Unit 2: Solve Linear Equations

Unit 2: Solve Linear Equations

Lesson 1: Writing and Solving Equations

Topic 1: Solving Equations

Learning Objectives

- Isolate variables using the Inverse Property or Inverse Operations.

Topic 2: Solving Multi-Step Equations

Learning Objectives

- Simplify algebraic equations using the Properties of Equality and the Distributive Property to clear parentheses and fractions.

Topic 3: Writing Expressions and Equations

Learning Objectives

- Translate word problems into algebraic expressions and equations.

Topic 4: Solving for a Specific Variable

Learning Objectives

- Rearrange formulas to isolate specific variables.

Lesson 2: Absolute Value Equations

Topic 1: Absolute Value

Learning Objectives

- Find the absolute value of numbers and expressions.
- Represent absolute values with numerical statements and on number lines.

Topic 2: Absolute Value Equations

Learning Objectives

- Find all possible solutions for absolute value equations involving variables and variable terms

Unit 2 - Media Run Times

Unit 2

Lesson 1

Topic 1, Presentation – 4 minutes

Topic 1, Worked Example 1 – 3 minutes

Topic 1, Worked Example 2 – 4.1 minutes

Topic 2, Presentation – 4.2 minutes

Topic 2, Worked Example 1 – 6 minutes

Topic 2, Worked Example 2 – 4.8 minutes

Topic 3, Presentation – 4.2 minutes

Topic 3, Worked Example 1 – 8 minutes

Topic 3, Worked Example 2 – 4.5 minutes

Topic 4, Presentation 1 – 2.7 minutes

Topic 4, Worked Example 1 – 6.9 minutes

Topic 4, Worked Example 2 – 2.6 minutes

Unit 2: Solve Linear Equations

Instructor Notes

The Mathematics of Writing and Solving Linear Equations

Most students taking algebra already know the techniques for solving simple equations. This unit explores the principles and properties they'll need to understand in order to handle multi-step equations. It covers the parts, simplification, rearrangement, and solution of linear equations.

Lesson 1 places particular emphasis on understanding the properties of equality and the distributive property. Students must be able to apply these concepts in order to succeed in this (or any) algebra course. This ability is a prerequisite for many of the later units of this course, such as:

- Unit 4: *Analyze and Graph Linear Equations, Functions, and Relations*
- Unit 5: *Analyze, Solve, and Graph Linear Inequalities*
- Unit 6: *Systems of Linear Equations and Inequalities*

In addition to solving given equations, students will also learn how to translate word problems into algebraic equations.

Lesson 2 introduces the concept of absolute value, and teaches students to solve equations that involve the absolute value of numbers and of variable expressions.

Teaching Tips: Algorithmic Challenges and Approaches

There are several aspects of writing and solving algebraic equations that challenge students. The first, and perhaps most common, is a 'language problem.' Many students are a little fuzzy about the meaning of mathematical symbols, so they have trouble using them correctly. For example, there is a common idea among students that the presence of an equals sign means “find the answer”. This works when answering a question like

If $x = -2$ then

$3(x + 8) = ?$

But not with a question such as

Which of the following equations is equivalent to $3(x + 8) = 4x + 2$

A $3x + 6 = 4x$

B $3x + 22 = 4x$

C $3x + 8 = 4x$

D $3x + 24 = 4x$

Misunderstanding the equals sign can also make it difficult for students to maintain the equality of an equation. When solving an equation such as $6 + 3x + 2 = 4x + 3$,

students realize that they need to subtract 2, but often do so from all of the constants rather than from each side of the equation. It may seem like the best cure for this is simply to insist they memorize some problem solving procedures, but a more valuable approach is to improve their understanding of the equals sign. Provide visual and/or hands on analogies like comparing the sides of an equation to the arms of a balance scale, and students will have a stronger feel for what balance and equality really mean.

Many students also have difficulty working with expressions in parentheses. When solving the equation $3(x+5)=24$, quite a few will fail to distribute 3 to both terms inside the parentheses and instead begin by subtracting 5 from both sides of the equation. Although they recognize mathematical symbols like = and ( ), a lot of algebra novices haven't fully internalized their meanings. For those who struggle with symbols, it is essential to provide experiences using manipulatives (both virtual and hands-on).

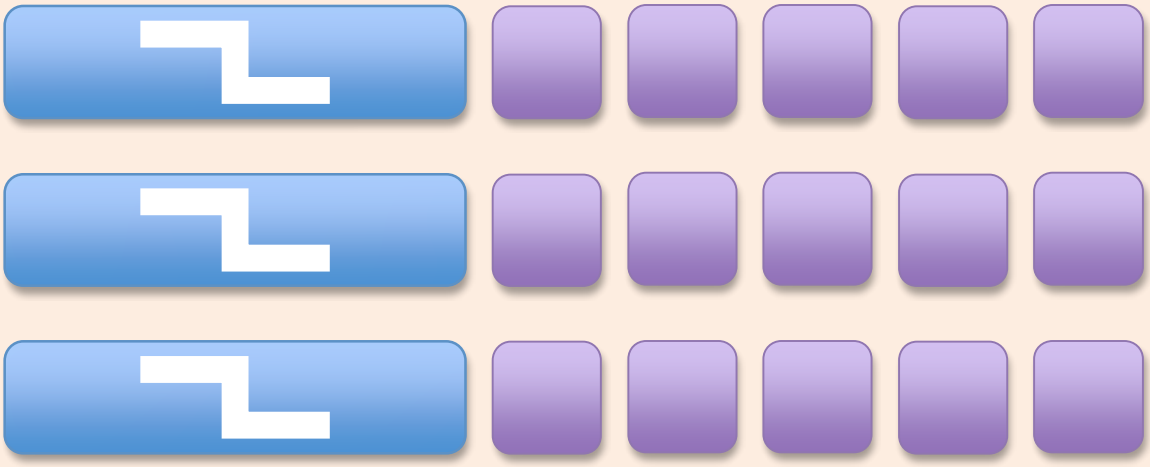
Example

Take our equation $3(x+5)=24$. Give students the chance to "build" it with actual objects or drawings, and things may start to make more sense. First, they should build the term inside the symbols, *x* + 5:

$$x+5$$

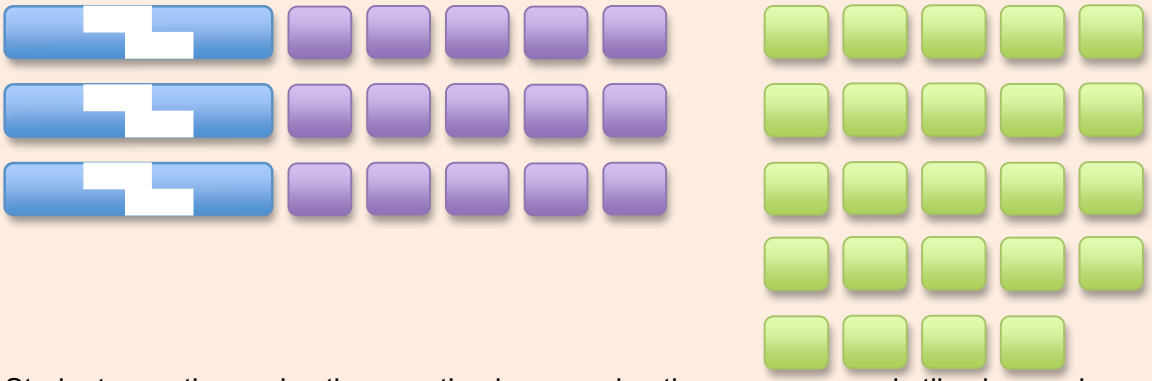
Then, repeat that by the term outside the symbol, 3:

$$3(x+5)$$



Finally, they add in the term on the other side of the equal sign, 24, to represent the entire equation:

$$3(x + 5) = 24$$



Students can then solve the equation by removing the square numeric tiles in equal numbers from both sides until they're left with $3x = 9$, or $x = 3$.

Note: It is very important to realize that using visual representations is NOT a substitute for learning the normal, symbolic manipulation methods of solving equations. These visual/tactile schemes are only scaffolds, which will later be removed, that help students develop a feel for the meaning and manipulation of algebraic symbols.

Hands-on Opportunities

There are no manipulatives used in the text of this unit. However, these websites include some hands-on programs that you may find useful:

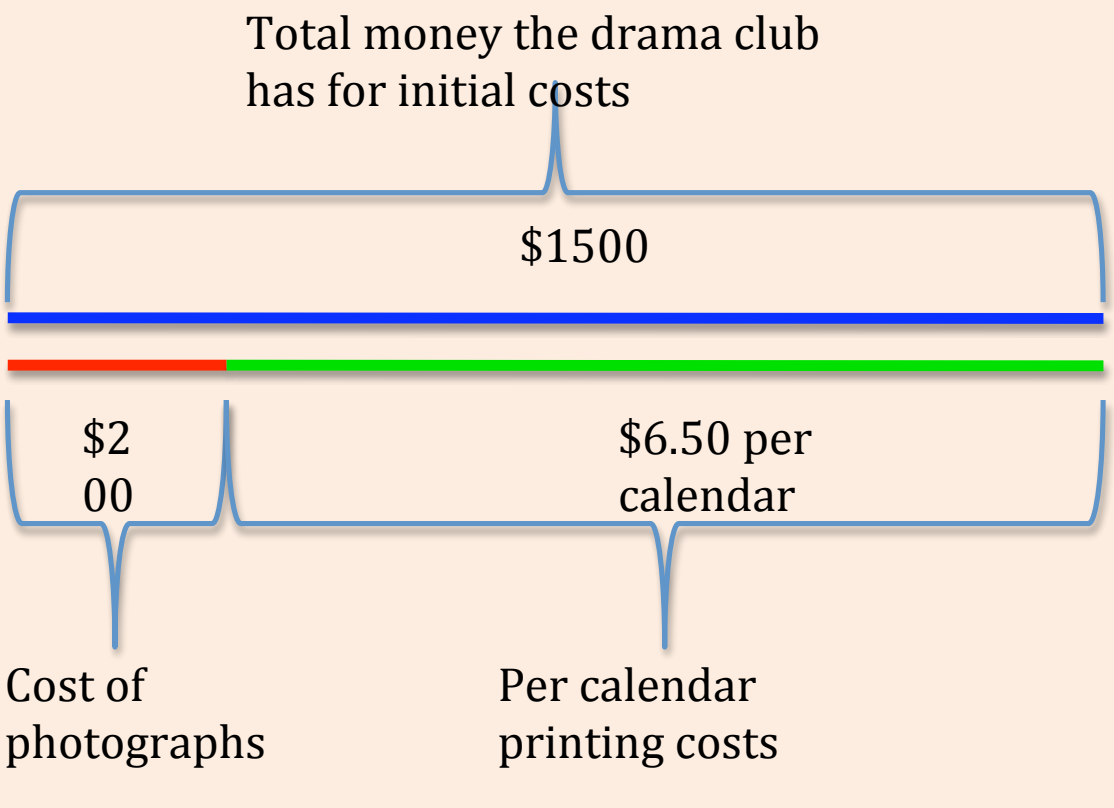
- Free balance scale applet: http://nlvm.usu.edu/en/nav/frames_asid_201_g_4_t_2.html?open=instructions
- Algebra tiles applet: http://nlvm.usu.edu/en/nav/frames_asid_189_g_4_t_2.html

Teaching Tips: Conceptual Challenges and Approaches

The main conceptual challenge in this unit is turning word problems into mathematical equations. Word problems are can be especially tricky for students who speak English as a second language, but many English only speakers are equally perplexed. The difficulty is compounded if students are uncomfortable using algebraic symbols, as discussed above.

The answer again lies in developing scaffolding techniques using pictorial representations of word problems. Instead of leaping directly from words to symbols, a visual stepping stone in between can ease the way.

Example
Let's take a problem from the text of Lesson 1 Topic 3:
The drama club at a high school is going to raise money by printing calendars that feature photos of scenes from its recent plays. The cost of printing the calendars is $5.50 per calendar. The photographer also charges a one-time cost of $200 for taking the photos. The club has $1500 to cover the initial costs of the calendar. How can we help them decide how many calendars they can order?
In the lesson, we pick out the knowns and unknowns and put them right into an equation. That technique makes perfect sense for some students. But for those who have difficulties translating the words into symbols, having them first represent the situation in a diagram similar to the one below may help.



Now that students can see the relationships between costs and cash on hand, it should be easier for them to turn the situation into an equation.

It is important that students develop their own diagrams, and don't just copy those provided by the teacher. Try dividing students into groups to work on the process, while you circulate and ask clarifying and advancing questions.
The pictorial representation is a critical scaffold to help students build a frame of reference for these types of problems. Once students have the ability to represent situations with similar diagrams, the step of moving from the diagram to an equation is relatively straightforward.

Note: The pictorial scaffolding technique does not in any way replace the symbolic mathematics that students will have to master in order to be successful in Algebra 1. It is a teaching mechanism, and students must be encouraged to leave it behind as they grow more comfortable writing equations.

Summary

The content of this unit is the foundation for the rest of the Algebra 1 course, so is vital that students learn the mechanics of solving equations. Just as important, students should be able to make sense of these operations and procedures because they understand the symbols and principles behind the work. Tactile and visual scaffolds can help convey these critical ideas.

Unit 2: Solve Linear Equations

Instructor Overview
Tutor Simulation: Building a Swimming Pool

Purpose

This simulation is designed to challenge students' ability to write and solve multi-step equations. In order to solve a real-world problem, they will have to:

- Use drawings or sketches to visualize a problem
- Recognize patterns
- Use tables to describe patterns and solutions
- Write an equation to model a real world situation
- Solve equations
- Modify an equation to solve for a different unknown
- Modify an equation to reflect a change in the model

Problem

Students are given the following problem:

> You have a summer job helping a neighbor build a swimming pool. Your first task is to lay the tile around the outside of the pool. You'll be paid by the number of tiles you install.
>
> Your challenge will be to calculate how many tiles you'll need, and how much money you could make depending on the size of your pool. Finally, you'll figure out how many tiles you'll need and how much money you'll make for tiling the walls and bottom of the pool.

Recommendations

Tutor simulations are designed to give students a chance to assess their understanding of unit material in a personal, risk-free situation. Before directing students to the simulation,

- make sure they have completed all other unit material.
- explain the mechanics of tutor simulations
    - Students will be given a problem and then guided through its solution by a video tutor;
    - After each answer is chosen, students should wait for tutor feedback before continuing;
    - After the simulation is completed, students will be given an assessment of their efforts. If areas of concern are found, the students should review unit materials or seek help from their instructor.
- emphasize that this is an exploration, not an exam.

Unit 2: Solve Linear Equations

Instructor Overview
Puzzle: Absolutely!

Objective

Absolutely! is a number game designed to reinforce the meaning of absolute value, the value of a number without regard to its sign. In order to solve the puzzles, students must take the absolute value of numbers and demonstrate that they understand tricky concepts such as the differences between a negative number, the absolute value of a negative number and the opposite of the absolute value of a negative number.

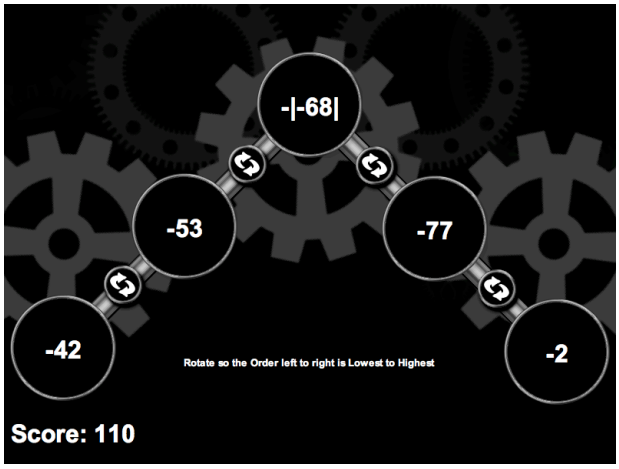


Figure 1. *Absolutely!* puts a sequence of numbers in a mechanical setting so the learner can properly order them by rotating the pairs.

Description

Each puzzle in the game consists of a short sequence of numbers. Numbers include positive and negative integers as well as numbers with negative signs within and without the absolute value symbol. Players earn points by correctly rearranging the numbers in each series in order of value from smallest to largest. They do this by clicking on a pivot point between numbers to move them up and down the sequence.

The game has 3 levels of difficulty, and each level has 10 puzzles. Level 1 puzzles have 3 numbers each, Level 2 puzzles have 4 numbers, and Level 3 puzzles contain 5 numbers per sequence. Every time a puzzle opens, the sequences are randomly generated, so the game can be played over and over without new problems each time.

Absolutely! can be shown and even played in class, as well as worked independently by individuals and small groups.

Unit 2: Solve Linear Equations

Instructor Overview
Project: Students Rule!

Student Instructions

Introduction
Student Councils play an important part in many schools across the country. The members are elected to office and are part of the democratic process within the school. Student council members raise money for school-wide activities, coordinate school social events and community projects, and work to share student ideas with school administration. Becoming involved in a student council is a great way to begin learning about the democratic process in action!

Task
Working together with your group, you will use algebra to help plan the best class party within the student council's budget. There are three major decisions that need to be made: food vendor, party rental, and DJ. Once you have made a decision on each item, your group will work to prepare a presentation for approval by the student council.

Instructions
Solve each problem in order. Save your work along the way, as you will create a professional presentation at the conclusion of the project.

1 First problem:

- There are two food vendors to consider. Event Solutions charges a one-time fee of $300 for table rentals and then $5 per person for food and drink. Parties Made Easy charges $8 per person for an all-inclusive event. The fee per person includes food and drink, as well as tables.

- If the student council has a budget of $2,000 for food and tables, how many people could attend if Event Solutions is used? How many people could attend if the student council chooses Parties Made Easy? Which vendor should be used? Justify your answer.

  Hint: (Use algebra to set up an equation for the total cost of using Event Solutions, based on the number of people, p. Then set up a second equation to represent the total cost of using Parties Made Easy, based on number of people, p.)

2 Second problem:

- The next item for consideration is choosing a party rental company. The student council has decided to rent an inflatable bungee race and obstacle course. You will use algebra to determine which party rental company is the better option. Acme Party Rental has offered a price of $200 per hour with a delivery fee of $250 and a set-up fee of $250. Rentals-R-Us has offered a price of $350 per hour with free delivery and a $100 set up fee.

- If the student council has a budget of $1500 for the party rentals, how many hours could the equipment be rented if Acme Party Rentals is chosen? How many hours could the equipment be rented if the student council chooses Rentals-R-Us? Which vendor should be used? Justify your answer.

  Hint: (Use algebra to set up an equation for the total cost of using Acme Party Rental, based on the number of hours, *h*. Then set up a second equation to represent the total cost of using Rentals-R-Us, based on number of hours, *h*.)

3 Third Problem:

- The final decision to be made for the party is selecting a DJ. Tunes, Inc. will provide a DJ for $125 per hour with a set-up fee of $325. Music Innovations has offered a price of $165 per hour with no set-up fee.

- If the student council has a budget of $825 for the DJ, how many hours could be afforded if Tunes, Inc. is chosen? How many hours could be afforded if they choose Rentals-R-Us? Which DJ should be used? Justify your answer.

  Hint: (Use algebra to set up an equation for the total cost of using Tunes, Inc., based on the number of hours, *h*. Then set up a second equation to represent the total cost of using Music Innovations, based on number of hours, *h*.)

4 Fourth problem:

- If your school has a student council, interview the members to discover what major projects are being worked on. What are the main budget-related decisions that need to be made? What are the variables involved? What needs to be addressed in order to find a solution? Could algebra help solve the problem? How?

- If your school does not have a student council, research the National Association of Student Councils' website for more information. Who would need to be contacted for approval in order to start a program?

  National Association of Student Councils: http://www.nasc.us/

Collaboration
Compare your algebraic equations and solutions with another group. Discuss any differences. Work together to ensure that both groups have the algebra set up and solved correctly. Then, share your research about your student council. Consider working together to write a letter to your school's student council sponsor about your project and research. If your school does not currently have a student council, consider writing a letter to inquire about starting a program.

Conclusions
In order to gain approval for the decisions about the party, all student council members would need to agree that the decisions make financial sense. Create a professional looking slide show presentation to bring before the student council to convince them that each decision is sound. For each of the problems, include the algebraic equation, step-by-step algebraic solution, and the final decision.

- Free Download for Microsoft Power Point: http://www.openoffice.us.com

- Google Docs: http://docs.google.com
  Google Docs will allow real-time collaboration on a document outside of school. The document can be shared between all group members.

Instructor Notes

Assignment Procedures

If possible, collect information from the student council sponsor about the budget, projects being considered, and a list of student council members. This information will allow the students to better develop their interview questions and will ensure that various student council members are interviewed. Consider assigning groups to interview specific members in order to get a broad variety of perspectives.

Recommendations:

- have students work in teams to encourage brainstorming and cooperative learning.
- assign a specific timeline for completion of the project that includes milestone dates.
- provide students feedback as they complete each milestone.
- ensure that each member of student groups has a specific job.

Technology Integration

This project provides abundant opportunities for technology integration, and gives students the chance to research and collaborate using online technology.

Students can neatly type their algebraic equations and solutions directly in Microsoft Power Point by choosing Object under the Insert menu. They can then work in Equation Editor to type the algebra neatly on each slide. It takes some practice to decipher the buttons on the Equation Editor menu. A quick mini-lesson on Equation Editor would allow the students to create a professional looking Power Point with integrated algebra.

The following are examples of free internet resources that can be used to support this project:

http://www.moodle.org
An Open Source Course Management System (CMS), also known as a Learning Management System (LMS) or a Virtual Learning Environment (VLE). Moodle has become very popular among educators around the world as a tool for creating online dynamic websites for their students.

http://www.wikispaces.com/site/for/teachers or http://pbworks.com/content/edu+overview
Lets you create a secure online Wiki workspace in about 60 seconds. Encourage classroom participation with interactive Wiki pages that students can view and edit from any computer. Share class resources and completed student work with parents.

http://www.docs.google.com
Allows a student to collaborate in real-time from any computer. Google Docs provides free access and storage for word processing, spreadsheets, presentations, and surveys. This is ideal for group projects.

http://why.openoffice.org/
The leading open-source office software suite for word processing, spreadsheets, presentations, graphics, databases and more. It can read and write files from other common office software packages like Microsoft Word or Excel and MacWorks. It can be downloaded and used completely free of charge for any purpose.

Rubric

Score	Content	Presentation
4	Your project appropriately answers each of the problems. Your algebraic equations are set up properly. The step-by-step solution to each equation is given. Your project correctly identifies which vendor is the better choice for the party and justifies the decision mathematically.	Your project contains information presented in a logical and interesting sequence that is easy to follow. Your project is professional looking with graphics and effective use of color.
3	Your project answers each of the problems. Your algebraic equations are set up and step-by-step solutions are given. Minor errors may be noted. Your project identifies which vendor is the better choice for the party and justifies the decision mathematically. Minor errors may be noted.	Your project contains information presented in a logical sequence that is easy to follow. Your project is neat with graphics and effective use of color.
2	Your project attempts to answer each of the problems. Algebraic equations are attempted and solutions are given. Major errors are noted. Your project attempts to identify which vendor is the better choice for the party and justifies the decision mathematically. Major errors are noted.	Your project is hard to follow because the material is presented in a manner that jumps around between unconnected topics. Your project contains low quality graphics and colors that do not add interest to the project.
1	Your project attempts to answer some of the problems. Some algebraic equations attempted and solutions are given; however, little to no work is shown. Major errors are noted. Your project attempts to identify which vendor is the better choice for the party but does not justify the decision mathematically. Major errors are noted.	Your project is difficult to understand because there is no sequence of information. Your project is missing graphics and uses little to no color.

Unit 2: Solve Linear Equations

Glossary

absolute value	the value of a number without regard to its sign
Additive Inverse Property	states that every real number added to its additive inverse (or opposite) will equal zero: For all real numbers a, $a + (-a) = 0$; also called Inverse Property of Addition
coefficient	a number that multiplies a variable
common denominator	a number that is a multiple of all of the denominators in a group of fractions
Distributive Property	states that the product of a number and a sum equals the sum of the individual products of the number and the addends: for all real numbers a, b, and c, $a(b + c) = ab + ac$
equation	a statement that describes the equality of two expressions by connecting them with an equals sign
formula	a type of equation—usually reserved for multi-variable equations that describe a well-known or often repeated calculation
Inverse Operations	operations that undo or cancel one another, such as addition/subtraction and multiplication/division
multi-step equation	an equation that requires more than one step to solve
Multiplicative Inverse Property	states that any number multiplied by 1 over that number equals 1: For all real numbers, $a \cdot \frac{1}{a} = 1$; also called Inverse Property of Multiplication
numeric constant	a quantity that has a known, fixed value
operation	a mathematical procedure, such as addition, subtraction, multiplication, and division
Property of Equality	states that the equality of an equation is maintained when both sides have the same value added, subtracted, multiplied, or divided
variable	a symbol that represents an unknown value

NROC Algebra 1--An Open Course
Unit 2
Mapped to Common Core State Standards, Mathematics

Algebra 1 | Solve Linear Equations | Writing and Solving Equations | Solving Equations

Grade: **7** - Adopted **2010**

STRAND / DOMAIN	**CC.7.EE.**	Expressions and Equations
CATEGORY / CLUSTER		Solve real-life and mathematical problems using numerical and algebraic expressions and equations.
STANDARD	**7.EE.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.
EXPECTATION	**7.EE.4.a.**	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. For example, the perimeter of a rectangle is 54 cm. Its length is 6 cm. What is its width?

Grade: **8** - Adopted **2010**

STRAND / DOMAIN	**CC.8.EE.**	Expressions and Equations
CATEGORY / CLUSTER		Analyze and solve linear equations and pairs of simultaneous linear equations.
STANDARD	**8.EE.7.**	Solve linear equations in one variable.
EXPECTATION	**8.EE.7.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).
EXPECTATION	**8.EE.7.b.**	Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.

Grade: 9-12 - Adopted 2010

STRAND / DOMAIN	**CC.A.**	Algebra
CATEGORY / CLUSTER	**A-REI.**	Reasoning with Equations and Inequalities
STANDARD		Understand solving equations as a process of reasoning and explain the reasoning.

EXPECTATION	**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.
STRAND / DOMAIN	**CC.A.**	Algebra
CATEGORY / CLUSTER	**A-REI.**	Reasoning with Equations and Inequalities
STANDARD		Solve equations and inequalities in one variable.
EXPECTATION	**A-REI.3.**	Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
STRAND / DOMAIN	**CC.F.**	Functions
CATEGORY / CLUSTER	**F-BF.**	Building Functions
STANDARD		Build new functions from existing functions.
EXPECTATION	**F-BF.4.**	Find inverse functions.
GRADE EXPECTATION	**F-BF.4.a.**	Solve an equation of the form f(x) = c for a simple function f that has an inverse and write an expression for the inverse. For example, f(x) =2 x^3 for x > 0 or f(x) = (x+1)/(x-1) for x not equal to 1.

Algebra 1 | Solve Linear Equations | Writing and Solving Equations | Solving Multi-Step Equations

Grade: **7** - Adopted **2010**

STRAND / DOMAIN	**CC.7.EE.**	Expressions and Equations
CATEGORY / CLUSTER		Solve real-life and mathematical problems using numerical and algebraic expressions and equations.
STANDARD	**7.EE.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.
EXPECTATION	**7.EE.4.a.**	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. For example, the perimeter of a rectangle is 54 cm. Its length is 6 cm. What is its width?

Grade: **8** - Adopted **2010**

STRAND / DOMAIN	**CC.8.EE.**	Expressions and Equations
CATEGORY / CLUSTER		Analyze and solve linear equations and pairs of simultaneous linear equations.
STANDARD	**8.EE.7.**	Solve linear equations in one variable.

EXPECTATION	**8.EE.7.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).
EXPECTATION	**8.EE.7.b.**	Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.

Grade: 9-12 - Adopted 2010

STRAND / DOMAIN	**CC.A.**	Algebra
CATEGORY / CLUSTER	**A-REI.**	Reasoning with Equations and Inequalities
STANDARD		Understand solving equations as a process of reasoning and explain the reasoning.
EXPECTATION	**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.
STRAND / DOMAIN	**CC.A.**	Algebra
CATEGORY / CLUSTER	**A-REI.**	Reasoning with Equations and Inequalities
STANDARD		Solve equations and inequalities in one variable.
EXPECTATION	**A-REI.3.**	Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
STRAND / DOMAIN	**CC.F.**	Functions
CATEGORY / CLUSTER	**F-BF.**	Building Functions
STANDARD		Build new functions from existing functions.
EXPECTATION	**F-BF.4.**	Find inverse functions.
GRADE EXPECTATION	**F-BF.4.a.**	Solve an equation of the form f(x) = c for a simple function f that has an inverse and write an expression for the inverse. For example, f(x) =2 x^3 for x > 0 or f(x) = (x+1)/(x-1) for x not equal to 1.

Algebra 1 | Solve Linear Equations | Writing and Solving Equations | Writing Expressions and Equations

Grade: **7** - Adopted **2010**

STRAND / DOMAIN	**CC.7.MP.**	Mathematical Practices
CATEGORY / CLUSTER	**7.MP.4.**	Model with mathematics.

Grade: **8** - Adopted **2010**

STRAND / DOMAIN	**CC.8.MP.**	Mathematical Practices
CATEGORY / CLUSTER	**8.MP.4.**	Model with mathematics.
STRAND / DOMAIN	**CC.8.EE.**	Expressions and Equations
CATEGORY / CLUSTER		Understand the connections between proportional relationships, lines, and linear equations.

STANDARD	**8.EE.5.**	Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.

Grade: 9-12 - Adopted 2010

STRAND / DOMAIN	**CC.MP.**	Mathematical Practices
CATEGORY / CLUSTER	**MP-4.**	Model with mathematics.
STRAND / DOMAIN	**CC.A.**	Algebra
CATEGORY / CLUSTER	**A-CED.**	Creating Equations
STANDARD		Create equations that describe numbers or relationships.
EXPECTATION	**A-CED.1.**	Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions.
EXPECTATION	**A-CED.2.**	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
EXPECTATION	**A-CED.3.**	Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.
STRAND / DOMAIN	**CC.F.**	Functions
CATEGORY / CLUSTER	**F-IF.**	Interpreting Functions
STANDARD		Analyze functions using different representations.
EXPECTATION	**F-IF.9.**	Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.
STRAND / DOMAIN	**CC.F.**	Functions
CATEGORY / CLUSTER	**F-BF.**	Building Functions
STANDARD		Build a function that models a relationship between two quantities.
EXPECTATION	**F-BF.1.**	Write a function that describes a relationship between two quantities.
GRADE EXPECTATION	**F-BF.1.a.**	Determine an explicit expression, a recursive process, or steps for calculation from a context.
STRAND / DOMAIN	**CC.M.**	Modeling

CATEGORY / CLUSTER	**M-2.**	Formulating a model by creating and selecting geometric, graphical, tabular, algebraic, or statistical representations that describe relationships between the variables

Algebra 1 | Solve Linear Equations | Writing and Solving Equations | Solving for a Specific Variable

Grade: 9-12 - Adopted 2010

STRAND / DOMAIN	**CC.A.**	Algebra
CATEGORY / CLUSTER	**A-CED.**	Creating Equations
STANDARD		Create equations that describe numbers or relationships.
EXPECTATION	**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.

Algebra 1 | Solve Linear Equations | Absolute Value Equations | Absolute Value

No Correlations

Algebra 1 | Solve Linear Equations | Absolute Value Equations | Solving Absolute Value Equations

Grade: 9-12-12 - Adopted 2010

STRAND / DOMAIN	**CC.A.**	Algebra
CATEGORY / CLUSTER	**A-REI.**	Reasoning with Equations and Inequalities
STANDARD		Understand solving equations as a process of reasoning and explain the reasoning.
EXPECTATION	**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.
STRAND / DOMAIN	**CC.F.**	Functions
CATEGORY / CLUSTER	**F-BF.**	Building Functions
STANDARD		Build new functions from existing functions.
EXPECTATION	**F-BF.4.**	Find inverse functions.
GRADE EXPECTATION	**F-BF.4.a.**	Solve an equation of the form f(x) = c for a simple function f that has an inverse and write an expression for the inverse. For example, f(x) =2 x^3 for x > 0 or f(x) = (x+1)/(x-1) for x not equal to 1.