Algebra I Course Level Expectations

Algebra I Course Level Expectations (CLEs) were developed through the partnership of CSDE and the following organizations:

Associated Teachers of Mathematics in Connecticut (ATOMIC)
Connecticut Academy for Education in Mathematics, Science & Technology Inc.
Connecticut Council of Leaders of Mathematics (CCLM)
Mathematics Basic Skills Council of Connecticut (MBSCC)
Mathematical Association of Two-Year Colleges of Connecticut (MatyCONN)
Project to Increase Mastery of Mathematics and Science (PIMMS)

Algebra I CLEs were created to:

- Further delineate the 9-12 Core performance expectations in the 2005 Mathematics Curriculum Framework
- Build upon the progression of Grade Level Expectations (GLEs) in all four standards of the PK-8 Mathematics Curriculum Standards.
- Connect directly to the grade 8 GLEs, based on the premise that Algebra I is the next logical course content in the continuum of mathematics learning.
- Incorporate the major topics of Algebra recommended in the 2008 National Mathematics Advisory Panel report.

Algebra I CLEs are intended to:

- Establish clear and consistent competencies and standards for Algebra I in CT
- Provide guidance for the instructional focus of a formal Algebra I course
- Address content assessed on CAPT in the algebraic reasoning strand

Algebra I CLEs are not intended to:

- Outline the specific objectives of an isolated lesson plan

Algebra I CLEs form the basis for district curriculum development, and provide the foundation for the Algebra I Model Curriculum which is presently scheduled for field testing.

The Big Ideas About Algebra

1. The fundamental structure of algebra provides a systematic method for identifying, describing, extending, analyzing and generalizing patterns.

2. Algebra provides a way to use numbers, symbolic notation and arithmetic operations to model, transform, simplify and solve problems efficiently.

3. Information may be represented by physical models, diagrams, data tables, graphs and symbolic expressions. Algebra facilitates correlation among the different representations, which may give different insights into the solution of a problem.

4. Algebra provides ways to describe and classify relationships and functions and use the classifications to derive models that have practical real-world applications.

5. Algebra provides a way to explore and understand the effects of parameter changes on any function and its various representations.

6. Algebra is a process of conjecturing about the relationships among quantities and measures. It provides a way to describe correlations, summarize data sets, estimate and make predictions, including extrapolation and interpolation of data.

7. Algebra provides the underlying structure to make connections among all branches of mathematics, including measurement, geometry, calculus and statistics.

8. Innovations in technology allow users to explore and deepen their understanding of new and long-standing mathematical concepts and applications of algebra.

Algebraic Reasoning: Patterns and Functions Patterns and functional relationships can be represented and analyzed using a variety of strategies, tools and technologies.	
State Standard **Students should…**	**Course Level Expectations** **The student will…**
1.1 **Understand and describe patterns and functional relationships.**	1.1.1 Identify, describe and analyze patterns and functions (including arithmetic and geometric sequences) from real-world contexts using tables, graphs, words and symbolic rules. 1.1.2 Determine the *n*th term of a sequence with and without the use of technology. 1.1.3 Translate one representation of a pattern into another representation. 1.1.4 Write both a recursive rule and an explicit rule for a sequence. 1.1.5 Describe the independent and dependent variables and how they are related to the domain and range of a function that describes a real-world problem. 1.1.6 Recognize that linear functions, which can be written symbolically as $y = m x + b$, represent constant additive change; a unit increase in the independent variable (x) causes the value of the dependent variable (y) to change by m units; arithmetic sequences are linear functions. 1.1.7 Recognize that exponential functions represent constant multiplicative change, written symbolically as $y = a \cdot b^x$; a unit increase in the independent variable (x) causes the value of the dependent variable (y) to be multiplied by b; geometric sequences are exponential functions. 1.1.8 Compare and contrast linear and exponential growth. 1.1.9 Illustrate and compare functions using a variety of technologies (i.e., graphing calculators, spreadsheets and online resources). 1.1.10 Make and justify predictions based on patterns.
1.2 **Represent and analyze quantitative relationships in a variety of ways.**	1.2.1 Represent functions (including linear and nonlinear functions such as square, square root and piecewise functions) with tables, graphs, words and symbolic rules; translate one representation of a function into another representation. 1.2.2 Create graphs of functions representing real-world situations with appropriate axes and scales. 1.2.3 Explain how changes in the parameters m and b affect the graph of a linear function. 1.2.4 Recognize and explain the meaning and practical significance of the slope and the x- and y-intercepts as they relate to a context, graph, table or equation. 1.2.5 Determine a linear function from two nonvertical ordered pairs or from a single ordered pair and a rate of change. 1.2.6 Explain how changes in the parameters a and b affect the graph of an exponential function and validate the practical significance of the parameters in a real-world problem.
1.3 **Use operations, properties and algebraic symbols to determine equivalence and solve problems**.	1.3.1 Simplify expressions and solve equations and inequalities. 1.3.2 Use function notation, $y = f(x)$, to find y for a given x and to find x for a given y. 1.3.3 Model and solve problems with linear and exponential functions and linear inequalities. 1.3.4 Solve systems of linear equations that model real world situations using both graphical and algebraic methods. 1.3.5 Pose a hypothesis based upon an observed pattern and use mathematics to test predictions.
Numerical and Proportional Reasoning	

Quantitative relationships can be expressed numerically in multiple ways in order to make connections and simplify calculations using a variety of strategies, tools and technologies**.**	
State Standard **Students should…**	**Course Level Expectations** **The student will …**
2.1 **Understand that a variety of numerical representations can be used to describe quantitative relationships.**	2.1.1 Compare, locate, label and order real numbers including integers and rational numbers on number lines, scales and coordinate grids. 2.1.2 Select and use an appropriate form of number (integer, fraction, decimal, ratio, percent, exponent, irrational) to solve practical problems involving order, magnitude, measures, locations and scales. 2.1.3 Analyze and evaluate large amounts of numerical information using technological tools such as spreadsheets, probes, algebra systems and graphing utilities to organize.
2.2 **Use numbers and their properties to compute flexibly and fluently, and to reasonably estimate measures and quantities.**	2.2.1 Use algebraic properties, including associative, commutative and distributive, inverse and order of operations to compute with real numbers and simplify expressions. 2.2.2 Choose from among a variety of strategies to estimate solutions to problems and find values of formulas, functions and roots. 2.2.3 Judge the reasonableness of estimations, computations and predictions.

Geometry and Measurement

Shapes and structures can be analyzed, visualized, measured and transformed using a variety of strategies, tools and technologies.

State Standard **Students should…**	**Course Level Expectations** **The student will …**
3.1 **Use properties and characteristics of two- and three-dimensional shapes and geometric theorems to describe relationships, communicate ideas and solve problems.**	3.1.1 Make, test and describe conjectures involving properties of two- and three-dimensional figures using models.
3.2 **Use spatial reasoning, location and geometric relationships to solve problems.**	3.2.1 Interpret geometric relationships using equations and inequalities.
3.3 **Develop and apply units, systems, formulas and appropriate tools to estimate and measure.**	3.3.1 Select and use appropriate units, scales and degree of precision to measure length, angle measure, area and volume of geometric models. 3.3.2 Develop and apply formulas to solve measurement problems indirectly.

Working with Data: Probability and Statistics

Data can be analyzed to make informed decisions using a variety of strategies, tools and technologies.

State Standard Students should…	Course Level Expectations The student will …
4.1 **Collect, organize and display data using appropriate statistical and graphical methods.**	4.1.1 Collect real data and create meaningful graphical representations (e.g., scatter plots, line graphs) of the data with and without technology. 4.1.2 Determine the association between two variables (i.e., positive or negative, strong or weak) from tables and scatter plots of real data.
4.2 **Analyze data sets to form hypotheses and make predictions**	4.2.1 Analyze the relationship between two variables using trend lines and regression analysis. 4.2.2 Estimate an unknown value between data points on a graph or list (interpolation) and make predictions by extending the graph or list (extrapolation). 4.2.3 Explain the limitations of linear and nonlinear models and regression (e.g., causation v. correlation).
4.3 **Understand and apply basic concepts of probability.**	*The basic concepts of probability are included in the grade-level expectations in earlier grades. Applications of these concepts should be reviewed or integrated as needed.*