Unit 1 Linear Equations

Content Area: **Math**
Course(s): **Algebra 1**
Time Period:
Length: **30 days**
Status: **Published**

Algebra 1

Department of Curriculum and Instruction

Belleville Public Schools

Curriculum Guide

Algebra 1, Grade 8

Unit 1 Linear Equations

Belleville Board of Education

102 Passaic Avenue

Belleville, NJ 07109

Prepared by: Instructional Coach; Lori Whittom

Dr. Richard Tomko, Ph.D., M.J., Superintendent of Schools

Ms. LucyAnn Demikoff, Director of Curriculum and Instruction K-12

Ms. Nicole Shanklin, Director of Elementary Education

Mr. George Droste, Director of Secondary Education

Board Approved: September 23, 2019

Unit Overview

Unit1 : Solving linear equations, equations involving absolute value and problems involving percent.

From this unit students should expect to learn how to solve one and multi-step equations, write mathematical sentences into equations and vice versa, solve absolute value equations, compare ratios, solve proportions, find percent of change and solve problems involving percent.

Enduring Understanding

Students will be able to use their learning to:

- Interpret and represent expressions and equations to model real-world situation.
- Use the structure of an expression to help simplify and regroup terms to find solutions to problems. This will help to interpret more complex expressions, as well as equations and inequalities.
- Communicate about ideas in Algebra in a standard and understandable manner.
- Relate the topics learned in Algebra to things that they do in their everyday lives.
- Become proficient in daily skills involving mathematics.

Common Misconceptions:

- Students may believe that all equations have a solution.
- Students may believe there are no similarities between solving equations and solving inequalities that help them better understand both types of problems.
- Students may believe that equations of quadratic don't model real-world phenomena.
- Students may believe that only “x” or “y” can represent variables.
- Students may believe that when equations contain variables with subscripts, those subscripts can be combined by like terms.
- Students may believe there is no connection between given formulas and real-world applications.
- Students may believe that units are not important during computations.
- Students may not realize the importance of the units’ conversions. Students may not use units to evaluate the appropriateness of solutions.
- Students may believe that ratios expressed with different units cannot be equivalent to one.

Essential Questions

- How do you interpret and evaluate algebraic expressions that model real-world situation?
- What kinds of relationships can proportions represent?
- Can equations that appear to be different be equivalent?
- How can you rewrite algebraic expressions?
- How can you solve equations?
- How do you write algebraic expression to model quantities?

- How do you represent relationship algebraically?

Exit Skills

By the end of Unit 1 Students Should be able to:

- Translate sentences into equations and equations into sentences
- Solve equations involving more than one operation
- Solve equations involving consecutive integers
- Solve equations with the variable on each side
- Solve equations involving grouping symbols
- Justify each step in solving equations using properties
- Evaluate absolute value expressions
- Solve absolute value equations
- Analyze and explain the process of solving an equation
- Develop fluency in writing, interpreting, and translating among various forms of linear equations and use them to solve problems.
- Master the solution of linear equations and apply related solution techniques.
- Compare ratios
- Solve proportions
- Solve problems involving percent
- Find percent of change
- Use formulas to solve real-world problems

New Jersey Student Learning Standards (NJSLS)

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.K-12.6	Attend to precision.
MA.K-12.7	Look for and make use of structure.
MA.A-CED.A.1	Create equations and inequalities in one variable and use them to solve problems.
MA.A-CED.A.4	Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.
MA.A-REI.A.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.
MA.A-REI.B.3	Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.

Interdisciplinary Connections

Literacy, Science, Economics

LA.SL.8.1	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 8 topics, texts, and issues, building on others' ideas and expressing their own clearly.
LA.SL.8.1.B	Follow rules for collegial discussions and decision-making, track progress toward specific

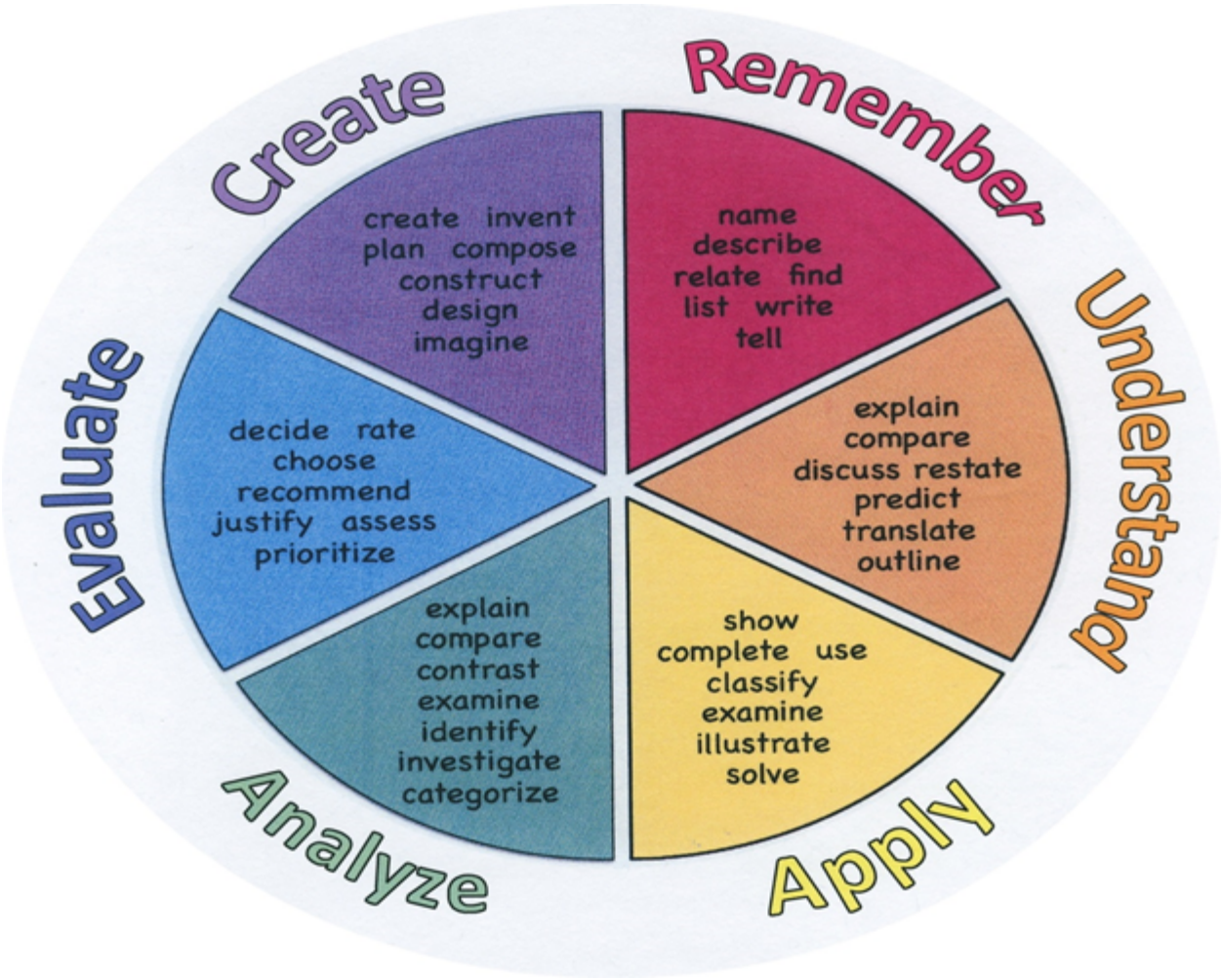
	goals and deadlines, and define individual roles as needed.
LA.SL.8.1.C	Pose questions that connect the ideas of several speakers and respond to others' questions and comments with relevant evidence, observations, and ideas.
LA.SL.8.1.D	Acknowledge new information expressed by others, and, when warranted, qualify or justify their own views in light of the evidence presented.

Learning Objectives

Students will be able to:

- Represent relationships algebraically and evaluate them using properties .
- Interpret and evaluate real-word expressions bu introducing a variable.
- Solve one-step equations in one variable using different operations.
- Solve multi-step equations and justify each step using properties.
- Solve equations with the variables on both sides using like terms and the distributive property.
- Identify equations that are identities or have no solution.
- Rewrite and use literal equations and formulas by solving them for the specific variable.
- Convert units and rates into different ones and understand the difference between them.
- Apply proportions to solve the real-world situations by applying the cross product method .
- To solve percent problems and find percent change by using proportions and equations.
- Model real-world situations using expressions and equations.
- Investigate and extend classroom activities into self research and long term projects.

Remember	Understand	Apply	Analyze	Evaluate	Create
Choose	Classify	Choose	Categorize	Appraise	Combine
Describe	Defend	Dramatize	Classify	Judge	Compose
Define	Demonstrate	Explain	Compare	Criticize	Construct
Label	Distinguish	Generalize	Differentiate	Defend	Design
List	Explain	Judge	Distinguish	Compare	Develop
Locate	Express	Organize	Identify	Assess	Formulate
Match	Extend	Paint	Infer	Conclude	Hypothesize
Memorize	Give Examples	Prepare	Point out	Contrast	Invent
Name	Illustrate	Produce	Select	Critique	Make
Omit	Indicate	Select	Subdivide	Determine	Originate
Recite	Interrelate	Show	Survey	Grade	Organize
Select	Interpret	Sketch	Arrange	Justify	Plan
State	Infer	Solve	Breakdown	Measure	Produce
Count	Match	Use	Combine	Rank	Role Play
Draw	Paraphrase	Add	Detect	Rate	Drive
Outline	Represent	Calculate	Diagram	Support	Devise
Point	Restate	Change	Discriminate	Test	Generate
Quote	Rewrite	Classify	Illustrate		Integrate
Recall	Select	Complete	Outline		Prescribe
Recognize	Show	Compute	Point out		Propose
Repeat	Summarize	Discover	Separate		Reconstruct
Reproduce	Tell	Divide			Revise
	Translate	Examine			Rewrite
	Associate	Graph			Transform
	Compute	Interpolate			
	Convert	Manipulate			
	Discuss	Modify			
	Estimate	Operate			
	Extrapolate	Subtract			
	Generalize				
	Predict				



Suggested Activities & Best Practices

Textbook, eAssessment, Supplemental Materials:

https://my.mheducation.com/login

AI Assessment and Learning System:

https://www.aleks.com/

Mindset:

https://www.youtube.com/watch?v=3icoSeGqQtY

http://www.youcubed.org/wp-content/uploads/Positive-Classroom-Norms2.pdf

Teaching Strategies for Improving Algebra Knowledge in Middle and High School Students:

https://ies.ed.gov/ncee/wwc/PracticeGuide/20

Algebra Tools - Functions:

https://www.state.nj.us/education/aps/cccs/math/NJISTFunctions.pdf

Algebra Tools - Algebra:

https://www.state.nj.us/education/aps/cccs/math/NJISTAlgebra.pdf

Misc Mathematics materials:

http://www.mathnstuff.com/

http://mathbitsnotebook.com/Algebra1/LinearEquations/LEsolveequations.html

Coaching Corner:

https://sites.google.com/belleville.k12.nj.us/thecoachingcorner/home

Solve Equation:

https://www.youtube.com/watch?v=WHeK1eNy1YQ

Solving Eq with Variables on both sides

https://www.youtube.com/watch?v=-NgHrnVgeWY

Algebra Tic-Tac-Toe

https://www.education.com/activity/article/tic-tac-equations/

Activites for Solving Equations:

https://lzlomek.wordpress.com/2012/10/10/activities-for-solving-equations/

Introduction to Linear Equations:

https://betterlesson.com/lesson/487890/introduction-to-linear-equations-and-inequalities-in-one-variable

Solving Equations with a variable on both sides:

https://whenmathhappens.com/2013/11/12/bothsides1-50min/

https://betterlesson.com/lesson/443641/solving-and-justifying-equations?from=search

Equations, Choice board:

https://www.corwin.com/sites/default/files/upm-binaries/18260_Gregory_ActDiffClssrm_MSMath_Pages_30_31.pdf

Misc Problems:

http://figurethis.nctm.org/challenges/c74/challenge.htm

Algebra Kahoots:

https://kahoot.com/explore/collections/math-kahoot-algebra/

Assessment Evidence - Checking for Understanding (CFU)

- Exit Ticket Solve the equation -4x + 10(x - 3) = 2x + 12 Fill in the following as you solve the equation Step 1:_____Step2:_____ Step3:_____ Step4:_____ (formative assessment)
- Benchmark #1 (summative assessment)
- Class discussions and solving problems in groups (formative assessment)
- Take home exams (alternative assessment)
- Analysis and fixing already solved problems (alternative assessment)

- Admit Tickets
- Anticipation Guide
- Common Benchmarks

- Compare & Contrast
- Define
- Describe
- Evaluate
- Evaluation rubrics
- Exit Tickets
- Explaining
- Fist- to-Five or Thumb-Ometer
- Journals
- KWL Chart
- Learning Center Activities
- Outline
- Question Stems
- Quickwrite
- Quizzes
- Self- assessments
- Study Guide
- Teacher Observation Checklist
- Think, Pair, Share
- Think, Write, Pair, Share
- Unit review/Test prep
- Web-Based Assessments

Primary Resources & Materials

Glencoe McGraw-Hill Algebra1 2014

Glencoe McGraw-Hill Algebra1 2010

Practice Glencoe Algebra1

Study Guide Glencoe Algebra1

Ancillary Resources

Glencoe Algebra 1 Tutor: Personal Tutor and Spanish Tutor

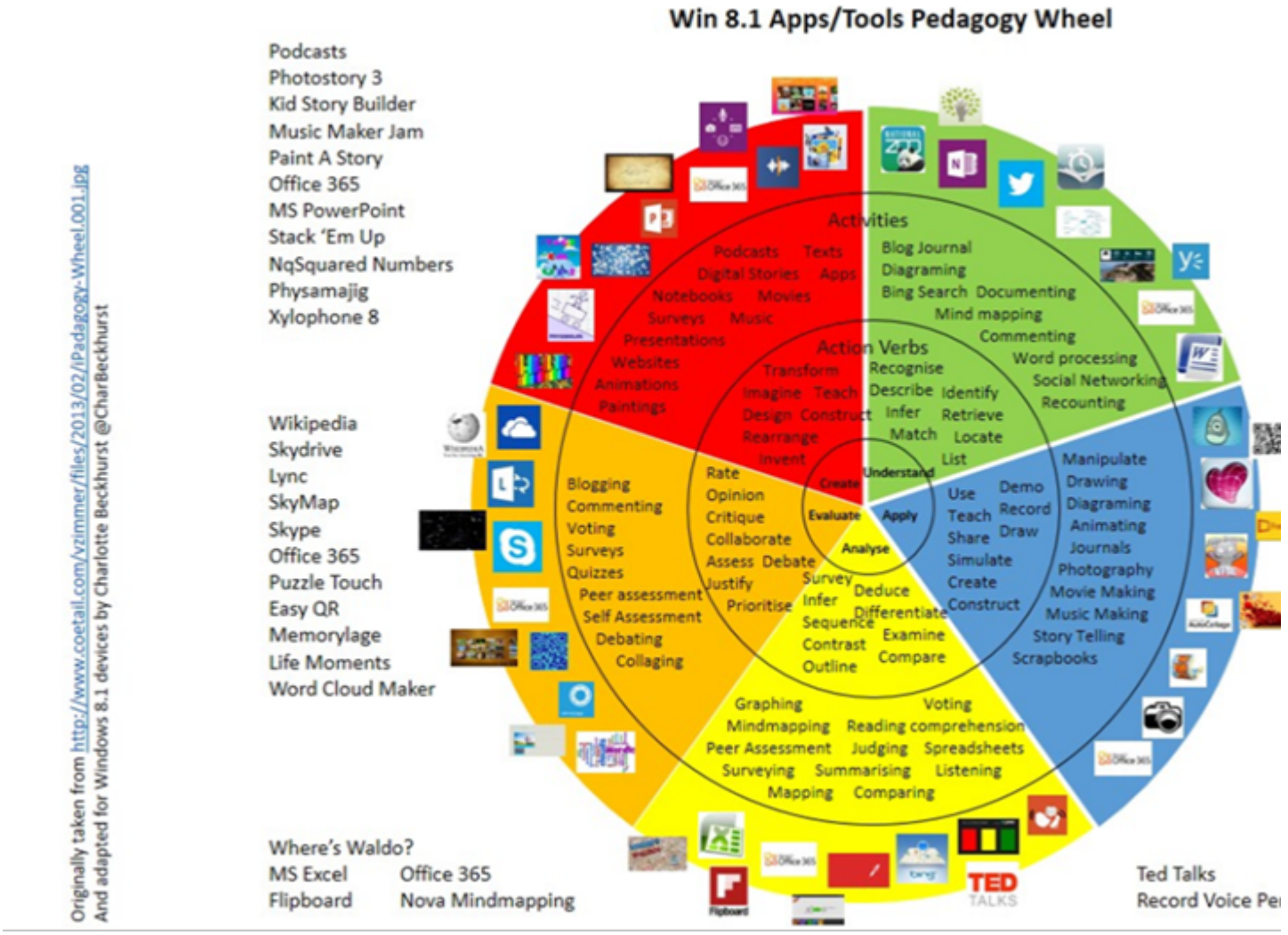
Glencore Algebra 1 Geometer's Sketchpad

Glencoe Algebra 1 Glencoe Mathematics Secondary Series

ALEKS

Technology Infusion

- Kahoot https://create.kahoot.it/details/c8a08d3a-2f1f-421a-b59f-caa59a881922
- Youtube
- Khan academy
- Google Sheets
- Office 365
- Google Docs
- PodCasts
- Google Slides
- Wikipedia
- Skype
- Twitter
- Ted Talks
- QR Barcode Generator
- Calculator/Graphing calculator
- Google Classroom
- McGraw-Hill Education
- Desmos.com
- Geogebra.org
- Edulastic
- Kuta Software



Alignment to 21st Century Skills & Technology

Mastery of key subjects and 21st century themes is essential for all students in the 21stcentury.

Key subjects include:

- English, reading or language arts
- World languages
- Arts

- Mathematics
- Economics
- Science
- Geography
- History
- Government and Civics

CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
CRP.K-12.CRP7	Employ valid and reliable research strategies.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.
CRP.K-12.CRP11	Use technology to enhance productivity.
CAEP.9.2.8.B.2	Develop a Personalized Student Learning Plan with the assistance of an adult mentor that includes information about career areas of interest, goals and an educational plan.
CAEP.9.2.8.B.3	Evaluate communication, collaboration, and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career.
TECH.8.1.12.A.3	Collaborate in online courses, learning communities, social networks or virtual worlds to discuss a resolution to a problem or issue.
TECH.8.1.12.F.1	Evaluate the strengths and limitations of emerging technologies and their impact on educational, career, personal and or social needs.

21st Century Skills/Interdisciplinary Themes

- Communication and Collaboration
- Creativity and Innovation
- Critical thinking and Problem Solving
- ICT (Information, Communications and Technology) Literacy
- Information Literacy

21st Century Skills

- Environmental Literacy
- Financial, Economic, Business and Entrepreneurial Literacy

- Health Literacy

Differentiation

- Use of algebra tiles to model solving equations(Mcgraw Hill Algebra 1 textbook page 81)
- Use of Algebra tiles to model multi-step equations(Mcgraw Hill Algebra 1 textbook page 90)
- Peer Partner
- One-0n-One Instruction as needed
- Cooperative groups
- Instruction given orally and written
- Break material down into smaller parts
- Assignments Shortened
- Study guide
- Tests/quizzes reviews
- Colored Counters and Algebra tiles
- Equation Mats
- Graphic Organizer
- Calculator/graphing calculator
- Anchor Charts display
- Extra time
- Assistive Technology
- repeat directions as needed
- Rephrase written directions

Special Education Learning (IEP's & 504's)

- Use of an equation mat and two color counters to model equations and demonstrate inverse operations

- printed copy of board work/notes provided

- additional time for skill mastery
- assistive technology
- check work frequently for understanding
- computer or electronic device utilizes
- extended time on tests/ quizzes
- have student repeat directions to check for understanding
- highlighted text visual presentation
- modified assignment format
- modified test content
- modified test format
- modified test length
- multi-sensory presentation
- preferential seating
- Provide modifications as dictated in the student's IEP/504 plan
- reduced/shortened reading assignments
- Reduced/shortened written assignments
- secure attention before giving instruction/directions
- shortened assignments
- student working with an assigned partner
- Use open book, study guides, test prototypes

English Language Learning (ELL)

The Glencoe Personal Tutor(Spanish):

Solve a consecutive integer tutorial

Write and solve a multistep equation tutorial

- teaching key aspects of a topic. Eliminate nonessential information
- using videos, illustrations, pictures, and drawings to explain or clarif
- allowing products (projects, timelines, demonstrations, models, drawings, dioramas, poster boards, charts, graphs, slide shows, videos, etc.) to demonstrate student’s learning;
- allowing students to correct errors (looking for understanding)
- allowing the use of note cards or open-book during testing
- decreasing the amount of workpresented or required

- having peers take notes or providing a copy of the teacher's notes
- modifying tests to reflect selected objectives
- providing study guides
- reducing the number of answer choices on a multiple choice test
- tutoring by peers

At Risk

Graphing calculator(TI-84) introduction

The Glencoe Personal Tutor

Glencoe -McGrawHill Resources

Teaching Algebra with Manipulatives: Algebra Tiles (pgs.81, 90)

Math Triumphs

Algebra 1 Study Notebook

- allowing students to correct errors (looking for understanding)
- teaching key aspects of a topic. Eliminate nonessential information
- allowing products (projects, timelines, demonstrations, models, drawings, dioramas, poster boards, charts, graphs, slide shows, videos, etc.) to demonstrate student's learning
- allowing students to select from given choices
- decreasing the amount of workpresented or required
- having peers take notes or providing a copy of the teacher's notes
- modifying tests to reflect selected objectives
- providing study guides
- reducing the number of answer choices on a multiple choice test
- tutoring by peers
- using authentic assessments with real-life problem-solving
- using videos, illustrations, pictures, and drawings to explain or clarify

Talented and Gifted Learning (T&G)

- Figure This! Bet I can Guess your Color Magic: writing expressions and equations https://figurethis.nctm.org/challenges/c60/challenge.htm

- Advanced problem-solving

- Allow students to work at a faster pace
- Complete activities aligned with above grade level text using Benchmark results
- Flexible skill grouping within a class or across grade level for rigor
- Higher order, critical & creative thinking skills, and discovery
- Multi-disciplinary unit and/or project
- Teacher-selected instructional strategies that are focused to provide challenge, engagement, and growth opportunities
- Utilize exploratory connections to higher-grade concepts
- Utilize project-based learning for greater depth of knowledge

Sample Lesson

Unit Name: Linear Equations

NJSLS:

Interdisciplinary Connection

of Objective: the student will be able to solve equations with one variable by combining like terms and using the distributive property to show whether there is one, none, or infinitely many solutions

Anticipatory Set/Do Now: Solve the equations $4x + 9 = 33$ and $-8x - 10 = 30$

Learning Activity:
Do Now-did they know to do the inverse operation? did they compute with rational numbers correctly?

Distribute graphic organizer with steps to Solving multi-step equations

Ask questions to discern understanding of distributive property, combining like terms, and inverse operations

Model Problems on Smart TV

What step should we do first? What step should we do next? ... How can we check our answer?

When is there no solution to an equation? When are there infinitely many solutions to an equation?

Have students do problems with their partner-think/pair/share

Have students go to board to show and explain their work and answer

Have students work independently while teacher conferences with individual students

Student Assessment/CFU's: debriefing with partners, thumbs up/down, conferencing

Materials: graphic organizer-steps to solving multi-step equations- anchor chart displayed showing steps to solving multi-step equations

21st Century Themes and Skills: Financial, Economic, and Business

Differentiation:
instruction-- peer partner, steps written and read aloud

materials--graphic organizer, hi-light steps, worked example, calculator

product--Shorten homework assignment

Integration of Technology: Teacher Prepared Smart TV lesson

MA.A-REI.A.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.