# Algebra 1H, Unit 4, System of Equations

Content Area: **Math**
Course(s): **Algebra 1H**
Time Period: **JanFeb**
Length: **20 Days**
Status: **Published**

## Title Section

## Department of Curriculum and Instruction

**Belleville Public Schools**

**Curriculum Guide**

# Algebra 1H

# Unit 4 System of Equations

**Belleville Board of Education**

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**Belleville, NJ 07109**

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Board Approved: September 23,2019

## Unit Overview

This unit is about solving and graphing systems of equations and inequalities.

The students in this unit should learn different methods of solving systems of equations and inequalities, and graph their solution sets on the coordinate plane

## Enduring Understanding

Students will be able to use their learning to:

- A solution to a system of equations has significance in the real world.
- There are limitations to solving a system of equations by graphing.
- Interpret and represent system of equations/inequalities to model real-world situations.
- Select a solution from a variety of ways and explain the solution based on this model.
- Make sense of problems and persevere in solving them.
- Reason abstractly and quantitatively.
- Construct viable arguments and critique the reasoning of others.
- Attend to precision.
- Look for and make use of structure.
- Look for and express regularity in repeated reasoning

## Essential Questions

- How can you solve a system of equations or inequalities?
- What are the three types of solutions to a system?
- How do systems of equations model real-world situations?
- What are different methods of solving systems of equations and what are the advantages and disadvantages of each?
- How might you determine which technique for solving a system of equations is appropriate?
- How do you approximate the solution of a system of equations by graphing?
- How can you use the system of equations/inequalities to model and solve contextual problems?
- • Can you give a real world situation where the solution of a system of linear equations would have no solution or infinitely many solutions?

## Exit Skills

By the end of Unit 4 Students Should be able to:

- Solve systems of equations by graphing.
- Solving systems of equations using substitution.
- Analyze special systems of equations/inequalities (no solution, infinite solutions).
- Solve systems by addition/ subtraction to eliminate a variable.
- Solve systems by multiplication of a row or both rows to eliminate a variable.
- Solve systems of inequalities by graphing.
- Choose the best method of solving a system of linear equations.
- Graph systems of linear inequalities in two variables.
- Explore systems of equations and inequalities, and they find and interpret their solutions.
- Use TI -84 to solve system of equations and systems of inequalities
- Model real-world situations using systems of linear equations/inequalities.

## New Jersey Student Learning Standards (NJSLS)

| | |
|---|---|
| MA.K-12.1 | Make sense of problems and persevere in solving them. |
| MA.K-12.2 | Reason abstractly and quantitatively. |
| MA.K-12.3 | Construct viable arguments and critique the reasoning of others. |
| MA.K-12.4 | Model with mathematics. |
| MA.K-12.5 | Use appropriate tools strategically. |
| MA.K-12.7 | Look for and make use of structure. |
| MA.A-CED | Creating Equations |
| MA.A-CED.A.2 | Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. |
| MA.A-CED.A.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. |
| MA.A-REI.C | Solve systems of equations |
| MA.A-REI.C.5 | Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions. |
| MA.A-REI.C.6 | Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables. |
| MA.A-REI.C.7 | Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically. |
| MA.A-REI.D.11 | Explain why the $x$-coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where $f(x)$ and/or $g(x)$ are linear, polynomial, rational, absolute value, exponential, and logarithmic functions. |
| MA.A-REI.D.12 | Graph the solutions to a linear inequality in two variables as a half plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes. |

## Interdisciplinary Connections

| | |
|---|---|
| 9.3.12.FN.1 | Utilize mathematical concepts, skills and problem solving to obtain necessary information for decision making in the finance industry. |

| | |
|---|---|
| LA.W.9-10.2 | Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content. |
| LA.L.9-10.1 | Demonstrate command of the conventions of standard English grammar and usage when writing or speaking. |
| LA.9-10.W.9-10.1 | Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence. Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among claim(s), counterclaims, reasons, and evidence. |
| 9-12.HS-PS1-4.2.1 | Develop a model based on evidence to illustrate the relationships between systems or between components of a system. |
| 9-12.HS-PS1-3.3 | Planning and Carrying Out Investigations |
| 9-12.HS-PS2-4.5.1 | Use mathematical representations of phenomena to describe explanations. |

## Learning Objectives

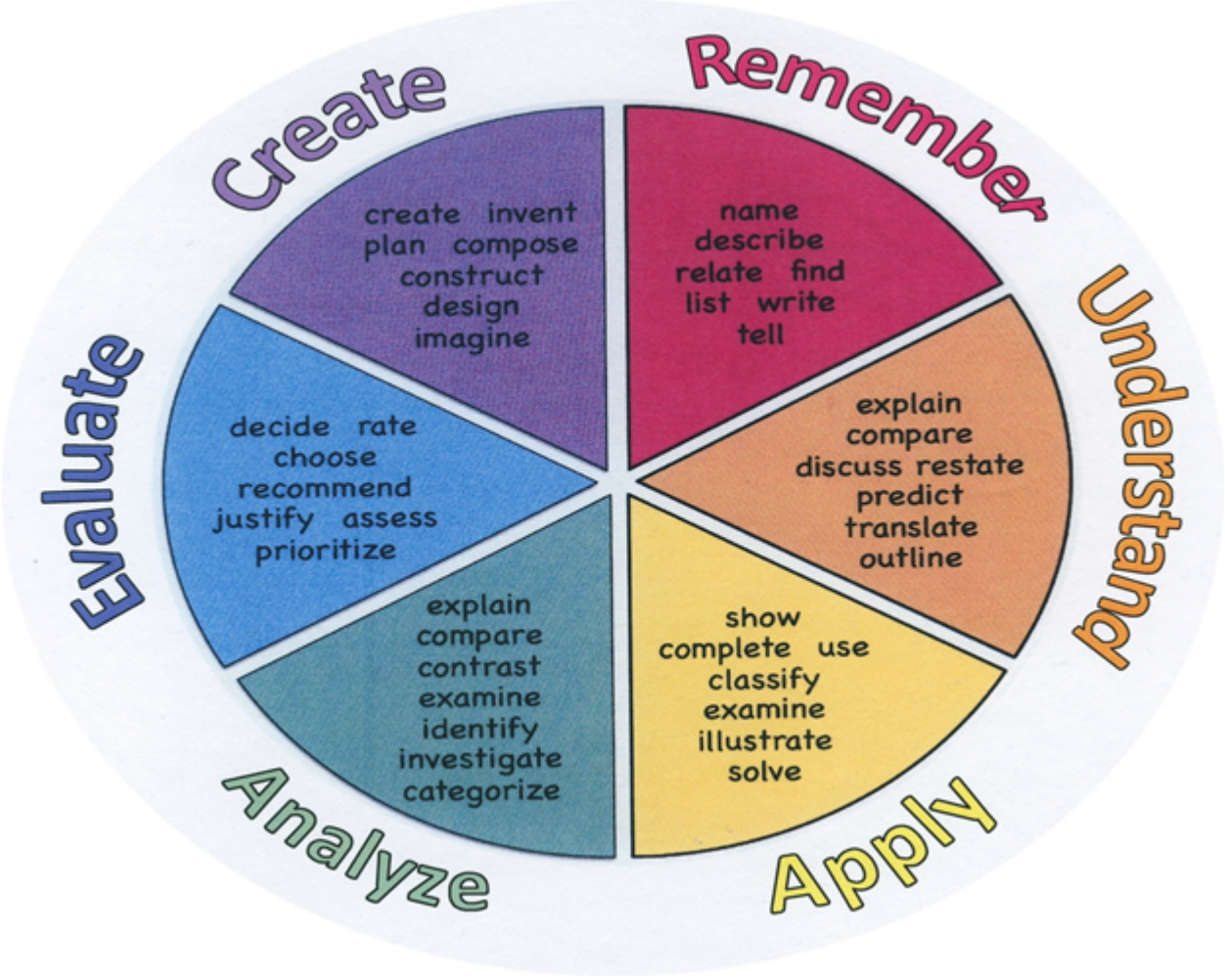
Students will be able to:

- Solve systems of equations by graphing.
- Analyze special systems of equations/inequalities (no solution, infinite solutions) by their intersections.
- Solve systems of equations using substitution.
- Solve systems by addition/ subtraction to eliminate a variable.
- Solve systems by multiplication of a row or both rows to eliminate a variable
- Choose the best method of solving a system of linear equations.
- Compare different methods of solving systems of inequalities.
- Graph system of equation/inequalities in two variables.
- Manipulate with graphing calculator to analyze set of solutions of systems of equations/inequalities in two variables.
- Model real-world situations using systems of linear equations/inequalities.

**Action Verbs:** Below are examples of action verbs associated with each level of the Revised Bloom's Taxonomy.

| 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<br>Draw<br>Outline<br>Point<br>Quote<br>Recall<br>Recognize<br>Repeat<br>Reproduce | Match<br>Paraphrase<br>Represent<br>Restate<br>Rewrite<br>Select<br>Show<br>Summarize<br>Tell<br>Translate<br>Associate<br>Compute<br>Convert<br>Discuss<br>Estimate<br>Extrapolate<br>Generalize<br>Predict | Use<br>Add<br>Calculate<br>Change<br>Classify<br>Complete<br>Compute<br>Discover<br>Divide<br>Examine<br>Graph<br>Interpolate<br>Manipulate<br>Modify<br>Operate<br>Subtract | Combine<br>Detect<br>Diagram<br>Discriminate<br>Illustrate<br>Outline<br>Point out<br>Separate | Rank<br>Rate<br>Support<br>Test | Role Play<br>Drive<br>Devise<br>Generate<br>Integrate<br>Prescribe<br>Propose<br>Reconstruct<br>Revise<br>Rewrite<br>Transform |



## Suggested Activities & Best Practices

Sysytem of Equations - Elimination:

https://whenmathhappens.com/2015/10/15/elimination-50min/

Sysytem of Equations - Substitiution:

https://whenmathhappens.com/2015/10/15/submethod-50min/

Real-World Applications of System of Equations:

https://tapintoteenminds.com/3act-math/counting-candy-sequel/

https://teacher.desmos.com/activitybuilder/custom/5670acf05a543a6007737ea8

https://teacher.desmos.com/activitybuilder/custom/5818fb314e762b653c3bf0f3

https://www.yummymath.com/2013/souvenirs-and-concessions-2/

System of Equations, flashcard, notes, examples, practice

https://quizlet.com/subject/system-of-equations/

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

Coaching Corner:

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

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/

Algebra Kahoots:

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

## Assessment Evidence - Checking for Understanding (CFU)

Glencoe McGraw Hill : Chapter Asssessments, Midchapter Assessments (Summative): System of Equations, System of Inequalities

EAssessment test generator (Summative)

Edulastic Formative Assessments (Formative)

Common Benchmark 2 on OnCourse (Benchmark)

"Do Now/Exit Ticket" Activity (Formative)

- Admit Tickets
- Anticipation Guide
- Common Benchmarks
- Compare & Contrast
- Create a Multimedia Poster
- DBQ's
- Define
- Describe
- Evaluate
- Evaluation rubrics
- Exit Tickets
- Explaining
- Fist- to-Five or Thumb-Ometer
- Illustration
- Journals
- KWL Chart
- Learning Center Activities
- Multimedia Reports
- Newspaper Headline
- Outline
- Question Stems
- Quickwrite
- Quizzes
- Red Light, Green Light
- Self- assessments
- Socratic Seminar
- Study Guide
- Surveys
- Teacher Observation Checklist
- Think, Pair, Share
- Think, Write, Pair, Share
- Top 10 List
- Unit review/Test prep
- Unit tests
- Web-Based Assessments
- Written Reports

## Primary Resources & Materials

Glencoe McGraw-Hill Algebra1 2014

Glencoe McGraw-Hill Algebra1 2010

Practice Glencoe Algebra1

Study Guide Glencoe Algebra1

## Ancillary Resources

ALEKS

The Glencoe Personal Tutor Plus

The Glencoe Personal Tutor Plus(Spanish)

## Technology Infusion

Create and have students complete exit tickets using Edulastic
{ https://app.edulastic.com/#renderResource/close/Mjk0MjE2ODUwOA%3D%3D } or Google forms

Create classes on Google classroom and post assignments, monitor student progress, and offer feedback.

Use graphing calculator to model problems.

Other technology that can be infused into this unit to enhance learning may include

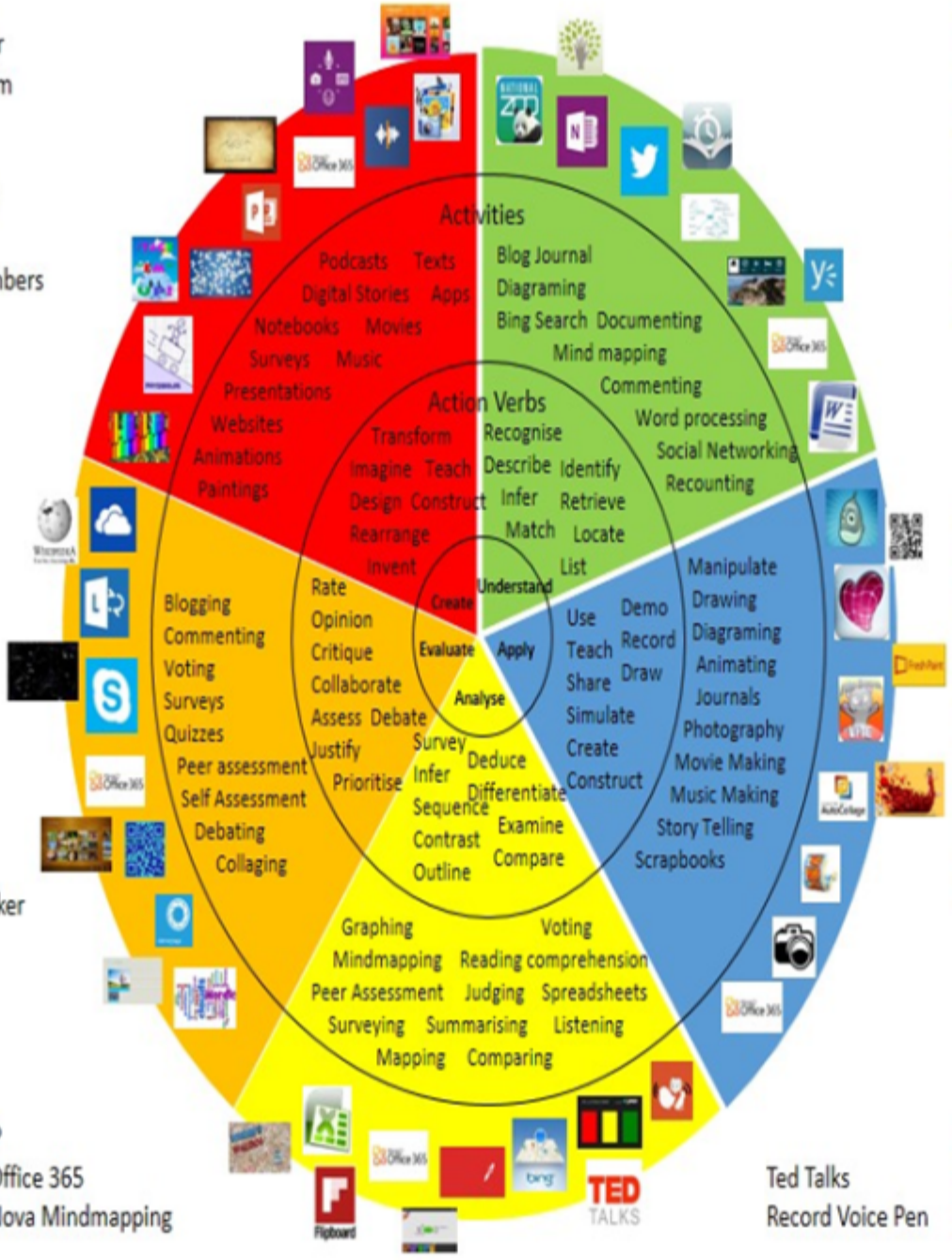
- Youtube
- Khan academy
- Google Classroom
- GSuite
- Kutasoftware
- PodCast
- Twitter
- Ted Talks

- ALEKS
- QR Barcode Generator
- Calculator/Graphing calculator
- Flipgrid
- Peardeck
- Edulastic
- McGraw-Hill Education
- Desmos.com
- Geogebra.org

# Win 8.1 Apps/Tools Pedagogy Wheel

Podcasts
Photostory 3
Kid Story Builder
Music Maker Jam
Paint A Story
Office 365
MS PowerPoint
Stack 'Em Up
NqSquared Numbers
Physamajig
Xylophone 8

Wikipedia
Skydrive
Lync
SkyMap
Skype
Office 365
Puzzle Touch
Easy QR
Memorylage
Life Moments
Word Cloud Maker




Where's Waldo?
MS Excel Office 365
Flipboard Nova Mindmapping

Ted Talks
Record Voice Pen

Originally taken from http://www.coetail.com/vzimmer/files/2013/02/iPadagogy-Wheel.001.jpg
And adapted for Windows 8.1 devices by Charlotte Beckhurst @CharBeckhurst

## Alignment to 21st Century Skills & Technology

Develop mathematical thinking using real world problems in the Glencoe Interactive Student Guide Workbook https://catalog.mcgraw-hill.com/repository/private_data/DOC/50001167/94/30.pdf

Mastery and infusion of **21st Century Skills & Technology** and their Alignment to the core content areas is essential to student learning. The core content areas include:

- English Language Arts;
- Mathematics;
- Science and Scientific Inquiry (Next Generation);
- Social Studies, including American History, World History, Geography, Government and Civics, and Economics;
- World languages;
- Technology;
- Visual and Performing Arts.

| | |
|---|---|
| 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.9.2.12.C.2 | Modify Personalized Student Learning Plans to support declared career goals. |
| 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.CS1 | Identify and define authentic problems and significant questions for investigation. |

## 21st Century Skills/Interdisciplinary Themes

- English Language Arts;
- Mathematics;
- Science and Scientific Inquiry (Next Generation);
- Social Studies/Economics;
- Technology;

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

- Information Literacy
- Life and Career Skills
- Media Literacy

## 21st Century Skills

- Civic Literacy
- Environmental Literacy
- Financial, Economic, Business and Entrepreneurial Literacy
- Global Awareness
- Health Literacy

## Differentiation

Glencoe -McGrawHill Resources:

*Teaching with Manipulatives:* Algebra Tiles, Models

Algebra Labs

*Math Triumphs*

*Algebra 1 Study Notebook*

TI-84 Calculator - solving system of equations and Inequalities

Kutasoftware Algebra 1

**Differentiations:**

- Small group instruction
- Small group assignments
- Extra time to complete assignments
- Pairing oral instruction with visuals
- Repeat directions
- Use manipulatives
- Center-based instruction

- Token economy
- Study guides
- Teacher reads assessments allowed
- Scheduled breaks
- Rephrase written directions
- Multisensory approaches
- Additional time
- Preview vocabulary
- Preview content & concepts
- Story guides
- Behavior management plan
- Highlight text
- Student(s) work with assigned partner
- Visual presentation
- Assistive technology
- Auditory presentations
- Large print edition
- Dictation to scribe
- Small group setting

**Hi-Prep Differentiations:**

- Alternative formative and summative assessments
- Choice boards
- Games and tournaments
- Group investigations
- Guided Reading
- Independent research and projects
- Interest groups
- Learning contracts
- Leveled rubrics
- Literature circles
- Multiple intelligence options
- Multiple texts
- Personal agendas
- Project-based learning
- Problem-based learning
- Stations/centers
- Think-Tac-Toes
- Tiered activities/assignments
- Tiered products
- Varying organizers for instructions

**Lo-Prep Differentiations**

- Choice of books or activities
- Cubing activities
- Exploration by interest
- Flexible grouping
- Goal setting with students
- Jigsaw
- Mini workshops to re-teach or extend skills
- Open-ended activities

- Think-Pair-Share
- Reading buddies
- Varied journal prompts
- Varied supplemental materials

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

Graphing calculator(Ti-84)

The Glencoe-McGrawHill  Personal Tutor

Glencoe -McGrawHill Resources:

*Teaching Algebra with Manipulatives*:https://catalog.mcgraw-hill.com/repository/private_data/DOC/50000008/74/21.pdf

*Algebra Lab*

*Math Triumphs*

*Algebra 1 Study Notebook*

*Kutasoftware Algebra 1*

- printed copy of board work/notes provided
- additional time for skill mastery
- assistive technology
- behavior management plan
- Center-Based Instruction
- 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
- multiple test sessions
- preferential seating

- preview of content, concepts, and vocabulary
- 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
- teacher initiated weekly assignment sheet
- 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 Algebra with Manipulatives: https://catalog.mcgraw-hill.com/repository/private_data/DOC/50000008/74/21.pdf

- 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 or omitting lengthy outside reading assignments
- reducing the number of answer choices on a multiple choice test

- tutoring by peers
- using computer word processing spell check and grammar check features
- using true/false, matching, or fill in the blank tests in lieu of essay tests

## 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
- allowing the use of note cards or open-book during testing
- collaborating (general education teacher and specialist) to modify vocabulary, omit or modify items to reflect objectives for the student, eliminate sections of the test, and determine how the grade will be determined prior to giving the test.
- decreasing the amount of workpresented or required
- having peers take notes or providing a copy of the teacher's notes
- marking students' correct and acceptable work, not the mistakes
- modifying tests to reflect selected objectives
- providing study guides
- reducing or omitting lengthy outside reading assignments
- reducing the number of answer choices on a multiple choice test
- tutoring by peers
- using authentic assessments with real-life problem-solving
- using true/false, matching, or fill in the blank tests in lieu of essay tests
- using videos, illustrations, pictures, and drawings to explain or clarify

## Talented and Gifted Learning (T&G)

Glencoe Enrichment Activities

Glencoe Chapter Projects

Math Forum: Problems of the Week, Sample Lesson( Min,Max), Resoning and Making Sense Task Library

- Above grade level placement option for qualified students
- Advanced problem-solving
- Allow students to work at a faster pace
- Cluster grouping
- Complete activities aligned with above grade level text using Benchmark results
- Create a blog or social media page about their unit
- Create a plan to solve an issue presented in the class or in a text
- Debate issues with research to support arguments
- 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

Using the template below, please develop a **Sample Lesson** for the first unit only.

Unit Name:

NJSLS:

Interdisciplinary Connection:

Statement of Objective:

Anticipatory Set/Do Now:

Learning Activity:

Student Assessment/CFU's:

Materials:

21st Century Themes and Skills:

Differentiation/Modifications:

Integration of Technology: