Unit 4: Geometric Figures

Content Area: **Math**
Course(s): **Math 7 Pre-Algebra**
Time Period:
Length: **45 Days**
Status: **Published**

Title Section

Department of Curriculum and Instruction

Pre-Algebra - Grade 7

Geometric Figures

Belleville Board of Education

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Board Approved: September 23, 2019

Unit Overview

Unit 4: From this unit students will be able to draw, describe and solve problems involving two- and three-dimensional, geometric figures. Create, compare and analyze geometric figures for congruency and similarity. Students will identify noncollinear and collinear points, lines and angles. Students will use a protractor to measure angles, determine the interior and exterior angles of polygons. Students will solve for perimeter, area, and volume in a real world context. Students will explore and solve problems using the Pythagorean Theorem and its converse.

Enduring Understanding

Students will understand .....

Identify the properties of quadrilaterals and the relationship among quadrilaterals.
Angles and line segments make up geometric figures and appear around us in real life objects.
The circumference and area of a circle are related to the length of its radius.
Perimeter and area and surface area measure are two different aspects of geometric figures, and composite figures.
Determine the volume of geometric figures.
Identify objects in a plane.

Geometric figures are a model to help describe, classify, and analyze real world objects.

Two and three dimensional objects can be classified, and analyzed by their attributes such as angle measures and side lengths.

Determine the compliment/supplement of an angle.

Create models of three- dimensional figures.

How algebra can assist in solving geometric situations.

Essential Questions

How would you use angle pairs to solve problems algebraically?

Why is the study of angles and lines important to understanding our environment?

How can geometry relate to our community through architecture and urban planning?

How are angle measurements used in real-world situations?

How is the circumference of a circle related to its radius?diameter?

How does knowledge of two dimensional figures help you when working with three-dimensional figures?

Can you identify cross sections of three dimensional figures?

How do you determine the volume and surface area of composite 3-D figures?

How can the Pythagorean Theorem solve distance problems?

Exit Skills

By the end of the unit students will be able to .....

Examine relationships between pairs of angles write and solve simple equations for an unknown angle in a figure.

Use technology or ruler and protractor to draw triangles with a given lengths if possible.

Describe the two-dimensional figures that result from slicing cross sections of 3D figures.

Determine the area and circumference of a circle.

Determine area and perimeter of composite figures.

Identify 3-dimensional figures and describe the 2-D figure created by various cross sections.

Determine the volume of prisms, cylinders and composite figures.

Explore surface area of prisms and cylinders using nets of the figures.

Solve real-world problems involving perimeter, circumference, area, volume, and surface area.

Identify vertical ,adjacent, complementary and supplementary pairs of angles.

Determine relationship of two lines(parallel, perpendicular or intersecting).

Estimate angle measures.

Identify and describe geometric figures.

Draw a triangle with given measurements.

Solve for the missing distance of a right triangle.

Find the perimeter of a polygon and the circumference of a circle

Recognize and utilize area formulas for 2-D figures.

Find area of composite figures.

Identify 3-D figures and their cross sections.

Determine volume of prisms, circular cylinders, and composite figures.

Explore surface area

Determine surface area of prisms and cylinders.

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-12.6	Attend to precision.
MA.K-12.7	Look for and make use of structure.
MA.7.G.A	Draw, construct, and describe geometrical figures and describe the relationships between them.
MA.7.G.A.1	Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.
MA.7.G.A.2	Draw (with technology, with ruler and protractor, as well as freehand) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle,

	or no triangle.
MA.7.G.A.3	Describe the two-dimensional figures that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids.
MA.7.G.B.4	Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle.
MA.7.G.B.5	Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure.
MA.7.G.B.6	Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.

Interdisciplinary Connections

STEM/STEAM

Architecture/Urban Planning

Economics

Business

Science

LA.RL.7.4	Determine the meaning of words and phrases as they are used in a text, including figurative and connotative meanings; analyze the impact of rhymes and other repetitions of sounds (e.g., alliteration) on a specific verse or stanza of a poem or section of a story or drama.
LA.RI.7.4	Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the impact of a specific word choice on meaning and tone.
LA.W.7.1.B	Support claim(s) with logical reasoning and relevant evidence, using accurate, credible sources and demonstrating an understanding of the topic or text.
LA.W.7.2.D	Use precise language and domain-specific vocabulary to inform about or explain the topic.
LA.SL.7.1	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 7 topics, texts, and issues, building on others' ideas and expressing their own clearly.
LA.L.7.1	Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.
LA.L.7.2.B	Spell correctly.
6-8.MS-ESS1-2.4.1	Models can be used to represent systems and their interactions.
VPA.1.1.8.D.CS1	Art is a universal language. Visual communication through art crosses cultural and language barriers throughout time.
VPA.1.3.8.D.2	Apply various art media, art mediums, technologies, and processes in the creation of allegorical, theme-based, two- and three-dimensional works of art, using tools and

	technologies that are appropriate to the theme and goals.
VPA.1.3.8.D.CS1	The creation of art is driven by the principles of balance, harmony, unity, emphasis, proportion, and rhythm/movement.

Learning Objectives

By the end of the unit students will be able to .....

Examine relationships between pairs of angles write and solve simple equations for an unknown angle in a figure.

Use technology or ruler and protractor to draw triangles with a given lengths if possible.

Describe the two-dimensional figures that result from slicing cross sections of 3D figures.

Determine the area and circumference of a circle.

Determine area and perimeter of composite figures.

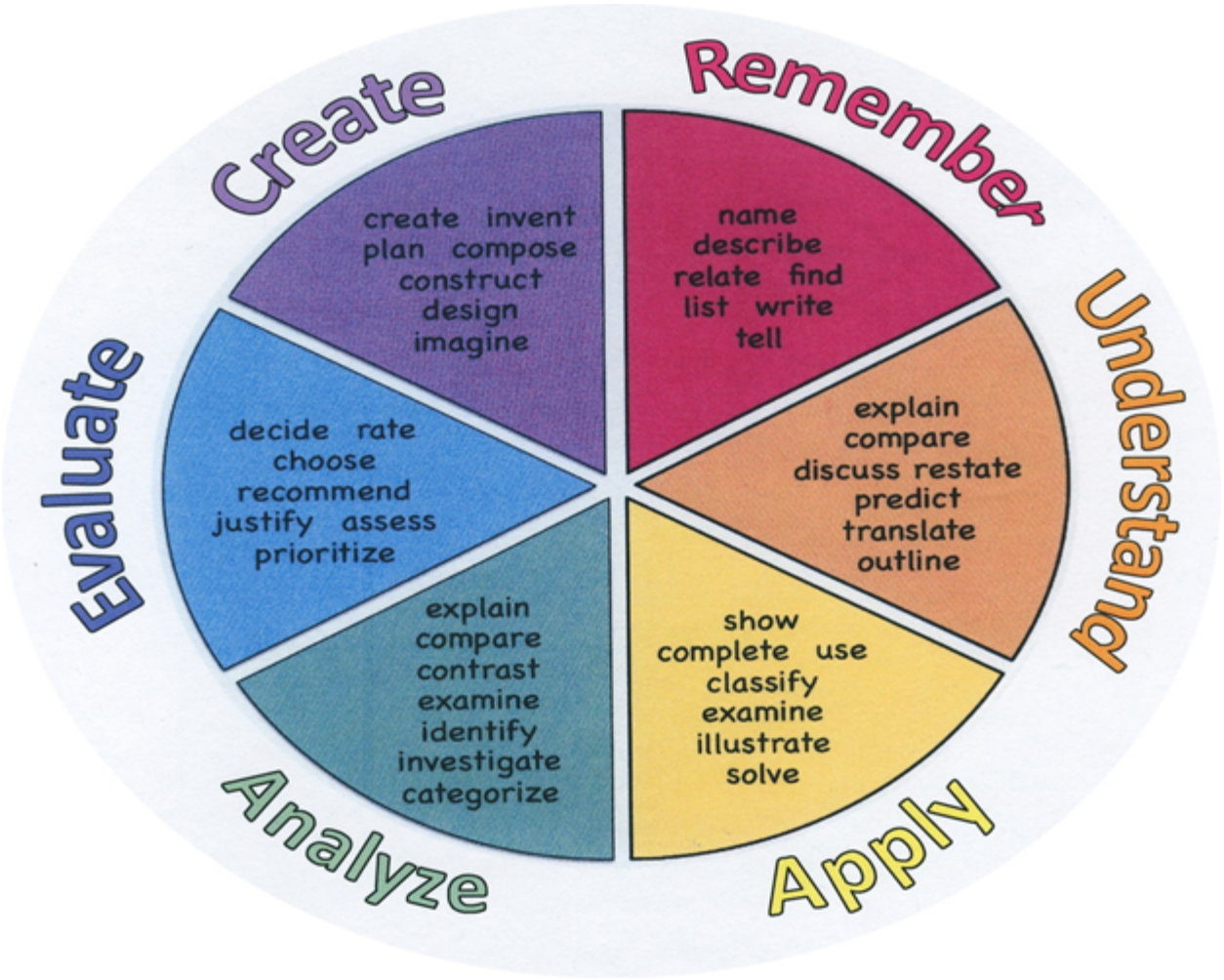
Identify 3-dimensional figures and describe the 2-D figure created by various cross sections.

Determine the volume of prisms, cylinders and composite figures.

Explore surface area of prisms and cylinders using nets of the figures.

Solve real-world problems involving perimeter, circumference, area, volume, and surface area.

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

Activity #1: Project - student locate a box and wrap it. On the gift tag, they calculate and show their work for the volume and surface area of their box.

Activity #2: Angles in Nature Project - Students collect leaves and mount on paper. Students use protractors to measure the angles, determining supplementary and complementary angles.

Activity #3: Students locate and print images of the constellations and measure the angles using a protractor.

https://my.mheducation.com/login

AI Assessment and Learning System:

https://www.aleks.com/

Angles, hockey

http://www.nbclearn.com/science-of-nhl-hockey/cuecard/56922

Videos on mathematical concepts (grade 6 - alg 2)

https://www.virtualnerd.com/

Lessonplans and instructional resources:

https://betterlesson.com/home?from=bl_landing_plans_cta

Educational animations, games and interactive math tools for middle school students

http://mathsnacks.com/

Mindset:

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

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

Math Discourse:

https://mrorr-isageek.com/start-a-math-fight/

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:(Refer to problems included in the pre-requisite skills in this document)

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

Algebra Tools - Algebra:(Refer to problems included in the pre-requisite skills in this document)

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

Quia (Quintessential Instructional Archive)- use to create or use already created online activities:

https://www.quia.com/web

Misc Mathematics materials:

http://www.mathnstuff.com/

Kahoot:

https://create.kahoot.it

Assessment Evidence - Checking for Understanding (CFU)

Entrance Ticket: Student is given a card with an angle measurement on it. Student must determine the complement and supplement of the angle.

Activity: Students select collected everyday items from a bin and use formulas to determine their volume.

Activities #1,2,3-benchmark assessments

Red Light, Green Light-formative assessment

Unit tests-summative assessment

Web-based assessment-alternate assessment

- Admit Tickets
- Anticipation Guide
- Common Benchmarks
- Compare & Contrast
- Create a Multimedia Poster
- 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
- Study Guide
- Surveys
- Teacher Observation Checklist
- Top 10 List
- Unit review/Test prep

- Unit tests
- Web-Based Assessments
- Written Reports

Primary Resources & Materials

Math Accelerated-A Pre-Algebra Program 2017 - McGraw-Hill

Math Accelerated-A Pre-Algebra Program 2017 - Digital Resources - McGraw-Hill

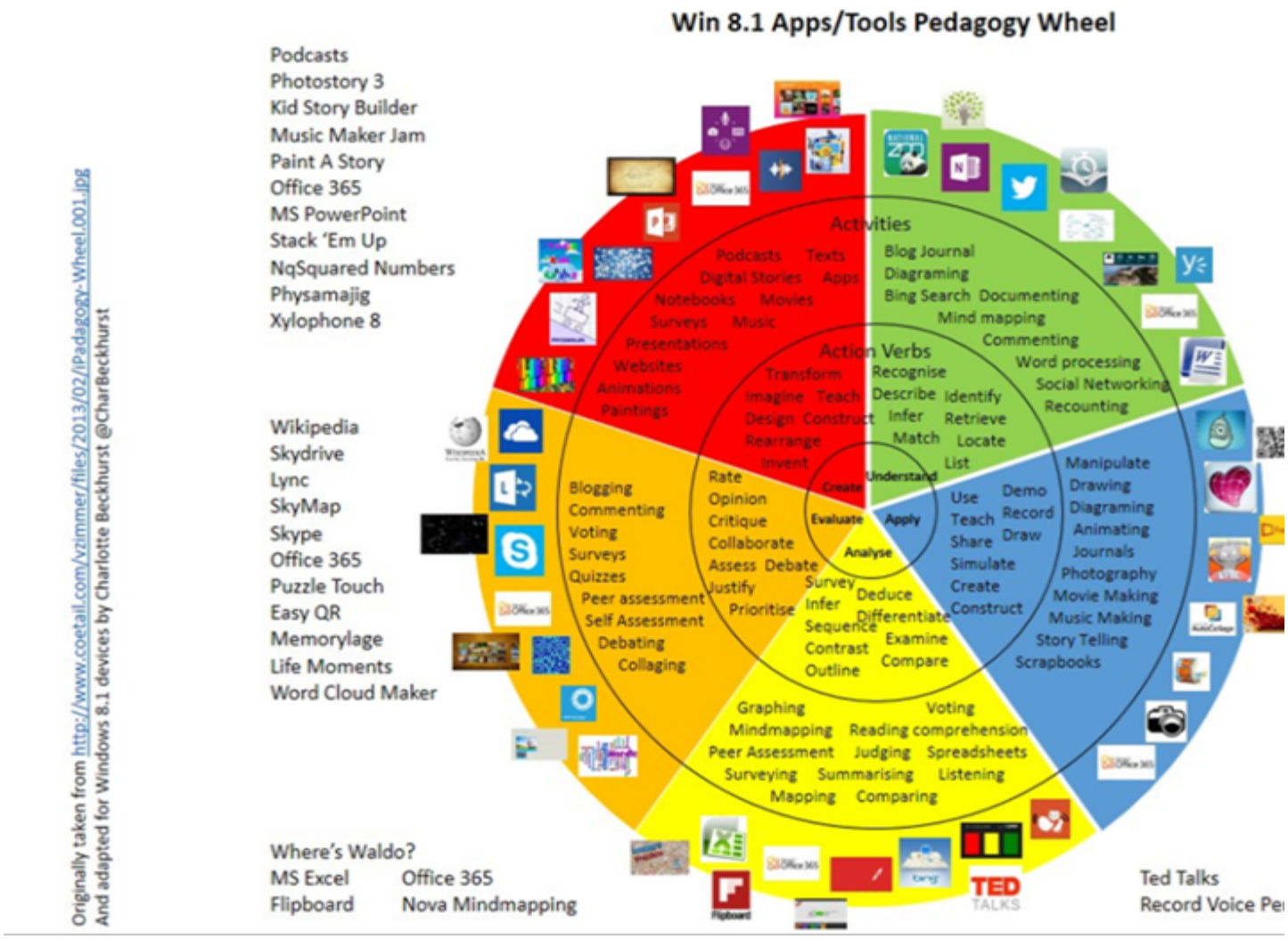
Ancillary Resources

Glencoe McGraw-Hill Algebra 1 2014

Technology Infusion

Activity - Students will use the Internet to explore occurrences of regular polygons in nature (Honey combs contain hexagons) and create a google slide to display their results.

- Calculator/Graphing calculator
- Google Classroom
- McGraw-Hill Education
- Desmos.com
- geogebra.org
- Youtube
- Khan academy
- MS Excel
- Office 365
- MS Word
- PodCasts
- MS Powerpoint
- Wikipedia
- Skype
- Twitter
- Ted Talks
- Flipgrid



Alignment to 21st Century Skills & Technology

- STEM/STEAM
- 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;

- Communication and Collaboration

- Life and Career Skills

- Critcal Thinking and Problem Solving

LA.W.7.2	Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.
LA.W.7.2.B	Develop the topic with relevant facts, definitions, concrete details, quotations, or other information and examples.
CRP.K-12.CRP1	Act as a responsible and contributing citizen and employee.
CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
CRP.K-12.CRP5	Consider the environmental, social and economic impacts of decisions.
CRP.K-12.CRP6	Demonstrate creativity and innovation.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.
CRP.K-12.CRP9	Model integrity, ethical leadership and effective management.
CRP.K-12.CRP10	Plan education and career paths aligned to personal goals.
SCI.MS-PS1-5	Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved.
VPA.1.3.8.D.2	Apply various art media, art mediums, technologies, and processes in the creation of allegorical, theme-based, two- and three-dimensional works of art, using tools and technologies that are appropriate to the theme and goals.
VPA.1.3.8.D.6	Synthesize the physical properties, processes, and techniques for visual communication in multiple art media (including digital media), and apply this knowledge to the creation of original artworks.
VPA.1.3.8.D.CS6	The visual possibilities and inherent qualities of traditional and contemporary art materials (including digital media) may inform choices about visual communication and art-making techniques.
CAEP.9.2.8.B.1	Research careers within the 16 Career Clusters ® and determine attributes of career success.
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.
CAEP.9.2.8.B.6	Demonstrate understanding of the necessary preparation and legal requirements to enter the workforce.
TECH.8.1.8.A.1	Demonstrate knowledge of a real world problem using digital tools.
TECH.8.1.8.A.3	Use and/or develop a simulation that provides an environment to solve a real world problem or theory.
TECH.8.1.8.A.4	Graph and calculate data within a spreadsheet and present a summary of the results.
TECH.8.1.8.A.CS1	Understand and use technology systems.
TECH.8.1.8.A.CS2	Select and use applications effectively and productively.
TECH.8.1.8.B.CS1	Apply existing knowledge to generate new ideas, products, or processes.
TECH.8.1.8.B.CS2	Create original works as a means of personal or group expression.
TECH.8.1.8.C.CS1	Interact, collaborate, and publish with peers, experts, or others by employing a variety of digital environments and media.

21st Century Skills/Interdisciplinary Themes

- English, Language Arts
- World languages
- Arts
- Statistics
- Economics
- Science
- Geography
- Social Studies
- Computer Science

21st Century Skills

STEM/STEAM

Global and Environmental Awareness

Problem Solving Skills

Personal Literacy

Business

Differentiation

Students work with assigned peer - using the results of entrance/exit tickets students are paired or grouped to compete the days assignment.

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)

Activity - Small Group Instruction: Students choose a simple image, to create translations, reflections and rotations.

Activity - Small Group Instruction: Student use graph paper to create nets for 3-dimensional figures and determine their area.

- 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)

Small Group Instruction: Students choose a simple image, to create translations, reflections and rotations.

- 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

Activity; Project - Students create an original comic book character and use each transformation to move the image across a coordinate plane.

- 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; Project - Students explore the work of M.C. Escher and create a simple tessellation.

- 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: