-solving tools in an effort to make a prediction.

TEKS: Number and Algebraic Methods.	Supporting Information
A(10)(A) **Number and algebraic methods.** The student applies the mathematical process standards and algebraic methods to rewrite in equivalent forms and perform operations on polynomial expressions. **The student is expected to add and subtract polynomials of degree one and degree two.**	Specificity includes simplifying polynomial expressions by differentiating by operations into A(10)(A), (B), and (C). Addition and subtraction of polynomials are limited to polynomials of degree one and degree two. Higher order polynomials are included in 2A(7)(B).
A(10)(B) **Number and algebraic methods.** The student applies the mathematical process standards and algebraic methods to rewrite in equivalent forms and perform operations on polynomial expressions. **The student is expected to multiply polynomials of degree one and degree two.**	Specificity includes simplifying polynomial expressions by differentiating by operations into A(10)(A), (B), and (C). Multiplication of polynomials is limited to polynomials of degree one and degree two. This can include monomials, binomials, or trinomials. Higher order polynomials are included in 2A(7)(B). Multiplication may include raising a polynomial to a whole number exponent with the restrictions listed in this SE.
A(10)(C) **Number and algebraic methods.** The student applies the mathematical process standards and algebraic methods to rewrite in equivalent forms and perform operations on polynomial expressions. **The student is expected to determine the quotient of a polynomial of degree one and polynomial of degree two when divided by a polynomial of degree one and polynomial of degree two when the degree of the divisor does not exceed the degree of the dividend.**	Polynomial operations include division of polynomials limited to polynomials of degree one and degree two. Third and fourth degree polynomials are included in 2A(7)(C). The degree of the divisor may not exceed the degree of the dividend. Division may be via factoring or the use of the standard algorithm. Remainders may be represented as rational polynomials.
A(10)(D) **Number and algebraic methods.** The student applies the mathematical process standards and algebraic methods to rewrite in equivalent forms and perform operations on polynomial expressions. **The student is expected to rewrite polynomial expressions of degree one and degree two in equivalent forms using the distributive property.**	Specificity is provided describing application of the distributive property as a means of factoring. When paired with A(1)(A), students may be expected to factor in problem situations. This may include determining the greatest common factor of each term. The degrees of the polynomial expressions have been limited to one and two degrees.
A(10)(E) **Number and algebraic methods.** The student applies the mathematical process standards and algebraic methods to rewrite in equivalent forms and perform operations on polynomial expressions. **The student is expected to factor, if possible, trinomials with real factors in the form $ax^2 + bx + c$, including perfect square trinomials of degree two.**	Students may be presented with a trinomial that cannot be factored. Otherwise, factors should be real. Students may be expected to factor the greatest common factor from a polynomial, factor trinomials of the form $ax^2 + bx + c$ with real factors, and factor perfect square trinomials.
A(10)(F) **Number and algebraic methods.** The student applies the mathematical process standards and algebraic methods to rewrite in equivalent forms and perform operations on polynomial expressions. **The student is expected to decide if a binomial can be written as the difference of two squares and, if possible, use the structure of a difference of two squares to rewrite the binomial**.	Students may be presented with a binomial that cannot be factored. Otherwise, factors should be real. Specificity includes factored forms. Students may be expected to factor the greatest common factor from a polynomial and factor binomial representing the difference of two squares.

TEKS: Number and Algebraic Methods.	Supporting Information
A(11)(A) **Number and algebraic methods.** The student applies the mathematical process standards and algebraic methods to rewrite algebraic expressions into equivalent forms. **The student is expected to simplify numerical radical expressions involving square roots.**	This SE does not involve the use of operations outside of the radical other than scalar multiplication or division, such as $3\sqrt{24}$. This SE includes simplifying algebraic expressions involving radical functions in Algebra II.
A(11)(B) **Number and algebraic methods.** The student applies the mathematical process standards and algebraic methods to rewrite algebraic expressions into equivalent forms. **The student is expected to simplify numeric and algebraic expressions using the laws of exponents, including integral and rational exponents.**	Specificity regarding the types of exponents is provided. *Example:* $(x^{2/3})(x^{4/3}) = x^2$. When paired with A(1)(A), students may be expected to apply the laws of exponents to scientific notation in real-world situations. Variables can appear as either the base or the exponent, but in either case must be rational numbers. This SE extends to solving equations with rational exponents in Algebra II.

TEKS: Number and Algebraic Methods.	Supporting Information
A(12)(A) **Number and algebraic methods.** The student applies the mathematical process standards and algebraic methods to write, solve, analyze, and evaluate equations, relations, and functions. **The student is expected to decide whether relations represented verbally, tabularly, graphically, and symbolically define a function.**	When paired with A(1)(E), students may be expected to gather and record data before determining if the relationship is functional. Students may be expected to determine whether a functional relationship exists between quantities in a relation. Specificity regarding representations of the relations has been added. The concept of function depends upon the condition placed upon independent values and not notation. In other words, the "(x)" may be understood such as $y = mx + b$ could be used instead of $y(x) = mx + b$.
A(12)(B) **Number and algebraic methods.** The student applies the mathematical process standards and algebraic methods to write, solve, analyze, and evaluate equations, relations, and functions. **The student is expected to evaluate functions, expressed in function notation, given one or more elements in their domains.**	Algebra I is the students' first exposure to function notation. This SE includes the concept that the relation will be expressed in function notation with one or more elements of the domain provided.
A(12)(C) **Number and algebraic methods.** The student applies the mathematical process standards and algebraic methods to write, solve, analyze, and evaluate equations, relations, and functions. **The student is expected to identify terms of arithmetic and geometric sequences when the sequences are given in function form using recursive processes.**	This SE includes functional representations and a recursive process to identify terms of arithmetic and geometric sequences. The statements below are all naming the same sequence: $\left.\begin{array}{l} a_0 = 1;\ a_n = a_{n-1} + 4 \\ a_0 = 1;\ a_{n+1} = a_n + 4 \\ \\ f(0) = 1;\ f(n) = f(n-1) + 4 \\ f(0) = 1;\ f(n+1) = f(n) + 4 \end{array}\right\}$ Be aware of the various options. Initial values are required to insure uniqueness of the sequence.

TEKS: Number and Algebraic Methods.	Supporting Information
A(12)(D) **Number and algebraic methods.** The student applies the mathematical process standards and algebraic methods to write, solve, analyze, and evaluate equations, relations, and functions. **The student is expected to write a formula for the *n*th term of arithmetic and geometric sequences, given the value of several of their terms.**	Specificity is included to indicate writing "a formula for the *n*th term" of sequences. A minimum of four terms of a sequence should be provided from which to generalize a formula. When paired with A(1)(B) and (F), students may be expected to look for patterns within and between paired values. Students may but are not expected to use a template to determine the *n*th term of an arithmetic or geometric sequence. The initial value is required to insure the unigueness of the sequence.
A(12)(E) **Number and algebraic methods.** The student applies the mathematical process standards and algebraic methods to write, solve, analyze, and evaluate equations, relations, and functions. **The student is expected to solve mathematic and scientific formulas, and other literal equations, for a specified variable.**	Specificity includes solving mathematic and scientific formulas and literal equations. The students may be expected to solve these equations for any of the variables within the equation. Transforming equations is subsumed within "solving."