

# Unit 2 Linear Equations & Inequalities

5 Weeks

Connecticut Common Core  
Algebra I Curriculum

# Today's Presenters

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# Today's Agenda

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- ▶ **Unit 2 Overview (20 minutes)**
- ▶ **Unit 2 Workshops**
  - ▶ Websites and Applets (30 minutes)
  - ▶ Algebra Tiles and Flowcharts (30 minutes)
  - ▶ Break (10 minutes)
  - ▶ Table and Graphing Features of TI 83/84 Calculators (30 minutes)
  - ▶ Review Strategies (30 minutes)
- ▶ **Standards for Mathematical Practice (15 minutes)**
- ▶ **Reflection & Closing (15 minutes)**

# Unit Content

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- ▶ Investigation 1: Understanding Algebraic Expressions (2 days)
- ▶ Investigation 2: One-Step and Two-Step Linear Equations (4 days)
- ▶ Investigation 3: Combining Like Terms to Solve Equations (4 days)
- ▶ Mid-Unit Test (1 day)
- ▶ Investigation 4: Solving Equations Using the Distributive Property (4 days)
- ▶ Investigation 5: Formulas and Literal Equations (2 days)
- ▶ Investigation 6: Linear Inequalities (4 days)
- ▶ Performance Task: iPods (2 days)
- ▶ End-Unit Review and Test (2 days)

# What Students Need to Know

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- ▶ Difference between an expression and an equation
- ▶ Associative, commutative & distributive properties
- ▶ Steps to solve a linear equation
- ▶ Checking a solution
- ▶ Combining like terms
- ▶ Modeling a situation with a linear equation

# What Students Need to Be Able to Do

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- ▶ Simplify an expression by combining like terms
- ▶ Evaluate an expression according to the order of operations
- ▶ Solve multi-step linear equations
- ▶ Solve equations which require the use of the distributive property
- ▶ Solve equations involving fractions
- ▶ Solve a literal equation for a variable

# Investigation 1: Understanding Algebraic Expressions (2 days)

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- ▶ Students represent expressions using verbal descriptions and flowcharts. Students recognize that a algebraic expression involving a single variable term can be thought of as a sequence of operations on the variable term.



# Investigation 2: One-Step and Two-Step Linear Equations (4 days)

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- ▶ Students solve one-step and two-step linear equations, and construct and solve linear equations to explore real world problems.





# Investigation 3: Combining Like Terms to Solve Equations (4 days)

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- ▶ Students solve multi-step equations in a variety of real-life contexts. To solve the equations students must combine like terms on one side of an equation, and collecting variable terms on one side and collect constants on the other side. Students also solve equations that have no solution or an infinite number of solutions.

# Investigation 4: Solving Equations Using the Distributive Property (4 days)

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- ▶ Students write and solve multi-step linear equations using the distributive property in a number of different contexts. The investigation begins with an introduction to the distributive property and how it can be used in equation solving. Activities focus on solving equations containing fractions and solving multi-step equations in context, and reinforce student understanding of contradictions and identities.

# Investigation 5: Formulas and Literal Equations (2 days)

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- ▶ Students apply the principles of solving equations to literal equations in order to change the subject of an equation or formula.



# Investigation 6: Linear Inequalities

## (4 days)

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- ▶ **Students will write linear inequalities that model real world scenarios and solve multi-step linear inequalities.**



# Performance Task: iPods

## (2 days)

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- ▶ Students make consumer decisions about the purchase of iPods and downloads.
- ▶ The task requires students to model situations with linear equations and use the equations to solve problems.



# Essential Questions

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By the end of this unit, students will be able to answer the following essential questions:

- ▶ What is an equation?
- ▶ What is an expression?
- ▶ What does equality mean?
- ▶ What is an inequality?
- ▶ How can we use linear equations and linear inequalities to solve real world problems?
- ▶ What is a solution set for a linear equation or linear inequality?
- ▶ How can models and technology aid in the solving of linear equations and linear inequalities?

# Investigation Exploration

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- ▶ Participants will break into four groups. Each group will participate in the following four workshops: (30 minute rotation)
  - ▶ **Workshop 1:** Websites and Applets That Support the Unit.
  - ▶ **Workshop 2:** Algebra Tiles & Flowcharts
  - ▶ **Workshop 3:** Using the Table and Graphing Features of the TI-83/84 Family of Calculators
  - ▶ **Workshop 4:** Review Strategies – Stations & SpeedMathing

# Assessment Plan

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## Investigation 1: Understanding Algebraic Expressions

- ▶ **Exit Slip 2.1** requires students to represent algebraic expressions by verbal descriptions and flowcharts, and convert verbal descriptions to algebraic expressions.
- ▶ **Journal Entry** prompts students to describe what it means to evaluate an algebraic expression.



# Assessment Plan

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## Investigation 2: One-Step and Two-Step Linear Equations

- ▶ **Exit Slip 2.2** requires students to write a two-step linear equation that models a real world situation and to solve the equation.
- ▶ **Journal Entry 1** asks students to explain how we can solve two-step linear equations and why the approach works.
- ▶ **Journal Entry 2** asks students to explain which solution strategy (flowchart, algebra tiles, solving by undoing) they prefer to use to solve equations.

# Assessment Plan

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## Investigation 3: Combining Like Terms to Solve Equations

- ▶ **Exit Slip 2.3.1** asks students to model and solve a contextual problem with a linear equation and solve a multi-step equation.
- ▶ **Exit Slip 2.3.2** asks students to identify the steps which occurred in the process of solving an equation.
- ▶ **Journal Entry 1** asks students to identify how the commutative and associative properties allow us to solve a multi-step linear equation.
- ▶ **Journal Entry 2** asks students to explain how they can tell if an equation has no solution or an infinite number of solutions.

# Assessment Plan

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## Investigation 4: Solving Equations using the Distributive Property

- ▶ **Exit Slips 2.4.1 & 2.4.2** ask students to solve non-contextual equations using the distributive property.
- ▶ **Exit Slip 2.4.3** asks students to write an equation to model a situation and use the distributive property and combining like terms to solve the equation.
- ▶ **Journal Prompt** asks students to reflect on what they find difficult about solving multi-step equations and how they can overcome the difficulty.

# Assessment Plan

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## Investigation 5: Formulas and Literal Equations

- ▶ **Exit Slip 2.5** asks students to change the subject of a formula.
- ▶ **Journal Entry 1** has students explain what it means to solve for a particular variable.
- ▶ **Journal Entry 2** has students show that they understand the meaning of “literal equation”.

# Assessment Plan

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## Investigation 6: Linear Inequalities

- ▶ **Exit Slip 2.6.1** asks students solve multi-step linear inequalities.
- ▶ **Exit Slip 2.6.2** asks students to write a linear inequality to model a situation and then solve an inequality and interpret the solution.
- ▶ **Journal Entry** asks students to explain when and why they reverse an inequality symbol when solving an inequality.

# Common Core Content Standards (priority standards are in bold)

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- ▶ **8EE 7. Solve linear equations in one variable.**
  - ▶ a. Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form  $x = a$ ,  $a = a$ , or  $a = b$  results (where  $a$  and  $b$  are different numbers).
  - ▶ b. Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.
- ▶ **A-SSE 1. Interpret expressions that represent a quantity in terms of its context.**
  - ▶ **a. Interpret parts of an expression, such as terms, factors, and coefficients.**
  - ▶ b. Interpret complicated expressions by viewing one or more of their parts as a single entity...
- ▶ **A-SSE 3. (part) Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.**

# Common Core Content Standards (priority standards are in bold)

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- ▶ **A-CED 1. (part) Create equations and inequalities in one variable and use them to solve problems. *Include equations arising from linear ... functions***
- ▶ A-CED 4. Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. *For example, rearrange Ohm's law  $V = IR$  to highlight resistance  $R$ .*
- ▶ **A-REI 1. Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.**
- ▶ A-REI 3. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
- ▶ **N-Q 1** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas....
- ▶ **N-Q 2** Define appropriate quantities for the purpose of descriptive modeling.
- ▶ **N-Q 3** Choose a level of accuracy appropriate to limitations on measurements when reporting quantities.

# Common Core Standards for Mathematical Practice (bold standards to be emphasized)

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- ▶ *Mathematical Practices #1 and #3 describe a classroom environment that encourages thinking mathematically and are critical for quality teaching and learning. Practices in bold are to be emphasized in the unit.*
- 1. Make sense of problems and persevere in solving them.**
- 2. Reason abstractly and quantitatively
- 3. Construct viable arguments and critique the reasoning of others.
- 4. Model with mathematics.
- 5. Use appropriate tools strategically.
- 6. Attend to precision.**
- 7. Look for and make use of structure.**
- 8. Look for and express regularity in repeated reasoning.



# Closure & Summary

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- ▶ Reflective Questions Integrating the Standards for Mathematical Practice
  - ▶ Where are the standards for mathematical practice evidenced in the materials you have studied today?
- ▶ What do you think? Take 3 post-its
- ✓ On one draw 😊 and write a concept/idea/activity you really understood and look forward to
- ✓ On one draw 😐 and write a concept/idea/activity you still have a few questions about
- ✓ On the third draw ☹️ and write a concept/idea/activity you feel you don't even know where to start on