

LESSON	OBJECTIVES	NCTM MATH STANDARDS: GRADES 6 - 8
Hands-On Equations(R) Learning System: Level I		NCTM Number and Operations Standard; Algebra; Problem Solving; Communication; Representation
Lesson 1	Students will use a symbol to represent an unknown.	Develop an initial conceptual understanding of different uses of variables.
	Students will demonstrate an understanding of the concepts of <i>equivalence</i> , <i>variable</i> , <i>constant</i> , <i>equation</i> , <i>equal to</i> (=), and <i>not equal to</i> (\neq).	Develop an initial conceptual understanding of different uses of variables.
	Students will use substitution and mental math to find and check solutions to physical or pictorial representations of algebraic equations in one variable.	Select and use various types of reasoning and methods of proof.
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Lesson 2	Students will demonstrate an understanding of the abstract representation of an algebraic equation in one variable.	Develop an initial conceptual understanding of different uses of variables.
	Students will model an abstract algebraic equation using concrete materials.	Create and use representations to organize, record, and communicate mathematical ideas.
		Relate and compare different forms of representation for a relationship.
		Create and use representations to organize, record, and communicate mathematical ideas.
	Students will use repeated addition to represent multiplication in an algebraic expression.	Select and use various types of reasoning and methods of proof.
		Create and use representations to organize, record, and communicate mathematical ideas.
	Students will demonstrate an understanding of the concepts of <i>equivalence</i> , <i>variable</i> , <i>constant</i> , <i>equation</i> , <i>equal to</i> (=), and <i>not equal to</i> (\neq).	Understand the meaning and effects of arithmetic operations with fractions, decimals, and integers.
		Develop an initial conceptual understanding of different uses of variables.
Students will use concrete models, guess-and-check, and number sense to solve one- and multi-step algebraic equations in one variable.	Apply and adapt a variety of appropriate strategies to solve problems.	
	Create and use representations to organize, record, and communicate mathematical ideas.	
	Select, apply, and translate among mathematical representations to solve problems.	
Students will use substitution and mental math to check solutions to algebraic equations in one variable.	Select and use various types of reasoning and methods of proof.	

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Lesson 3	Students will use concrete models to represent algebraic equations in one variable with unknowns on both sides of the equation.	<p>Relate and compare different forms of representation for a relationship.</p> <p>Create and use representations to organize, record, and communicate mathematical ideas.</p> <p>Select and use various types of reasoning and methods of proof.</p>
	Students will use kinesthetic motions (physical actions) to solve algebraic equations in one variable with unknowns on both sides of the equation.	<p>Apply and adapt a variety of appropriate strategies to solve problems.</p> <p>Select and use various types of reasoning and methods of proof.</p>
	Students will demonstrate an understanding of the concepts of <i>equivalence</i> , <i>variable</i> , <i>constant</i> , <i>equation</i> , <i>equal to</i> (=), and <i>not equal to</i> (\neq).	Develop an initial conceptual understanding of different uses of variables.
	Students will use repeated addition to represent multiplication in an algebraic expression.	<p>Relate and compare different forms of representation for a relationship.</p> <p>Understand the meaning and effects of arithmetic operations with fractions, decimals, and integers.</p>
	Students will use the Subtraction Property of Equality with variables to form equivalent statements when solving algebraic equations in one variable with unknowns on both sides of the equation.	<p>Recognize and generate equivalent forms for simple algebraic expressions and solve linear equations.</p> <p>Understand and use the inverse relationships of addition and subtraction, multiplication and division, and squaring and finding square roots to simplify computations and solve problems.</p> <p>Develop and evaluate mathematical arguments and proof.</p>
	Students will use substitution and mental math to check solutions to algebraic equations in one variable.	<p>Select and use various types of reasoning and methods of proof.</p> <p>Organize and consolidate their mathematical thinking through communication.</p> <p>Communicate their mathematical thinking coherently and clearly to peers, teachers, and others.</p> <p>Analyze and evaluate the mathematical thinking and strategies of others.</p> <p>Use the language of mathematics to express mathematical ideas precisely.</p>

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Lesson 4	Students will use concrete models to represent algebraic equations in one variable with unknowns on both sides of the equation.	<p>Relate and compare different forms of representation for a relationship.</p> <p>Create and use representations to organize, record, and communicate mathematical ideas.</p> <p>Select and use various types of reasoning and methods of proof.</p>	
	Students will use kinesthetic motions (physical actions) to solve algebraic equations in one variable with unknowns on both sides of the equation.	<p>Apply and adapt a variety of appropriate strategies to solve problems.</p> <p>Select and use various types of reasoning and methods of proof.</p>	
	Students will use the Subtraction Property of Equality with variables and with constants to form equivalent statements when solving algebraic equations in one variable.	<p>Understand the meaning and effects of arithmetic operations with fractions, decimals, and integers.</p> <p>Understand and use the inverse relationships of addition and subtraction, multiplication and division, and squaring and finding square roots to simplify computations and solve problems.</p> <p>Recognize and generate equivalent forms for simple algebraic expressions and solve linear equations.</p> <p>Develop and evaluate mathematical arguments and proofs.</p>	
	Students will use substitution and mental math to check solutions to algebraic equations in one variable.	<p>Select and use various types of reasoning and methods of proof.</p> <p>Organize and consolidate their mathematical thinking through communication.</p> <p>Communicate their mathematical thinking coherently and clearly to peers, teachers, and others.</p> <p>Analyze and evaluate the mathematical thinking and strategies of others.</p> <p>Use the language of mathematics to express mathematical ideas precisely.</p>	

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Lesson 5	Students will use concrete models and kinesthetic motions (physical actions) to represent and solve algebraic equations in one variable with unknowns on both sides of the equation.	<p>Apply and adapt a variety of appropriate strategies to solve problems.</p> <p>Relate and compare different forms of representation for a relationship.</p> <p>Select and use various types of reasoning and methods of proof.</p>
	Students will add and subtract monomials and combine like terms to form equivalent expressions when solving algebraic equations in one variable.	Recognize and generate equivalent forms for simple algebraic expressions and solve linear equations.
	Students will use Properties of Equality, such as the Subtraction Property of Equality, to form equivalent statements when solving algebraic equations in one variable with unknowns on both sides of the equation.	Understand the meaning and effects of arithmetic operations with fractions, decimals, and integers.
		Understand and use the inverse relationships of addition and subtraction, multiplication and division, and squaring and finding square roots to simplify computations and solve problems.
		Recognize and generate equivalent forms for simple algebraic expressions and solve linear equations.
	Develop and evaluate mathematical arguments and proof.	
	Students will use substitution and mental math to check solutions to algebraic equations in one variable.	Select and use various types of reasoning and methods of proof.
		Organize and consolidate their mathematical thinking through communication.
		Communicate their mathematical thinking coherently and clearly to peers, teachers, and others.
		Analyze and evaluate the mathematical thinking and strategies of others.
Use the language of mathematics to express mathematical ideas precisely.		

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Lesson 6	Students will use concrete models to represent the multiplication of a binomial by a positive integer constant, such as $2(x + 1)$.	<p>Create and use representations to organize, record, and communicate mathematical ideas.</p> <p>Relate and compare different forms of representation for a relationship.</p>	
	Students will use concrete models and kinesthetic motions (physical actions) to represent and solve algebraic equations in one variable with unknowns on both sides of the equation.	<p>Apply and adapt a variety of appropriate strategies to solve problems.</p> <p>Create and use representations to organize, record, and communicate mathematical ideas.</p> <p>Relate and compare different forms of representation for a relationship.</p> <p>Select, apply, and translate among mathematical representations to solve problems.</p> <p>Select and use various types of reasoning and methods of proof.</p>	
	Students will use algebraic properties, such as the Subtraction Property of Equality and the Distributive Property of Multiplication over Addition, to form equivalent statements and expressions when solving algebraic equations in one variable.	<p>Understand the meaning and effects of arithmetic operations with fractions, decimals, and integers.</p> <p>Use the associative and commutative properties of addition and multiplication and the distributive property of multiplication over addition to simplify computations with integers, fractions, and decimals.</p> <p>Understand and use the inverse relationships of addition and subtraction, multiplication and division, and squaring and finding square roots to simplify computations and solve problems.</p> <p>Recognize and generate equivalent forms for simple algebraic expressions and solve linear equations.</p> <p>Develop and evaluate mathematical arguments and proof.</p>	
	Students will use substitution and mental math to check solutions to algebraic equations in one variable.	<p>Select and use various types of reasoning and methods of proof.</p> <p>Organize and consolidate their mathematical thinking through communication.</p> <p>Communicate their mathematical thinking coherently and clearly to peers, teachers, and others.</p> <p>Analyze and evaluate the mathematical thinking and strategies of others.</p> <p>Use the language of mathematics to express mathematical ideas precisely.</p>	

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Lesson 7	Students will use pictorial models to represent abstract algebraic equations, including equations that contain multiplication of a binomial by a positive integer constant, such as $2(x + 1)$.	<p>Create and use representations to organize, record, and communicate mathematical ideas.</p> <p>Relate and compare different forms of representation for a relationship.</p>
	Students will use pictorial representations to solve algebraic equations in one variable with unknowns on both sides of the equation.	<p>Apply and adapt a variety of appropriate strategies to solve problems.</p> <p>Select, apply, and translate among mathematical representations to solve problems.</p> <p>Select and use various types of reasoning and methods of proof.</p>
	Students will use algebraic properties, such as the Subtraction Property of Equality and the Distributive Property of Multiplication over Addition, to form equivalent statements and expressions when solving algebraic equations in one variable.	<p>Understand the meaning and effects of arithmetic operations with fractions, decimals, and integers.</p> <p>Use the associative and commutative properties of addition and multiplication and the distributive property of multiplication over addition to simplify computations with integers, fractions, and decimals.</p> <p>Understand and use the inverse relationships of addition and subtraction, multiplication and division, and squaring and finding square roots to simplify computations and solve problems.</p> <p>Recognize and generate equivalent forms for simple algebraic expressions and solve linear equations.</p> <p>Develop and evaluate mathematical arguments and proof.</p>
	Students will use substitution and mental math to check solutions to algebraic equations in one variable.	<p>Select and use various types of reasoning and methods of proof.</p> <p>Organize and consolidate their mathematical thinking through communication.</p> <p>Communicate their mathematical thinking coherently and clearly to peers, teachers, and others.</p> <p>Analyze and evaluate the mathematical thinking and strategies of others.</p> <p>Use the language of mathematics to express mathematical ideas precisely.</p>

Hands-On Equations(R) Verbal Problems Book: Introduction & Level I		NCTM Algebra; Problem Solving; Communication; Representation
Level I Verbal Problems	Students will analyze verbal problems and determine what strategy is best for representing the problem using concrete models or pictorial symbols.	Apply and adapt a variety of appropriate strategies to solve problems.
		Use representations to model and interpret physical, social, and mathematical phenomena.
		Recognize reasoning and proof as fundamental aspects of mathematics.
		Organize and consolidate their mathematical thinking through communication.
	Students will use mathematical models (e.g., concrete, pictorial) to represent and solve application problems involving quantitative relationships with rational numbers.	Model and solve contextualized problems using various representations, such as graphs, tables, and equations.
		Solve problems that arise in mathematics and in other contexts.
		Relate and compare different forms of representation for a relationship.
		Create and use representations to organize, record, and communicate mathematical ideas.
		Select, apply, and translate among mathematical representations to solve problems.
		Apply and adapt a variety of appropriate strategies to solve problems.
	Students will write down the representation of the unknown elements of the verbal problem.	Develop an initial conceptual understanding of different uses of variables.
		Create and use representations to organize, record, and communicate mathematical ideas.
		Use representations to model and interpret physical, social, and mathematical phenomena.
Organize and consolidate their mathematical thinking through communication.		
Communicate their mathematical thinking coherently and clearly to peers, teachers, and others.		
Students will use multiple strategies (e.g., a 5-step problem solving process, breaking a problem into parts, and determining whether a problem has too much information or not enough information) to solve real-world application problems.	Apply and adapt a variety of appropriate strategies to solve problems.	

Level I Verbal Problems	Students will represent physically or pictorially given relations, such as Jim's age 10 years from now given his current age, the amount of rain that falls in three months given the amount it falls in one month, the distance travelled by a train in two hours given the distance it travels in one hour, or a number that is $\frac{2}{3}$ of another number.	Create and use representations to organize, record, and communicate mathematical ideas.
		Select, apply, and translate among mathematical representations to solve problems.
		Use representations to model and interpret physical, social, and mathematical phenomena.
		Relate and compare different forms of representation for a relationship.
		Model and solve contextualized problems using various representations, such as graphs, tables, and equations.
		Recognize reasoning and proof as fundamental aspects of mathematics.
		Select and use various types of reasoning and methods of proof.
	Students will represent and solve application problems including problems involving distance, money, age, and patterns of numbers (e.g., consecutive numbers, consecutive even numbers, and consecutive odd numbers).	Model and solve contextualized problems using various representations, such as graphs, tables, and equations.
		Solve problems that arise in mathematics and in other contexts.
		Recognize reasoning and proof as fundamental aspects of mathematics.
		Organize and consolidate their mathematical thinking through communication.
		Communicate their mathematical thinking coherently and clearly to peers, teachers, and others.
Students will provide the answer to verbal problems in full sentence format.	Use the language of mathematics to express mathematical ideas precisely.	
	Solve problems that arise in mathematics and in other contexts.	
	Organize and consolidate their mathematical thinking through communication.	
	Communicate their mathematical thinking coherently and clearly to peers, teachers, and others.	
	Use the language of mathematics to express mathematical ideas precisely.	

Level I Verbal Problems	Students will use substitution and mental math to check solutions to application problems involving algebraic equations in one variable.	Select and use various types of reasoning and methods of proof. Organize and consolidate their mathematical thinking through communication. Communicate their mathematical thinking coherently and clearly to peers, teachers, and others. Analyze and evaluate the mathematical thinking and strategies of others. Use the language of mathematics to express mathematical ideas precisely.
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