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Curriculum Guide

MATH ESSENTIALS GRADES 11-12

UNIT 7 GEOMETRY BASICS

Belleville Board of Education

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Unit Overview

Unit 7: Geometry Basics

In this unit, students should learn to simplify square roots, use the Pythagorean Theorem, identify triangles by its type of angles and number of congruent sides, draw conclusions about the congruence of triangles, identify the corresponding parts of congruent figures, find measures of angles formed by intersecting, parallel & perpendicular lines, use trigonometry to find missing side and angle measures.

Enduring Understanding

Unit Enduring Understandings: Students will understand that..

- Square roots can be rational or irrational.
- Radicals can be simplified by using the Product Property of Radicals.
- The Pythagorean Theorem is a central problem-solving tool in both Algebra and Geometry.
- The Pythagorean Theorem and its converse is related to the formula used to determine the distance between two points on the coordinate plane.
- Triangles can be classifying by its type of angles (acute, right, obtuse) and its number of congruent sides (scalene, isosceles, equilateral).
- Two triangles can be proven congruent without showing ALL corresponding parts are congruent.
- All of the corresponding parts of congruent figures are congruent.

- Facts about adjacent, vertical, supplementary, complementary angles, and angles formed by parallel lines can be used to find missing measures.
- The relationship between the sides and angles of right triangles leads to the exploration of trigonometric functions.
- Trigonometry can be used to find missing side or angle measures in right triangles.

Essential Questions

Unit Essential Questions: Students will keep considering..

- How do we know that a radical needs to be simplified?
- How can the Pythagorean Theorem be used to find missing side lengths?
- What is the relationship among the lengths of the sides of a right triangle?
- How can the Pythagorean Theorem be used to solve problems in everyday life?
- How are triangles classified?
- What relationships between sides and angles can be used to prove the congruence of triangles?
- What types of angles exist in geometry?
- What are the basic trigonometric functions used to solve right triangles?
- How is trigonometry used to solve right triangles?

Exit Skills

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

- Write radicals in simplest form.
- Use the Pythagorean Theorem to find missing the side lengths of a right triangle.
- Classify a triangle by its type of angles and number of congruent sides.
- Use postulates and theorems to prove that two triangles are congruent.
- Identify and find the measures of the corresponding parts of congruent figures.
- Use line and angle relationships to find measures of angles formed by intersecting and parallel lines.
- Use trigonometric functions to find the measures of missing angles and side lengths.

New Jersey Student Learning Standards (NJSLS-S)

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.G-CO.A.1	Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment,

	based on the undefined notions of point, line, distance along a line, and distance around a circular arc.
MA.K-12.4	Model with mathematics.
MA.G-CO.B.7	Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent.
MA.G-CO.B.8	Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions.
MA.K-12.6	Attend to precision.
MA.K-12.7	Look for and make use of structure.
MA.G-SRT.B.5	Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.
MA.G-SRT.C	Define trigonometric ratios and solve problems involving right triangles
MA.G-SRT.C.8	Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.

Interdisciplinary Connections

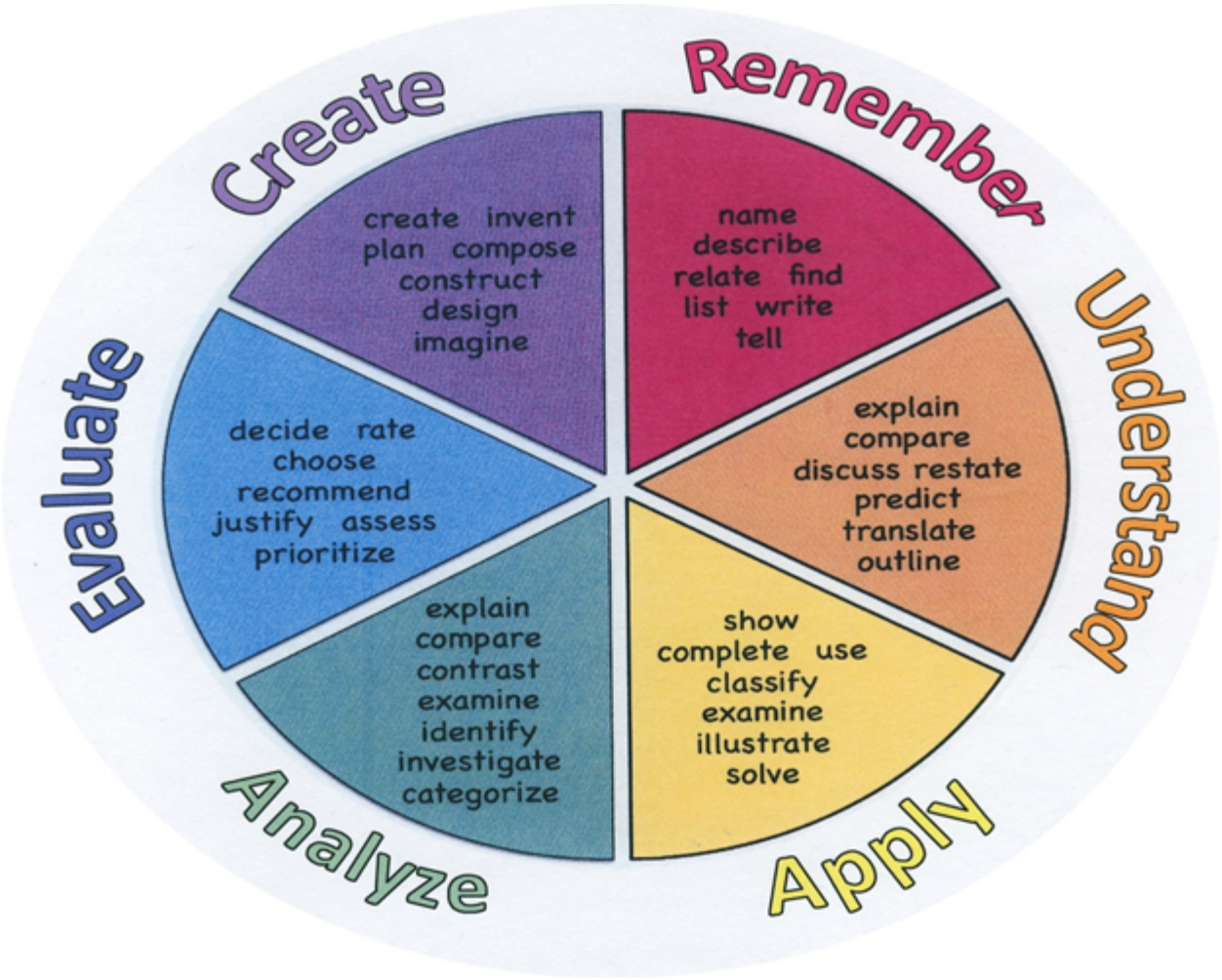
LA.RL.11-12.4	Determine the meaning of words and phrases as they are used in the text, including figurative and connotative meanings; analyze the impact of specific word choices on meaning and tone, including words with multiple meanings or language that is particularly fresh, engaging, or beautiful. (e.g., Shakespeare as well as other authors.)
LA.W.11-12.2.D	Use precise language, domain-specific vocabulary, and techniques such as metaphor, simile, and analogy to manage the complexity of the topic.
LA.SL.11-12.4	Present information, findings and supporting evidence clearly, concisely, and logically. The content, organization, development, and style are appropriate to task, purpose, and audience.
LA.L.11-12.6	Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.

Learning Objectives

Students will be able to...

- Rewrite radicals in their simplest form.
- Identify the situations where the Pythagorean Theorem can be used to find missing side lengths.
- Use the Pythagorean Theorem to find missing side lengths and to solve real-world problems.
- Determine whether a triangle is acute/obtuse/right and scalene/isosceles/equilateral.
- Justify the congruence of triangles by using postulates/theorems.
- Identify and find the measures of the corresponding sides/angles of congruent figures.
- Differentiate among the types of angles formed by parallel and intersecting lines.
- Compute the measures of the different angles formed by parallel and intersecting lines.
- Use trigonometric functions to find the missing angle/side measures of right triangles.
- Distinguish word problems and situations that use the Pythagorean Theorem from those that use trigonometry.

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

Supplemental Materials:

- khanacademy.com
- njctl.org
- coolmath.com
- mathbitsnotebook.com/
- https://parcc-assessment.org/released-items/
- https://collegereadiness.collegeboard.org/sat/practice

Assessment and Learning:

- aleks.com
- Google Forms
- edulastic.com
- Google Classroom

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

Assessment Evidence - Checking for Understanding (CFU)

Edulastic Formative Assessment (Formative)

Kahoots - Various Topics (Formative)

Glencoe McGraw-Hill EAssessment Test Generator (Summative)

Common benchmarks on OnCourse (Benchmark)

"Do Now/Exit Ticket" Activity (Formative)

- Admit Tickets
- Anticipation Guide
- Common Benchmarks
- Compare & Contrast
- Create a Multimedia Poster
- Define
- Describe
- Evaluate
- Evaluation rubrics
- Exit Tickets
- Explaining
- Illustration
- Journals
- KWL Chart
- Learning Center Activities
- Outline
- Question Stems
- Quickwrite
- Quizzes
- Red Light, Green Light
- Self- assessments
- Socratic Seminar
- Study Guide
- Teacher Observation Checklist
- Think, Pair, Share
- Think, Write, Pair, Share

- Top 10 List
- Unit review/Test prep
- Unit tests
- Web-Based Assessments

Primary Resources & Materials

- https://www.nj.gov/education/cccs/2016/math/standards.pdf
- aleks.com
- edulastic.com
- njctl.org
- Glencoe McGraw-Hill Algebra 1 2014
- Glencoe McGraw-Hill Geometry 2014
- https://accuplacer.collegeboard.org/student/practice

Ancillary Resources

- teacher-prepared worksheets, notes and slides
- ASVAB for Dummies
- collegeboard.org
- homeschoolmath.net
- Glencoe Math Accelerated 2017

Technology Infusion

Create and assign exit tickets using Google Forms

Create and display slide presentations using Google Slides

Pythagorean Theorem Interactive slider activity using Geogebra: https://www.geogebra.org/m/tZ9xwMAy

- Youtube
- Khan academy
- MS Word
- Google Slides
- Google Classroom
- Google Forms
- Edulastic
- ALEKS
- Desmos.com
- Geogebra.org

- Smart Exchange
- McGraw-Hill Education



Alignment to 21st Century Skills & 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.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.F.1	Evaluate the strengths and limitations of emerging technologies and their impact on educational, career, personal and or social needs.

21st Century Skills/Interdisciplinary Themes

- 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

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

Differentiation

GENERAL EXAMPLES INCLUDE:

Use of Glencoe virtual manipulatives: http://www.glencoe.com/sites/common_assets/mathematics/ebook_assets/vmf/VMF-Interface.html
Study Guides provided prior to tests and quizzes
Use of ALEKS for differentiated practice or extension of skills

Differentiations:

- Small group instruction
- Small group assignments
- Extra time to complete assignments
- Pairing oral instruction with visuals
- Repeat directions
- Use manipulatives
- Center-based instruction
- Study guides
- Teacher reads assessments allowed
- Scheduled breaks
- Rephrase written directions
- Multisensory approaches
- Additional time
- Preview vocabulary
- Preview content & concepts
- 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
- Group investigations
- Guided Reading
- Independent research and projects
- Interest groups
- Learning contracts
- Leveled rubrics
- 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 supplemental materials

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

Flash cards for vocabulary and new concepts
One-on-one questioning during testing to elicit responses
Use of Glencoe personal tutor or The Video Math Tutor for additional instruction

- 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 multilingual mathematics glossary including definitions in English and its translations to other languages:
https://my.hrw.com/math06_07/nsmedia/tools/glossary/msm/glossary.html
Use of Spanish instructional videos of concepts:
https://www.youtube.com/user/KhanAcademyEspanol/videos
https://www.mathtv.com/
Peer partners for assignments with students that can verbally translate material and meanings of concepts

- 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

Printed or video copy of material missed during excessive absences
Retests or test corrections of incorrect work on tests
Working contract to ensure completion of prioritized tasks

- 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)

Glencoe Enrichment Activities and Chapter Projects

Complete higher level learning problems in textbook

Complete math league sample contest problems:

https://www.mathleague.com/index.php/annualcontestinformation/samplecontests

- 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 plan to solve an issue presented in the class or in a text
- 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

Unit Name: Practice: Trigonometry and Related Word Problems

NJSLS: MA.9-12.G-SRT.C.8 Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.

Interdisciplinary Connection: Real-Life Connection: Can use trigonometric ratios to find the angle of steepness of a trail.

Statement of Objective: SWDT Use trigonometric ratios to find side and angle measures in right triangles.

Anticipatory Set/Do Now: Use trigonometry to find the missing side - examples.

Learning Activity: Review Do Now, Practice Exercises: Students complete individually or in pairs, Group Work: Students produce a booklet demonstrating three different examples of trigonometry problems, Class Discussion to Summarize.

Student Assessment/CFU's: questioning, observation, illustration

Materials: calculators, WS: Trigonometry and Related Word Problems, booklets for students to place examples, markers, colored pencils

21st Century Themes and Skills: communication, critical thinking, global awareness

Differentiation/Modifications: cooperative groups, teacher’s notes, calculator, highlighting and labeling

Integration of Technology: calculators