

# Algebra 1A , Unit 7 , Radical Expressions

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

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## **Department of Curriculum and Instruction**



**Belleville Public Schools**

**Curriculum Guide**

# Algebra 1A

## Unit 7 Radical Expressions

**Belleville Board of Education**

**102 Passaic Avenue**

**Belleville, NJ 07109**

**Prepared by:** Annamaria Contella

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 K-8, ESL Coordinator K-12

Mr. George Droste, Director of Secondary Education

Board Approved: September 23, 2019

## **Unit Overview**

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- This unit is about simplifying radical expressions, operations with radical expressions and solving problems using the Pythagorean Theorem.
- The students should learn how to simplify radicals, perform operations with radicals and apply the Pythagorean Theorem to solve problems

## **Enduring Understanding**

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- Find the length/distance in the variety of the real-world problems.
- Make sense of problems and persevere in solving them.
- Reason abstractly and quantitatively.
- Construct viable arguments and critique the reasoning of others.
- Model with mathematics.
- Attend to precision.
- Look for and make use of structure.
- Look for and express regularity in repeated reasoning.

## Essential Questions

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- How are radical expressions represented?
- How can simplify radicals?
- How do you add radicals?
- How do you multiply radicals?
- What properties of real numbers do you use to perform operations with radicals?
- What relationship do the sides in a right triangle have?
- How can you find the length of the unknown side in a right triangle?

## Exit Skills

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By the end of Unit 7 Students Should be able to:

- Simplifying radical expressions.
- Perform operations with radical expressions.
- Simplify radical expressions by using the Product Property
- Simplify radical expressions by using the Quotient Property of square roots.
- Master the solution of linear equations and apply related solution techniques and the laws of exponents to the creation and solution of simple exponential equations.
- Add, subtract, and multiply radical expressions.
- Extend the laws of exponents to rational exponents involving square and cube roots and apply this new understanding of number.
- Create quadratic and exponential expressions.
- Apply The Pythagorean Theorem to find unknown sides and distances.
- Solve problems by using the Pythagorean Theorem.

- Determine whether a triangle is a right triangle.

## **New Jersey Student Learning Standards (NJSL)**

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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.N-RN.A.2	Rewrite expressions involving radicals and rational exponents using the properties of exponents.
MA.K-12.4	Model with mathematics.
MA.F-IF.B.4	For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship.
MA.K-12.5	Use appropriate tools strategically.
MA.K-12.6	Attend to precision.
MA.K-12.7	Look for and make use of structure.
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.G-SRT.C.8	Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.
MA.A-REI.B.4a	Use the method of completing the square to transform any quadratic equation in $x$ into an equation of the form $(x - p)^2 = q$ that has the same solutions. Derive the quadratic formula from this form.

## **Interdisciplinary Connections**

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LA.RL.9-10.1	Cite strong and thorough textual evidence and make relevant connections to support analysis of what the text says explicitly as well as inferentially, including determining where the text leaves matters uncertain.
9.3.12.FN.1	Utilize mathematical concepts, skills and problem solving to obtain necessary information for decision making in the finance industry.
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-PS1-3.1.1

students observe patterns in systems at different scales and cite patterns as empirical evidence for causality in supporting their explanations of phenomena. They recognize classifications or explanations used at one scale may not be useful or need revision using a different scale; thus requiring improved investigations and experiments. They use mathematical representations to identify certain patterns and analyze patterns of performance in order to reengineer and improve a designed system.

9-12.HS-PS1-3.3

Planning and Carrying Out Investigations

9-12.HS-PS2-4.5

Mathematical and computational thinking at the 9–12 level builds on K–8 and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions.

## Learning Objectives

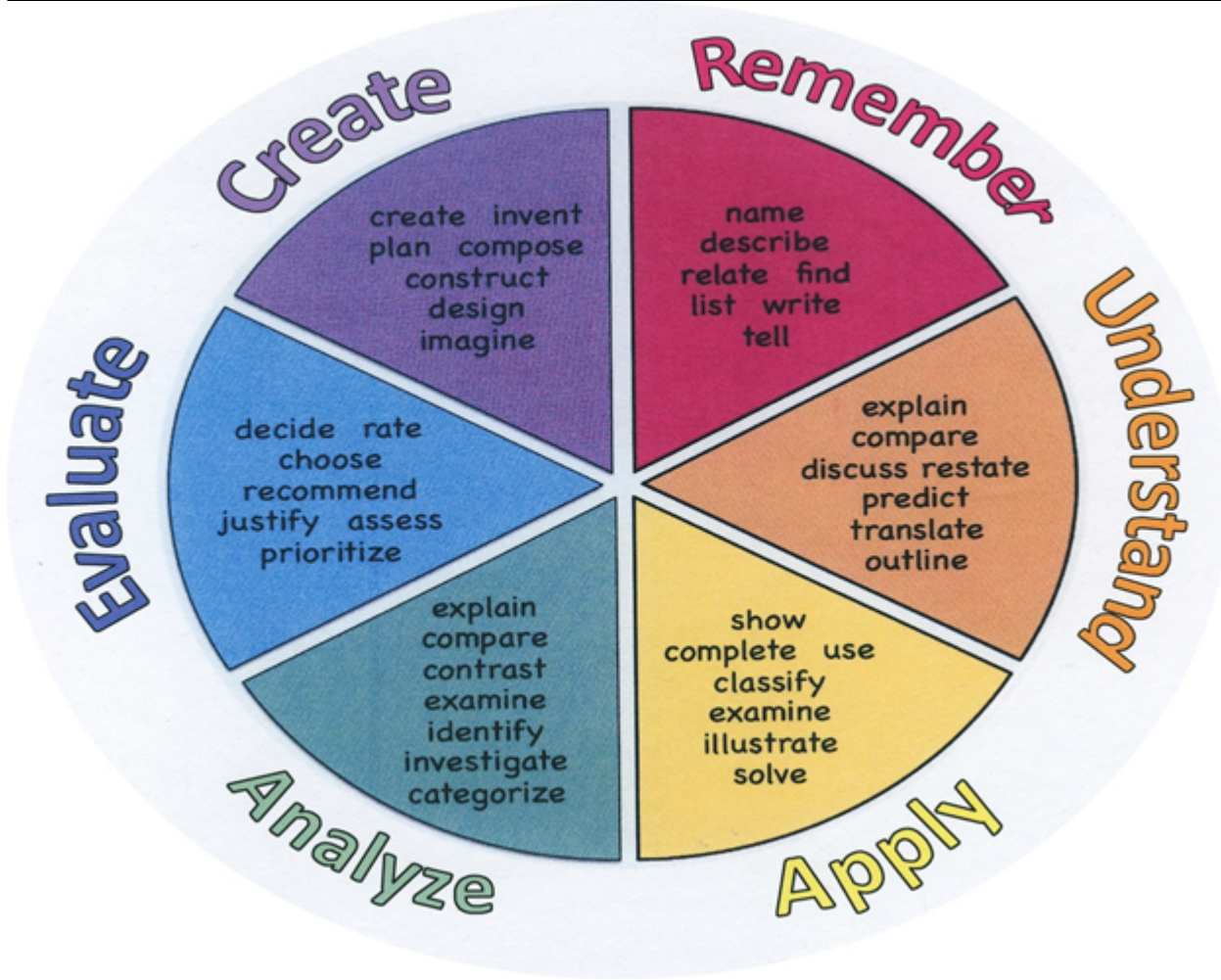
Students will be able to:

- Simplify radical expressions by using the Product property of square roots.
- Simplify radical expressions by using the Quotient property of square roots.
- Simplify radical expressions by using the Zero property of square roots.
- Perform operations with radical expressions by using a varieties of properties.
- Create a graphic organizer to compare and identify different properties with radicals.
- Add, subtract, and multiply radical expressions.
- Justify the steps in simplifying radicals using different properties.
- Apply The Pythagorean Theorem to find unknown sides and distances.
- Plan the steps in solving the real-world applications involving the Pythagorean Theorem.
- Conclude whether a triangle is a right triangle by checking the outcomes of the Pythagorean Theorem

**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	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 Reproduce	Summarize Tell Translate Associate Compute Convert Discuss Estimate Extrapolate Generalize Predict	Discover Divide Examine Graph Interpolate Manipulate Modify Operate Subtract	Separate		Reconstruct Revise Rewrite Transform
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### 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>

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/>

Radical Pracrice

<https://quizlet.com/260485139/radicals-flash-cards/>

Various Radical practice

[http://www.mdc.edu/main/images/Radical%20Expressions\\_tcm6-60836.PDF](http://www.mdc.edu/main/images/Radical%20Expressions_tcm6-60836.PDF)

<https://whenmathhappens.com/2018/08/14/concept-quiz-simplifying-radicals/>

<https://edulastic.com/>

## **Assessment Evidence - Checking for Understanding (CFU)**

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Glencoe McGraw Hill : Chapter Assessments, Midchapter Assessments (Summative) - <https://connected.mcgraw-hill.com/c2j/assetBuckets.assess.do?bookId=DFRTR2RBH9YT25W7OSMM6J3XM1&selectedCategoryId=3KTMO6D7VZ6SJ4YD3XNOQB3O44>

EAssessment test generator (Summative): <https://assess.k12.mhedu.com/Instructor/TestGenerator.aspx>

Edulastic Formative Assessments (Formative): <https://app.edulastic.com/>



## Common Benchmark #4 (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**

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Glencoe McGraw-Hill Algebra1 2014

Glencoe McGraw-Hill Algebra1 2010

Practice Glencoe Algebra1

Study Guide Glencoe Algebra1

## **Ancillary Resources**

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ALEKS

The Glencoe Personal Tutor Plus

The Glencoe Personal Tutor Plus(Spanish)

## **Technology Infusion**

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

Use graphing calculator to model problems

## Technology that may be infused into this unit to enhance learning

- Youtube
- Khan academy
- Google Classroom
- GSuite
- Kutasoftware
- PodCasts
- Twitter
- Ted Talks
- ALEKS
- 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

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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](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 Geography, Government, and Economics;
- 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

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- 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**

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

## **Differentiation**

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Glencoe -McGrawHill Resources:

*Teaching with Manipulatives: Algebra Tiles*

*Algebra Labs*

*Math Triumphs*

*Algebra 1 Study Notebook*

TI-84 Calculator Activities

**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)**

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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](https://catalog.mcgraw-hill.com/repository/private_data/DOC/50000008/74/21.pdf)

*Algebra Lab*

*Math Triumphs*

*Algebra 1 Study Notebook*

- 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
- 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)**

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The Glencoe Personal Tutor(Spanish):

Teaching Algebra with Manipulatives: [https://catalog.mcgraw-hill.com/repository/private\\_data/DOC/50000008/74/21.pdf](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 clarify
- 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 work presented 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**

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Graphing calculator(TI-84) introduction

The Glencoe Personal Tutor

Glencoe -McGrawHill Resources

*Teaching Algebra with Manipulatives: Algebra Tiles*

*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 work presented 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)**

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Glencoe Enrichment Activities

Glencoe Chapter Projects

Math Forum: Problems of the Week, Sample Lesson( Min,Max), Reasoning 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**

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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: