# Unit 4: Systems of Equations and Inequalities

Content Area: **Math**
Course(s): **Algebra 1**
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**Title Section**

## Department of Curriculum and Instruction

**Belleville Public Schools**

Curriculum Guide

# Algebra 1 A

# Unit 4: Systems of Equations and Inequalities

**Belleville Board of Education**

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## 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.

## NJSLS

A.CED.3 Represent constraints by equations, and by systems of equations, and interpret solutions as viable or nonviable options in a modeling context.

A.REI.6 Solve systems of linear equations exactly and approximately (e.g. with graphs), focusing on pairs of linear equations in two variables.

A.CED.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

A.REI.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.

A.REI.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.

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| MA.9-12.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.9-12.A-REI.C.6 | Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing |

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|---|---|
| | on pairs of linear equations in two variables. |
| MA.9-12.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.9-12.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.9-12.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. |

## 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.
- Model real-world situations using systems of linear equations/inequalities.

## Enduring Understanding

Students will be able to use their learning to:

- Interpret and represent system of equations/inequalities to model real-world situation.
- 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?
- 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?

## 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.

## Interdisciplinary Connections

Ecomomics, business, financing, geometry, literacy, science.

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| CRP.K-12.CRP2 | Apply appropriate academic and technical skills. |
| CRP.K-12.CRP4 | Communicate clearly and effectively and with reason. |
| CRP.K-12.CRP11 | Use technology to enhance productivity. |
| CRP.K-12.CRP8 | Utilize critical thinking to make sense of problems and persevere in solving them. |
| CRP.K-12.CRP7 | Employ valid and reliable research strategies. |
| 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, persona l and or social needs.

## Alignment to 21st Century Skills & Technology

**Key SUBJECTS AND 21st CENTURY THEMES**

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

## 21st Century/Interdisciplinary Themes

- Financial, Economic, Business and Entrepreneurial Literacy
- Global Awareness

## 21st Century Skills

- 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

## 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/

## Technology Infusion

- Youtube
- Khan academy
- MS Excel
- Office 365
- MS Word
- PodCasts
- MS Powerpoint
- Wikipedia
- Skype
- Twitter
- Ted Talks
- QR Barcode Generator
- Calculator/Graphic calculator
- desmos.com
- geogebra.org

## Differentiation

- Cooperative groups
- Board work

- Team work
- Classroom discussions
- Questions and Answers
- Study guide
- Tets/quizzes reviews
- Notes taking/transparencies
- Organizer
- Calculator/graphic calculator
- Posters display
- Extra time

## Special Education

- 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
- multiple test sessions
- multi-sensory presentation
- preferential seating
- preview of content, concepts, and vocabulary
- 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

## ELL

- 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

## Intervention Strategies

- 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

## Evidence of Student Learning-CFU's

Please list ways educators may effectively check for understanding in this secion.

- Admit Tickets
- Anticipation Guide
- Common benchmarks
- Compare & Contrast
- Define
- Describe
- Evaluate
- Evaluation rubrics
- Exit Tickets
- Explaining
- Illustration
- KWL Chart
- Outline
- Question Stems
- Quizzes
- Self- assessments
- Study Guide
- Teacher Observation Checklist
- Top 10 List
- Unit tests

## Primary Resources

Glencoe McGraw-Hill Algebra1 2014

Glencoe McGraw-Hill Algebra1 2010

Practice Glencoe Algebra1

Study Guide Glencoe Algebra1

## Ancillary Resources

Houghton Mifflin Harcourt On core Mathematics Algebra1

Glencoe McGraw-Hill Science and Mathematics Lab Manual