

# Connections to NCTM's *Principles and Standards for School Mathematics*

Strand	Grade Level	NCTM Standard	NCTM Expectations	Lesson, Problem, and Description
Algebra	6–8	Understand patterns, relations, and functions	<ul style="list-style-type: none"> <li>• Represent, analyze, and generalize a variety of patterns with tables, graphs, words, and, when possible, symbolic rules</li> <li>• Relate and compare different forms of representation for a relationship</li> <li>• Identify functions as linear or nonlinear and contrast their properties from tables, graphs, or equations</li> </ul>	<p><i>Lesson 1, Problems 1, 2, 5, 6; Lesson 2, Problems 1, 2, 3; Lesson 3, Problem 6:</i> Rate of change in a table and in symbolic rule <math>y = mx + b</math></p> <p><i>Lesson 2, Problems 2, 4; Lesson 3, Problems 1, 2, 3:</i> Rate of change in a linear graph and in symbolic rule <math>y = mx + b</math></p> <p><i>Lesson 3, Problem 5:</i> Using graph, formula, and table together in a situation</p>
		Represent and analyze mathematical situations and structures using algebraic symbols	<ul style="list-style-type: none"> <li>• Explore relationships between symbolic expressions and graphs of lines, paying particular attention to the meaning of <i>intercept</i> and <i>slope</i></li> <li>• Use symbolic algebra to represent situations and to solve problems, especially those that involve linear relationships</li> </ul>	<p><i>Lesson 5, Problems 1, 2, 3; Lesson 6, Problems 1, 2, 3, 5, 6, 7, 8, 9:</i> Slope in the real world and on linear graphs</p> <p><i>Lesson 7, Problems 1, 2:</i> Relating slope ratio and rate of change</p> <p><i>Lesson 4, Problems 1, 5, 6; Lesson 8, Problems 1, 2:</i> Using constant rate of change and <math>y = mx + b</math> to solve problems</p>

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Algebra	6–8		<ul style="list-style-type: none"> <li>Recognize and generate equivalent forms for simple algebraic expressions and solve linear equations</li> </ul>	<p><i>Lesson 1, Problems 3, 4, 7, 8; Lesson 3, Problem 9; Lesson 4, Problems 2, 3, 4: Solving linear equations with one variable</i></p> <p><i>Lesson 2, Problem 7; Lesson 7, Problem 1: Solving for a variable in a linear equation with two variables</i></p>
		Use mathematical models to represent and understand quantitative relationships	<ul style="list-style-type: none"> <li>Model and solve contextualized problems using various representations, such as graphs, tables, and equations</li> </ul>	<p><i>Lessons 1 through 10: Linear relations in concrete situations, including babies' weights, population growth, distance-rate-time, dieting, depreciation, graphing calculator displays, standardized tests, and slopes of roads, ramps, and roofs</i></p> <p><i>Lesson 3, Problem 7; Lessons 7 through 10: Linear relations in abstract situations, including link between slope on a graph and rate of change in a function, links among formula, graph, intercepts, and slope</i></p>
		Analyze change in various contexts	<ul style="list-style-type: none"> <li>Use graphs to analyze the nature of changes in quantities in linear relationships</li> </ul>	<p><i>Lesson 3, Problem 8: Interpreting graphs of distance and time</i></p> <p><i>Lesson 7, Problems 2, 5: Finding rate of change from graph</i></p>
Algebra	9–12	Understand patterns, relations, and functions	<ul style="list-style-type: none"> <li>Analyze functions of one variable by investigating rates of change, intercepts, zeros</li> <li>Interpret representations of functions of two variables</li> </ul>	<p><i>Lesson 1, Problems 1, 2, 5, 6; Lesson 2, Problems 1, 2, 3; Lesson 3, Problem 6: Rate of change in a table and in symbolic rule <math>y = mx + b</math></i></p> <p><i>Lesson 2, Problems 2, 4; Lesson 3, Problems 1, 2, 3: Rate of change in a linear graph and in symbolic rule <math>y = mx + b</math></i></p>

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Algebra	9–12			<p><i>Lesson 7, Problems 1, 2:</i> Relating slope ratio and rate of change</p> <p><i>Lesson 4, Problems 1, 5, 6; Lesson 8, Problems 1, 2:</i> Using constant rate of change and <math>y = mx + b</math> to solve problems</p>
		Represent and analyze mathematical situations and structures using algebraic symbols	<ul style="list-style-type: none"> <li>• Understand the meaning of equivalent forms of expressions, equations, inequalities, and relations</li> <li>• Write equivalent forms of equations, inequalities, and systems of equations and solve them with fluency—mentally or with paper and pencil in simple cases and using technology in all cases</li> <li>• Use symbolic algebra to represent and explain mathematical relationships</li> </ul>	<p><i>Lesson 2, Problem 7; Lesson 7, Problem 1:</i> Solving for a variable in a linear equation with two variables</p> <p><i>Lesson 1, Problems 3, 4, 7, 8; Lesson 3, Problem 9; Lesson 4, Problems 2, 3, 4:</i> Solving linear equations with one variable</p> <p><i>Lesson 2, Problem 7; Lesson 7, Problem 1:</i> Solving for a variable in a linear equation with two variables</p>
		Use mathematical models to represent and understand quantitative relationships	<ul style="list-style-type: none"> <li>• Identify essential quantitative relationships in a situation and determine the class or classes of functions that might model the relationships</li> <li>• Use symbolic expressions, including iterative and recursive forms, to represent relationships arising from various contexts</li> <li>• Draw reasonable conclusions about a situation being modeled</li> </ul>	<p><i>Lessons 1 through 10:</i> Recognizing constant rate of change as the invariant in linear relationships; representation of constant rate of change numerically, symbolically, and in graphs and situations</p>
		Analyze change in various contexts	<ul style="list-style-type: none"> <li>• Approximate and interpret rates of change from graphical and numerical data</li> </ul>	<p><i>Lesson 2, Problem 1, through Lesson 4:</i> Finding and using rate of population change from data</p>

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				<i>Lesson 3, Problems 1, 2, 8; Lesson 5, Problem 1: Finding and using rate of change from graphs</i>
Number and Operations	6–8	Understand numbers, ways of representing numbers, relationships among numbers, and number systems	<ul style="list-style-type: none"> <li>• Work flexibly with fractions, decimals, and percents to solve problems</li> </ul>	<i>Lessons 1 through 10: Contexts of problems include fractions (babies' weights, slopes), decimals (money, fluid measure), percents (mental math tips, sale prices), and wide range of whole numbers (population, weights)</i>
		Compute fluently and make reasonable estimates	<ul style="list-style-type: none"> <li>• Select appropriate methods and tools for computing with fractions and decimals from among mental computation, estimation, calculators or computers, and paper and pencil, depending on the situation, and apply the selected methods</li> <li>• Develop and analyze algorithms for computing with fractions, decimals, and integers and develop fluency in their use</li> <li>• Develop and use strategies to estimate the results of rational-number computations and judge the reasonableness of the results</li> </ul>	<i>Lessons 1 through 10: Mental math problems reinforce times tables and algorithms for mental computation and estimation</i>
Data Analysis and Probability	6–8	Develop and evaluate inferences and predictions that are based on data	<ul style="list-style-type: none"> <li>• Make conjectures about possible relationships between two characteristics of a sample on the basis of scatter plots of the data and approximate lines of fit</li> </ul>	<i>Lesson 2, Problems 1, 2, 4; Lesson 4, Problems 1, 3; Lesson 8, Problem 6: Given data, making a scatter plot finding the equation of a trend line, and using the equation to interpolate and/or extrapolate</i>

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Problem Solving	6–12	Problem solving	<ul style="list-style-type: none"> <li>• Build new mathematical knowledge through problem solving</li> <li>• Solve problems that arise in mathematics and in other contexts</li> <li>• Apply and adapt a variety of appropriate strategies to solve problems</li> <li>• Monitor and reflect on the process of mathematical problem solving</li> </ul>	<p><i>Lesson 3, Problems 4, 5; Lesson 5, Problem 4; Lesson 8, Problem 8:</i> Constant rate of change in a new context</p> <p><i>Lesson 3, Problem 8:</i> Using a graph to find distance travelled</p> <p><i>Lesson 5, Problem 3:</i> Figuring out a set of linear equations to make a linear design on a calculator screen</p>
Communication	6–12	Communication	<ul style="list-style-type: none"> <li>• Organize and consolidate their mathematical thinking through communication</li> <li>• Communicate their mathematical thinking coherently and clearly to peers, teachers, and others</li> <li>• Analyze and evaluate the mathematical thinking and strategies of others</li> <li>• Use the language of mathematics to express mathematical ideas precisely</li> </ul>	<p><i>Lessons 1 through 8:</i> Requiring students to work in a group and make presentations to the class, as described in Chapter 3, “Teaching Using Student Presentations,” supports the communication standard.</p> <p><i>Lessons 8 through 10:</i> Preparing a poster for others to critique</p>
Connections	6–12	Connections	<ul style="list-style-type: none"> <li>• Recognize and use connections among mathematical ideas</li> <li>• Understand how mathematical ideas interconnect and build on one another to produce a coherent whole</li> <li>• Recognize and apply mathematics in contexts outside of mathematics</li> </ul>	<p><i>Lessons 1 through 4:</i> Connections between pairs of representations</p> <p><i>Lessons 4 through 8:</i> Connections among multiple representations</p> <p><i>Lessons 1 through 10:</i> Connections with the real world are made by using problem situations familiar to the students.</p>

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Representation	6–12	Representation	<ul style="list-style-type: none"> <li>• Create and use representations to organize, record, and communicate mathematical ideas</li> <li>• Select, apply, and translate among mathematical representations to solve problems</li> <li>• Use representations to model and interpret physical, social, and mathematical phenomena</li> </ul>	<p><i>Lessons 1 through 10: Using multiple representations of linear relationships (table, graph, formula, situation) is the overall theme of all the Active Algebra lessons.</i></p>