

# 03 Solving Equations

Content Area: **Mathematics**  
Course(s):  
Time Period: **Week1**  
Length: **5 Weeks**  
Status: **Published**

## **Stage 1: Desired Results**

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### **Unit Overview/ Rationale**

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Students use linear equations to represent, analyze and solve a variety of problems. Students strategically choose and efficiently implement procedures to solve linear equations in one variable, understanding that when they use the properties of equality and the concept of logical equivalence, they maintain the solutions of the original equation. Strategic competence in solving includes looking ahead for productive manipulations and anticipating the nature of the the solution.

### **Standards & Indicators**

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CommonCore: Mathematics, CommonCore: Grade 8, Mathematical Practice

The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.

- ☐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.

MA.7.7.EE.B.4a	Solve word problems leading to equations of the form $px + q = r$ and $p(x + q) = r$ , where $p$ , $q$ , and $r$ are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach.
MA.8.8.EE.C	Analyze and solve linear equations and pairs of simultaneous linear equations.
MA.8.8.EE.C.7	Solve linear equations in one variable.
MA.8.8.EE.C.7a	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).
MA.8.8.EE.C.7b	Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.
MA.8.8.F.A	Define, evaluate, and compare functions.
MA.7.7.EE.A.2	Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related.
MA.8.8.F.A.1	Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output.
MA.7.7.EE.B	Solve real-life and mathematical problems using numerical and algebraic expressions and equations.
MA.8.8.F.A.2	Compare properties (e.g. rate of change, intercepts, domain and range) of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).
MA.7.7.EE.B.3	Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.
MA.7.7.EE.B.4	Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.

### **Big Ideas - Students will understand that...**

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-Algebraic and numeric procedures are interconnected and build on one another to produce a coherent whole.

-Rules of arithmetic and algebra can be used together with (the concept of) equivalence to transform equations and inequalities so solutions can be found to solve problems.

### **Essential Questions - What provocative questions will foster inquiry and transfer of learning**

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- Why are number and algebraic patterns important as rules?
- How can numeric operations be extended to algebraic expressions?
- How are arithmetic operations related to functions?
- Why is it useful to represent real-life situations algebraically?
- What makes an algebraic algorithm both effective and efficient?

## **Content - Students will know...**

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Expressions and Equations:

- Addition and subtraction equations
- Multiplication and division equations
- Equations containing fractions
- Multi-step equations
- Solving by combining like terms
- Variables on both sides
- Solving with tables and graphs
- Equations with decimals
- Equations with no solution
- Equations with all real solutions
- Formulas
- Literal Equations
- Proportions
- Percent equations
- Writing and solving equations for real problems

Functions:

- Tables and graphs
- Identifying functions
- Evaluating functions
- Function notation

### **Skills - Students will be able to...**

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- Solve linear equations using addition and subtraction
- Solve linear equations using multiplication and division
- Solve linear equations with multiple steps
- Solve linear equations with variables on both sides
- Solve equations by using a table or graph
- Solve equations that contain decimals and fractions
- Solve equations that have no solution or all real solutions
- Solve formulas or literal equations for one of its variables
- Rewrite an equation in function form
- Use a function table to evaluate a function
- Use rates, ratios, and percents to model and solve real-life problems
- Solve proportions containing algebraic expressions
- Solve proportions for real life situations
- Write equations for real situations and solve them for a given variable

## Stage 2: Assessment Evidence

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### Assessment

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## Stage 3: Learning Plan

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### Learning Activities

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Activity:

solving equations involving one transformation:

Students will investigate solving equations with one transformation through the use of manipulatives. They will apply the use of inverse operations to isolate the variable in an equation.

Sample Assessment:

Teacher observations of student progress.

Sample item: solve  $5 = x + 12$

□

Activity:

solving equations involving one transformation:

Students will investigate solving equations with one transformation through the use of manipulatives. They will apply the use of inverse operations to isolate the variable in an equation.

Sample Assessment:

Teacher observations of student progress.

Sample item: solve  $10 = (2/3)m$

□

Activity:

Students will use manipulatives to solve equations with 2 or more transformations. They will apply inverse operations to isolate the variable. They will also use the distributive property, combining like terms, and multiplying the reciprocal in order to simplify and solve.

Assessment:

Sample item:  $5x + 3(x + 4) = 28$ .

□

Activity:

Students will use algebra tiles to model equations with variables on both sides. They will generalize methods for isolating the variable through inverse operations. Also, students will explore equations with many solutions or no solutions.

Assessment:

Sample assessment item:

$$6 - (-5r) = 5r - 3$$

□

Activity:

Students will explore solving equations by using the graphing calculators. They will use the table or graph to determine the solutions for the equations.

Assessment:

Teacher observations of student progress. Students report results to the class.

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Activity:

Classes will investigate methods to solve equations that contain values that are not whole numbers.☐ They may share their generalizations to the class and determine a method that works best for them.

Assessment:

Teacher observations of student progress.☐ Students report results to the class.

Solve:☐  $(1/3)a - 15 = (1/2)a + 9$

☐

Activity:

Groups of students will explore commonly used formulas and how to solve for one of the variables.☐ For example, they will determine the width of a garden if they have a known length and perimeter.☐ Class may determine a method to solve formulas for a given variable

Assessment:

Given a triangle with a base of 4 meters and an area of 120 square meters, solve for the height.

☐

Activity:

Groups of students will conduct a schoolwide survey.☐ They will display their results as a table and use percents and ratios to describe their data.☐ They may use unit rates to make predictions for larger populations.☐ They may also display their data☐as circle graph.


Assessment:

Teacher observation of student progress.☐ Students will present their findings to the class.

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## Resources

Prentice Hall Algebra 1

Chapter 2  - Solving Equations