Unit 7 Radical Expressions

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

Algebra 1 Honors

Department of Curriculum and Instruction

Belleville Public Schools

Curriculum Guide

Algebra 1 H, Grade 8

Unit 7 Radical Expressions

Belleville Board of Education

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Unit Overview

- 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
- The students should learn how to perform operations with radicals
- The students should learn how to apply the Pythagorean Theorem to solve problems.

Enduring Understanding

- 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

- 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

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.
- Become facile with algebraic manipulation, including rearranging and collecting terms, and factoring, identifying, and canceling common factors in rational 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 (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.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.F-IF.C.7b	Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
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

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

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

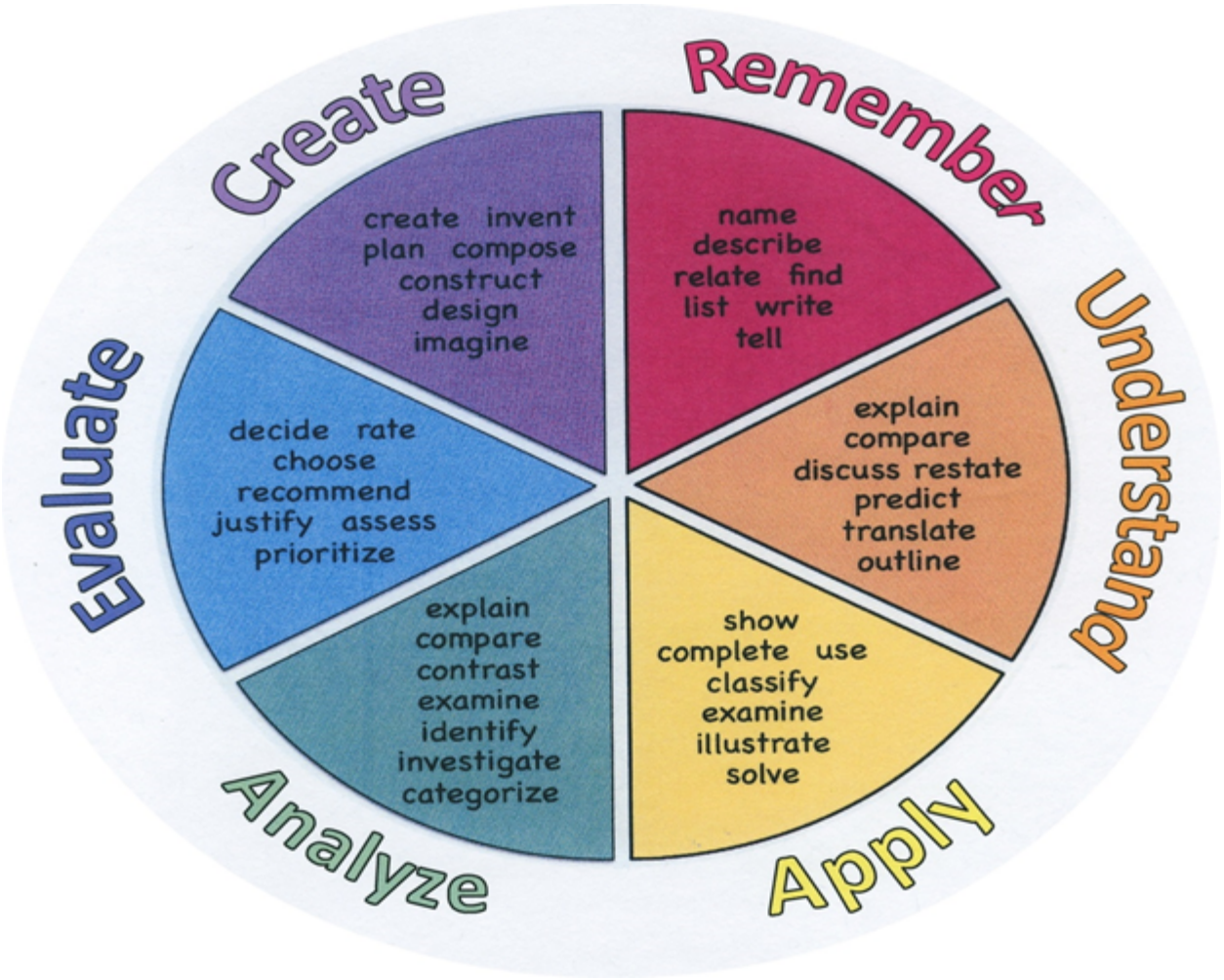
Students will be able to:

- 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.
- Arrange a varieties of the examples in different logical categories.
- Group Pythagorean triples into different set, like if (3,4,5) is Pythagorean triple then it's multiple (6,8,10) is also Pythagorean triple.

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	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

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/

Graphing Calculator, Math Resources

https://mathbits.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

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

Assessment Evidence - Checking for Understanding (CFU)

- Pythagorean Theorem https://create.kahoot.it/details/distance-formula-and-pythagorean-theorem/24706c82-10cd-4bd2-be45-a56aee603b26 (formative assessment)
- Benchmark #4 (summative assessment)
- Weekly quizzes (summative assessment)
- Homework checks (formative assessment)
- Group review (formative assessment)
- KWL chart (formative assessment)

- Self-evaluations (formative assessment)
- Create a topic presentation - teach a peer (alternative assessment)
- Take home exams (alternative assessment)

- 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

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Ancillary Resources

Glencoe Algebra 1 Tutor: Personal Tutor and Spanish Tutor

Glencore Algebra 1 Geometer's Sketchpad

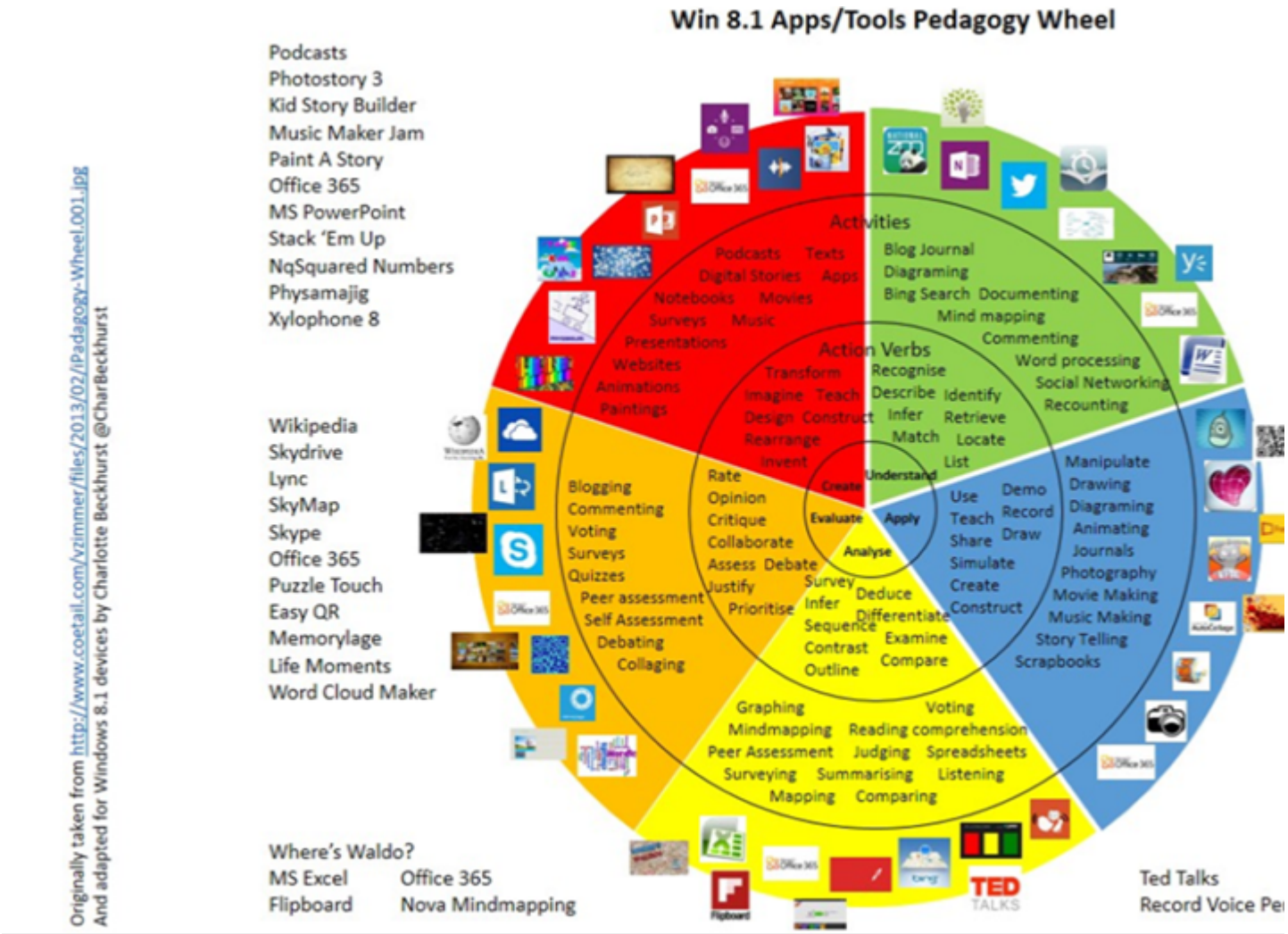
Glencoe Algebra 1 Glencoe Mathematics Secondary Series

ALEKS

Technology Infusion

- betterlesson.com https://betterlesson.com/lesson/571684/multiplying-radical-expressions?from=search
- Youtube

- Khan academy
- Edulastic
- Google Sheets
- Google Classroom
- Office 365
- Google Docs
- PodCasts
- Google Slides
- Wikipedia
- Skype
- Twitter
- Ted Talks
- QR Barcode Generator
- Calculator/Graphic calculator
- desmos.com
- geogebra.org



Alignment to 21st Century Skills & Technology

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

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.1	Evaluate the strengths and limitations of emerging technologies and their impact on educational, career, personal and or social needs.
TECH.8.2.12.D.CS2	Use and maintain technological products and systems.

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

- Civic Literacy
- Environmental Literacy

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

Differentiation

- Use of coordinate plane grid and graphing calculator TI 84 to investigate the inverse of a functions(McGraw Hill Algebra 1 textbook page 619)
- Use of TI 84 graphing calculator to compare parent functions(McGraw Hill Algebra 1 textbook page 627)
- Use of Color coding for legs and hypotenuse of right triangles

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)

Use of coordinate plane grid and graphing calculator TI 84 to investigate the inverse of a functions(McGraw Hill Algebra 1 textbook page 619)
Use of TI 84 graphing calculator to compare parent functions(McGraw Hill Algebra 1 textbook page 627)
Use of Color coding for legs and hypotenuse of right triangles

- 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)

- Use of coordinate plane grid and graphing calculator TI 84 to investigate the inverse of a functions(McGraw Hill Algebra 1 textbook page 619)
- Use of TI 84 graphing calculator to compare parent functions(McGraw Hill Algebra 1 textbook page 627)
- Use of Color coding for legs and hypotenuse of right triangles

- 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

- Use of coordinate plane grid and graphing calculator TI 84 to investigate the inverse of a functions(McGraw Hill Algebra 1 textbook page 619)
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- Use of Color coding for legs and hypotenuse of right triangles

- 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)

Activity: Using the Pythagorean Theorem to solve real life problems- https://tapintoteenminds.com/3act-math/taco-cart/

- 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: