



SPRINGFIELD PUBLIC SCHOOLS
ENGAGING STUDENTS • FOSTERING ACHIEVEMENT • CULTIVATING 21ST CENTURY GLOBAL SKILLS

Springfield Public Schools Springfield, New Jersey 07081

Geometry Honors

Curriculum Guide

2024

This curriculum may be modified through varying materials, techniques and strategies, as per a student's IEP.

Springfield Board of Education
Approved on August 26, 2024



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**Springfield Public Schools
Springfield, New Jersey**

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Unit Overview Template

Content Area: Math	Grade Level: 9	Unit Title: Logic
Unit Summary: Students will use variables to complete truth tables and logic proofs. The two-column proof will be utilized, and used for the remainder of the year.		
Primary Interdisciplinary Connections: <i>Science and Engineering</i>		
21st Century Themes ☒ Creativity and Innovation ☒ Critical Thinking and Problem Solving ☐ ICT Literacy ☐ Information Literacy ☐ Life and Career Skills ☒ Communication and Collaboration ☐ Media Literacy		
Unit Rationale: Students will spend the rest of the year performing proofs in Euclidean Geometry. This unit gives a concrete introduction to the two-column proof.		
Career Readiness (Standard 9): 9.4.12.CI.1 - Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a). 9.4.12.CT.2 - Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a). 9.4.12.TL.3 - Analyze the effectiveness of the process and quality of collaborative environments.		

Learning Targets

Standards: G.CO; G.SRT	
Content Statements: Prove geometric theorems; Prove theorems using similarity.	
CPI#:	Cumulative Progress Indicator (CPI):
G.CO.C.9	Prove theorems about lines and angles. Theorems include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints.
G.CO.C.10	Prove theorems about triangles. Theorems include: measures of interior angles of a triangle sum to 180°; base angles of isosceles triangles are congruent; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point.
G.CO.C.11	Prove theorems about parallelograms. Theorems include: opposite sides are congruent, opposite angles are congruent, the diagonals of a parallelogram bisect each other, and conversely, rectangles are parallelograms with congruent diagonals.
G.SRT.B.4	Prove theorems about triangles. Theorems include: a line parallel to one side of a triangle divides the other two proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity.
G.SRT.B.5	Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.
SEL.PK-12.2.2	Recognize the skills needed to establish and achieve personal and educational goals.



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SEL.PK-12.4.1	Develop, implement and model effective problem-solving, and critical thinking skills.
SEL.PK-12.5.2	Utilize positive communication and social skills to interact effectively with others.
HS-ETS1-2	Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
8.2.12.ITH.3	Analyze the impact that globalization, social media, and access to open source technologies has had on innovation and on a society's economy, politics, and culture.

Unit Essential Questions:

- What is a truth table and what does it show?
- How do we manipulate conditional statements?
- How do we use symbolic logic?
- How do we perform symbolic proofs?

Unit Enduring Understandings:

- How logic is used and who uses it.
- What a truth table shows.
- What conditional statements tell us.

Unit Learning Targets:

Students will.... understand and perform logic proofs.



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Evidence of Learning

Summative Assessment: Logic Laws Assessment

Equipment Needed: Desmos

Teacher Resources: Desmos Activities, Problem Set, Textbook

Formative Assessments:

- Class work
- Homework
- Vocab Pop Quizzes
- Quizzes
- Exam



Lesson Plans

Lesson	Time Frame
Lesson 1 What is a Truth Table?	1 day
Lesson 2 Theorems in Symbolic Logic	1 day
Lesson 3 Proofs in Symbolic Logic	1 day

Teacher Notes: When doing logic proofs with theorems, use "the first," "the second," etc when referring to variables.

Curriculum Development Resources/Technology Resources:

Click the links below to access additional resources used to design this unit:

www.deltamath.com

www.desmos.com

www.kutasoftware.com

<https://tasks.illustrativemathematics.org/content-standards>

<https://nj.digitalitemlibrary.com/home>

<https://resources.newmeridiancorp.org/released-items/>



Lesson Plan 1 Template

Content Area: Math Lesson Title: What is a Truth Table? Time Frame: 1 day

Lesson Components

21st Century Themes

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

21st Century Skills

- ☐ Creativity and Innovation ☒ Critical Thinking and Problem Solving ☐ Information Literacy
☐ Life and Career Skills ☐ Communication and Collaboration ☐ Media Literacy ☐ ICT Literacy

Interdisciplinary Connections:

Science and Engineering

Integration of Technology:

Desmos

Equipment Needed:

Projector, laptop

Goals/Objectives	Learning Activities/ Instructional Strategies	Formative Assessment Tasks
Students will: - Decide truth value combinations for multiple variables. - Complete truth tables for different situations.	Lesson Sequence - Students will lead the class discussion on what logic is. Students will pair-share, then come back as a whole group to discuss. - The teacher will work with students to build a Truth Table. - The teacher asks students to determine the truth values for different combinations of connectives (AND, OR, NOT, IF...THEN) - What are symbolic manipulations in logic? - Desmos activity: How do we apply truth tables to circuit board logic?	- Class discussion - Form a truth table - Recognize logically equivalent statements - Desmos activity



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Differentiation:

Fill out certain cells in a truth table prior to class.

Resources Provided:

- Textbook
- Problem set



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Lesson Plan 2 Template

Content Area: Math Lesson Title: Theorems in Symbolic Logic Time Frame: 1 day

Lesson Components

21st Century Themes

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

21st Century Skills

- ☐ Creativity and Innovation ☒ Critical Thinking and Problem Solving ☐ Information Literacy
☐ Life and Career Skills ☐ Communication and Collaboration ☐ Media Literacy ☐ ICT Literacy

Interdisciplinary Connections:

Science and Engineering

Integration of Technology:

Desmos

Equipment Needed:

Projector, laptop

Goals/Objectives	Learning Activities/ Instructional Strategies	Formative Assessment Tasks
Students will: - Derive the Laws of Logic. - Students will recognize the Laws of Logic. - Students will memorize the Law of Logic. - Students will apply the Laws of Logic.	Lesson Sequence - What conclusions can you draw from certain conditions? - How do you recognize the Laws of Logic? - Use the terms "the first" "the second" "the third" when working through proofs. - The students will work out a Desmos activity applying geometric concepts to the logic laws.	- Class work. - Can students recognize the Laws? - Can students recite the Laws from memory? - Quiz
Differentiation: Post the Logic Laws in the room.		
Resources Provided: - Textbook - Problem set		



Lesson Plan 3 Template		
Content Area: Math	Lesson Title: Proofs in Symbolic Logic	Time Frame: 1 day
Lesson Components		
<u>21st Century Themes</u>		
☐ Global Awareness ☐ Financial, Economic, Business and Entrepreneurial Literacy ☒ Civic Literacy ☐ Health Literacy		
<u>21st Century Skills</u>		
☐ Creativity and Innovation ☒ Critical Thinking and Problem Solving ☐ Information Literacy ☐ Life and Career Skills ☐ Communication and Collaboration ☐ Media Literacy ☐ ICT Literacy		
Interdisciplinary Connections: Science and Engineering		
Integration of Technology: Desmos		
Equipment Needed: Projector, laptop		

Goals/Objectives	Learning Activities/ Instructional Strategies	Formative Assessment Tasks
Students will: • Apply the Laws of Logic to symbolic proofs. • Change English sentences to symbolic logic.	Lesson Sequence 1. The students review the Laws of Logic using the words “the first... the second...” 2. The students then are given their first symbolic proof to solve in pairs. The teacher circulates while students apply the Laws of Logic. 3. How do you use given information in the right sequence? 4. How do you rewrite English sentences into symbolic logic? 5. Work through examples with students. 6. Allow students ample time to work on examples on their own.	• Class work. • Can students follow a proof done together? • Can students perform proofs on their own? • Can students change English sentences into symbolic logic?



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Differentiation:

The Logic Laws are written in the room.

Resources Provided:

- Textbook
- Problem set



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Lesson Reflection

Reflect on the lesson you have developed and rate the degree to which the lesson *Strongly*, *Moderately* or *Weakly* meets the criteria below.

Lesson Activities	Strongly	Moderately	Weakly
Are challenging Strongly and require higher-order thinking and problem-solving skills	☒	☐	☐
Allow for student choice	☐	☒	☐
Provide scaffolding for acquiring targeted knowledge/skills	☐	☒	☐
Integrate global perspectives	☐	☒	☐
Integrate 21st-century skills	☐	☒	☐
Provide opportunities for interdisciplinary connection and transfer of knowledge and skills	☐	☒	☐
Foster student use of technology as a tool to develop critical thinking, creativity, and innovation skills	☐	☒	☐
Are varied to address different student learning styles and preferences	☐	☒	☐
Are differentiated based on student needs	☐	☒	☐
Are student-centered with the teacher acting as a facilitator and co-learner during the teaching and learning process	☒	☐	☐
Provide means for students to demonstrate knowledge and skills and progress in meeting learning goals and objectives	☒	☐	☐
Provide opportunities for student reflection and self-assessment	☒	☐	☐
Provide data to inform and adjust instruction to better meet the varying needs of learners	☒	☐	☐

Curriculum Design Template

Content Area: Math	Grade Level: 9	Unit Title: Logic
Created: 2024		Board Approved on:



Unit Overview Template

Content Area: Math **Grade Level:** 9 **Unit Title:** Triangle Congruence Proofs

Unit Summary: Students will use the language of Euclidean Geometry to prove facts in Euclidean Geometry. Students will extend proofs beyond just proving triangle congruent, such as proving lines are parallel and proving quadrilaterals.

Primary Interdisciplinary Connections: *Science and Engineering*

21st Century Themes ☐ Creativity and Innovation ☒ Critical Thinking and Problem Solving ☐ ICT Literacy
☐ Information Literacy ☐ Life and Career Skills ☐ Communication and Collaboration ☐ Media Literacy

Unit Rationale: The study of congruent figures allows for the further development of the linkage between algebra and geometry, and the further development of each student's ability to work with proof.

Career Readiness (Standard 9):

9.4.12.CI.1 - Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).

9.4.12.CT.2 - Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).

9.4.12.TL.3 - Analyze the effectiveness of the process and quality of collaborative environments.

Learning Targets

Standards: G.CO; G.SRT

Content Statements: Understand congruence in terms of rigid motion; Prove geometric theorems; Prove theorems involving similarity

CPI#:	Cumulative Progress Indicator (CPI):
G.CO.B.6	Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure; given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent.
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.
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.
G.CO.C.9	Prove theorems about lines and angles. Theorems include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints.
G.CO.C.10	Prove theorems about triangles. Theorems include: measures of interior angles of a triangle sum to 180°; base angles of isosceles triangles are congruent; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point.



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G.CO.C.11	Prove theorems about parallelograms. Theorems include: opposite sides are congruent, opposite angles are congruent, the diagonals of a parallelogram bisect each other, and conversely, rectangles are parallelograms with congruent diagonals.
G.SRT.B.4	Prove theorems about triangles. Theorems include: a line parallel to one side of a triangle divides the other two proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity.
G.SRT.B.5	Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.
SEL.PK-12.2.2	Recognize the skills needed to establish and achieve personal and educational goals.
SEL.PK-12.4.1	Develop, implement and model effective problem-solving, and critical thinking skills.
SEL.PK-12.5.2	Utilize positive communication and social skills to interact effectively with others.
HS-ETS1-2	Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
8.2.12.ITH.3	Analyze the impact that globalization, social media, and access to open source technologies has had on innovation and on a society's economy, politics, and culture.
Unit Essential Questions: • What are definitions in Euclidean Geometry? • How do you prove triangles are congruent? • How do you use congruent triangles to prove other objects are congruent?	
Unit Enduring Understandings: • Proper format of a two column proof. • How to use given information and a diagram. • How to create diagrams based on given information.	
Unit Learning Targets: <i>Students will....develop theorems in Euclidean Geometry to complete a two column proof.</i>	



Evidence of Learning

Summative Assessment: Triangle Congruence Proof Assessment

Equipment Needed: Desmos, Problem Set

Teacher Resources: Laptop, textbook

Formative Assessments:

- Class work
- Homework
- Vocab Pop Quizzes
- Quizzes
- Exam



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Lesson Plans

Lesson	Time Frame
Lesson 1 Definitions in Euclidean Geometry	1 day
Lesson 2 What are Congruent Triangles?	1 day
Lesson 3 Beyond Triangle Congruence Proofs	1 day

Teacher Notes: Definitions are very important for developing the theorems and completing proofs.

Curriculum Development Resources/Technology Resources:

Click the links below to access additional resources used to design this unit:

www.deltamath.com

www.desmos.com

www.kutasoftware.com

<https://tasks.illustrativemathematics.org/content-standards>

<https://nj.digitalitemlibrary.com/home>

<https://resources.newmeridiancorp.org/released-items/>



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Lesson Plan 1 Template

Content Area: Math Lesson Title: Definitions in Euclidean Geometry Time Frame: 1 day

Lesson Components

21st Century Themes

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

21st Century Skills

- ☐ Creativity and Innovation ☒ Critical Thinking and Problem Solving ☐ Information Literacy
☐ Life and Career Skills ☐ Communication and Collaboration ☐ Media Literacy ☐ ICT Literacy

Interdisciplinary Connections:

Science and Engineering

Integration of Technology:

Desmos

Equipment Needed:

Projector, laptop

Goals/Objectives	Learning Activities/ Instructional Strategies	Formative Assessment Tasks
Students will: - Determine definitions based on undefined terms. - Memorize definitions. - Solve for measures of special angles.	Lesson Sequence - Discuss undefined terms: point, line, and plane. - Students then develop definitions based on the undefined terms of geometric constructs. - Discuss special angle pairs. Students should determine different visual examples in pairs. - Ask students to then work in pairs to determine properties of special triangles. - Using Desmos, solve problems with special angle pairs and special triangles.	- Class work - Formation of definitions - Homework
Differentiation: Word wall posted in the room.		
Resources Provided: Textbook		



Lesson Plan 2 Template

Content Area: Math Lesson Title: What are Congruent Triangles? Time Frame: 1 day

Lesson Components

21st Century Themes

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

21st Century Skills

- ☐ Creativity and Innovation ☒ Critical Thinking and Problem Solving ☐ Information Literacy
☐ Life and Career Skills ☐ Communication and Collaboration ☐ Media Literacy ☐ ICT Literacy

Interdisciplinary Connections:

Science and Engineering

Integration of Technology:

Desmos

Equipment Needed:

Projector, laptop

Goals/Objectives	Learning Activities/ Instructional Strategies	Formative Assessment Tasks
Students will: - Decide what it means to have congruent triangles. - Figure out shortcuts to prove triangles are congruent. - Form two column proofs. - Use two column proofs to prove triangles are congruent.	Lesson Sequence - Students work on a Desmos activity to determine how the pairs of triangles are congruent. - How can we force triangles to be congruent? - How do we use given information and a diagram to prove triangles are congruent? - While in pairs, ask students to draw and mark pairs of congruent triangles using SAS, ASA, and SSS. Circulate and ask students to draw their examples on the board.	- Homework - Class work - Quiz



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- | | | |
|--|---|--|
| | <ol style="list-style-type: none">5. Work out examples together.6. Students then work on examples by themselves. | |
|--|---|--|

Differentiation:

- Leveled assessments
- Modified Assignments
- Rule Sheet

Resources Provided:

- Textbook



Lesson Plan 3 Template

Content Area: Math Lesson Title: Beyond Triangle Congruence Proofs Time Frame: 1 day

Lesson Components

21st Century Themes

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

21st Century Skills

- ☐ Creativity and Innovation ☒ Critical Thinking and Problem Solving ☐ Information Literacy
☐ Life and Career Skills ☐ Communication and Collaboration ☐ Media Literacy ☐ ICT Literacy

Interdisciplinary Connections:

Science and Engineering

Integration of Technology:

Desmos

Equipment Needed:

Projector, laptop

Goals/Objectives	Learning Activities/ Instructional Strategies	Formative Assessment Tasks
Students will: • Complete double triangle congruence proofs. • Prove line segments are congruent. • Prove angles are congruent. • Prove corresponding parts of congruent triangles are congruent.	Lesson Sequence 1. Ask the students: Once you prove triangles are congruent, what else is congruent in a diagram? 2. As students deductively derive theorems, each student should create a Page of Reasons in their notebook. 3. Have students work in small groups of 3 to solve a series of proofs. Circulate the room and ensure students come up with theorems using proper terms. 4. Come back together as a whole class to formally rewrite the theorems that students came up with by using common language all students agree with.	• Homework • Class work • Quiz



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Differentiation:

Page of Reasons is posted in class so students can reference it.
Leveled assessments.

Resources Provided:

- Textbook



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Lesson Reflection

Reflect on the lesson you have developed and rate the degree to which the lesson *Strongly, Moderately* or *Weakly* meets the criteria below.

Lesson Activities	Strongly	Moderately	Weakly
Are challenging Strongly and require higher order thinking and problem solving skills	☒	☐	☐
Allow for student choice	☐	☒	☐
Provide scaffolding for acquiring targeted knowledge/skills	☒	☐	☐
Integrate global perspectives	☐	☒	☐
Integrate 21st century skills	☐	☒	☐
Provide opportunities for interdisciplinary connection and transfer of knowledge and skills	☐	☒	☐
Foster student use of technology as a tool to develop critical thinking, creativity and innovation skills	☐	☒	☐
Are varied to address different student learning styles and preferences	☐	☒	☐
Are differentiated based on student needs	☒	☐	☐
Are student-centered with teacher acting as a facilitator and co-learner during the teaching and learning process	☒	☐	☐
Provide means for students to demonstrate knowledge and skills and progress in meeting learning goals and objectives	☒	☐	☐
Provide opportunities for student reflection and self- assessment	☒	☐	☐
Provide data to inform and adjust instruction to better meet the varying needs of learners	☒	☐	☐

Curriculum Design Template

Content Area: Math	Grade Level: 9	Unit Title: Triangle Congruence Proofs
Created: 2024	Board Approved on:	



Unit Overview Template

Content Area: Math **Grade Level:** 9 **Unit Title:** Coordinate Geometry Proofs and Transformations

Unit Summary: Students will perform coordinate proofs, as well as find areas and complete transformations on the plane.

Primary Interdisciplinary Connections: *Science and Engineering*

21st Century Themes ☒ Creativity and Innovation ☒ Critical Thinking and Problem Solving ☐ ICT Literacy
☐ Information Literacy ☐ Life and Career Skills ☐ Communication and Collaboration ☐ Media Literacy

Unit Rationale: Students will connect previous topics on proving shapes with coordinate geometry, which is a vital part of mathematics as a whole.

Career Readiness (Standard 9):

9.4.12.CI.1 - Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).

9.4.12.CT.2 - Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).

9.4.12.TL.3 - Analyze the effectiveness of the process and quality of collaborative environments.

Learning Targets

Standards: G.GPE; G.CO; G.SRT

Content Statements: Understand similarity in terms of similarity transformations; Prove theorems involving similarity; Use coordinates to prove simple geometric theorems algebraically; Prove geometric theorems; Experiment with transformations in the plane; Understand congruence in terms of rigid motion.

CPI#:	Cumulative Progress Indicator (CPI):
G.GPE.B.4	Use coordinates to prove simple geometric theorems algebraically. For example, prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle; prove or disprove that the point $(1, \sqrt{3})$ lies on the circle centered at the origin and containing the point $(0, 2)$.
G.GPE.B.7	Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.
G.CO.C.9	Prove theorems about lines and angles. Theorems include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints.
G.CO.C.10	Prove theorems about triangles. Theorems include: measures of interior angles of a triangle sum to 180° ; base angles of isosceles triangles are congruent; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point.
G.CO.C.11	Prove theorems about parallelograms. Theorems include: opposite sides are congruent, opposite angles are congruent, the diagonals of a parallelogram bisect



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	each other, and conversely, rectangles are parallelograms with congruent diagonals.
G.SRT.A.1	Verify experimentally the properties of dilations given by a center and a scale factor: - A dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged. - The dilation of a line segment is longer or shorter in the ratio given by the scale factor.
G.SRT.B.4	Prove theorems about triangles. Theorems include: a line parallel to one side of a triangle divides the other two proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity.
G.SRT.B.5	Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.
G.GPE.B.5	Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point).
G.GPE.B.6	(+) Find the point on a directed line segment between two given points that partitions the segment in a given ratio.
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.
G.CO.A.2	Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch).
G.CO.A.3	Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.
G.CO.A.4	Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.
G.CO.A.5	Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another.
G.CO.B.6	Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure; given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent.
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.
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.
SEL.PK-12.2.2	Recognize the skills needed to establish and achieve personal and educational goals.



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SEL.PK-12.4.1	Develop, implement and model effective problem-solving, and critical thinking skills.
SEL.PK-12.5.2	Utilize positive communication and social skills to interact effectively with others.
HS-ETS1-2	Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
8.2.12.ITH.3	Analyze the impact that globalization, social media, and access to open source technologies has had on innovation and on a society's economy, politics, and culture.

Unit Essential Questions:

- How do we classify quadrilaterals?
- How do you prove you have a special quadrilateral in coordinate geometry?
- What does the parallel postulate tell us about quadrilaterals?

Unit Enduring Understandings:

- Classifying quadrilaterals.
- Proving special quadrilaterals.
- Plotting quadrilaterals.
- Using slope, distance formula, and midpoint formula.

Unit Learning Targets:

*Students will....*develop methods to prove each quadrilateral using coordinates.



Evidence of Learning

Summative Assessment: Coordinates Assessment

Equipment Needed: Desmos

Teacher Resources: Desmos, graph paper

Formative Assessments:

- Homework
- Class discussions
- Class work
- Quizzes
- Pop Quizzes
- Exam



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ENGAGING STUDENTS • FOSTERING ACHIEVEMENT • CULTIVATING 21ST CENTURY GLOBAL SKILLS

Lesson Plans

Lesson	Time Frame
Lesson 1 Prove Quadrilaterals With the Distance Formula	1 day
Lesson 2 Prove Quadrilaterals With the Slope Formula	1 day
Lesson 3 Prove Quadrilaterals With the Midpoint Formula	1 day

Teacher Notes: Students should draw figures in their notebooks to appreciate how to draw them using graph paper.

Curriculum Development Resources/Technology Resources:

Click the links below to access additional resources used to design this unit:

www.deltamath.com

www.desmos.com

www.kutasoftware.com

<https://tasks.illustrativemathematics.org/content-standards>

<https://nj.digitalitemlibrary.com/home>

<https://resources.newmeridiancorp.org/released-items/>



Lesson Plan 1 Template

Content Area: Math Lesson Title: Prove Quadrilaterals With the Distance Formula Time Frame: 1 day

Lesson Components

21st Century Themes

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

21st Century Skills

- ☒ Creativity and Innovation ☒ Critical Thinking and Problem Solving ☐ Information Literacy
☐ Life and Career Skills ☐ Communication and Collaboration ☐ Media Literacy ☐ ICT Literacy

Interdisciplinary Connections:

Science and Engineering

Integration of Technology:

Desmos

Equipment Needed:

Projector, laptop

Goals/Objectives	Learning Activities/ Instructional Strategies	Formative Assessment Tasks
Students will: - Plot quadrilaterals. - Develop the distance formula. - Identify special properties of quadrilaterals. - Identify similarities and differences between special types.	Lesson Sequence - Students will first plot points and count distances. - Students will then develop the distance formula. - Students will then apply the distance formula to pairs of points. - How do you prove you have a parallelogram/rhombus using distance? - Develop the criteria to prove each quadrilateral. - Work through examples on Desmos.	- Can students plot quadrilaterals? - Can students use the distance formula? - Can students apply the distance formula to proofs? - Homework
Differentiation: Use of technology to assist drawings, formulas on the board, word wall		
Resources Provided: - Textbook - Graph paper		



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Lesson Plan 2 Template

Content Area: Math Lesson Title: Prove Quadrilaterals With the Slope Formula Time Frame: 1 day

Lesson Components

21st Century Themes

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

21st Century Skills

- ☒ Creativity and Innovation ☒ Critical Thinking and Problem Solving ☐ Information Literacy
☐ Life and Career Skills ☐ Communication and Collaboration ☐ Media Literacy ☐ ICT Literacy

Interdisciplinary Connections:

Science and Engineering

Integration of Technology:

Desmos, graphing calculators

Equipment Needed:

Projector, laptop

Goals/Objectives	Learning Activities/ Instructional Strategies	Formative Assessment Tasks
Students will: - Identify how to calculate slope. - Decide how slope is used to prove quadrilaterals. - Identify what kind of an answer slope gives you. - Decide what kind of lines have special slopes.	Lesson Sequence - Ask students to pair-share to recall how to calculate slope. - Class discussion on what slope describes, and how to use it. - Why is slope important for quadrilaterals? - How do you use slope to prove a parallelogram, trapezoid, square, rhombus? Break students into groups of 3 to determine theorems. - Complete the Desmos activity on proving quadrilaterals with slope.	- Classwork - Proofs - Discussion - Homework
Differentiation: Alternate way to get slope is to plot and count, formulas on the board, word wall.		
Resources Provided: - Graph paper - Textbook		



Lesson Plan 3 Template

Content Area: Math Lesson Title: Prove Quadrilaterals With the Midpoint Formula Time Frame: 1 day

Lesson Components

21st Century Themes

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

21st Century Skills

- ☒ Creativity and Innovation
 ☒ Critical Thinking and Problem Solving
 ☐ Information Literacy
☐ Life and Career Skills
☐ Communication and Collaboration
☐ Media Literacy
☐ ICT Literacy

Interdisciplinary Connections:

Science and Engineering

Integration of Technology:

Desmos

Equipment Needed:

Projector, laptop

Goals/Objectives	Learning Activities/ Instructional Strategies	Formative Assessment Tasks
Students will: - Derive the midpoint formula. - Apply the midpoint formula. - Use the midpoint formula to prove a parallelogram.	Lesson Sequence - Ask students: what is a midpoint? - Pair students together to determine how to calculate the midpoint of two points. Ask students to come up with the formula. - Find the midpoint of the diagonals of a quadrilateral. - If the midpoints are the same, the diagonal bisect each other. - Extend to the “midpoint” of a triangle. How many different types of points can you find?	- Homeworks - Class discussion - Class work



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Differentiation:

Alternate method for calculating midpoint is to use a graph, formulas on the board, word wall.

Resources Provided:

- Textbook
- Graph paper



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Lesson Reflection

Reflect on the lesson you have developed and rate the degree to which the lesson *Strongly, Moderately* or *Weakly* meets the criteria below.

Lesson Activities	Strongly	Moderately	Weakly
Are challenging Strongly and require higher-order thinking and problem-solving skills	☒	☐	☐
Allow for student choice	☐	☒	☐
Provide scaffolding for acquiring targeted knowledge/skills	☐	☒	☐
Integrate global perspectives	☐	☒	☐
Integrate 21st century skills	☐	☒	☐
Provide opportunities for interdisciplinary connection and transfer of knowledge and skills	☐	☒	☐
Foster student use of technology as a tool to develop critical thinking, creativity and innovation skills	☐	☒	☐
Are varied to address different student learning styles and preferences	☒	☐	☐
Are differentiated based on student needs	☒	☐	☐
Are student-centered with teacher acting as a facilitator and co-learner during the teaching and learning process	☒	☐	☐
Provide means for students to demonstrate knowledge and skills and progress in meeting learning goals and objectives	☒	☐	☐
Provide opportunities for student reflection and self-assessment	☒	☐	☐
Provide data to inform and adjust instruction to better meet the varying needs of learners	☒	☐	☐

Curriculum Design Template

Content Area: Math	Grade Level: 9	Unit Title: Coordinate Geometry Proofs and Transformations
Created: 2024	Board Approved on:	



Unit Overview Template

Content Area: Math	Grade Level: 9	Unit Title: Indirect Proofs
Unit Summary: Students will use the language of Euclidean Geometry to prove statements false. Students will extend their knowledge of geometric concepts using these indirect proofs.		
Primary Interdisciplinary Connections: <i>Science and Engineering</i>		
21st Century Themes ☐ Creativity and Innovation ☒ Critical Thinking and Problem Solving ☐ ICT Literacy ☐ Information Literacy ☐ Life and Career Skills ☐ Communication and Collaboration ☐ Media Literacy		
Unit Rationale: This unit goes more in depth with congruence proofs, triangle properties, and proving theorems. Students will have more practice looking at geometric theorems.		
Career Readiness (Standard 9): 9.4.12.CI.1 - Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a). 9.4.12.CT.2 - Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a). 9.4.12.TL.3 - Analyze the effectiveness of the process and quality of collaborative environments.		

Learning Targets

Standards: G.CO; G.SRT	
Content Statements: Prove Geometric Theorems; Prove theorems involving similarity.	
CPI#:	Cumulative Progress Indicator (CPI):
G.CO.C.9	Prove theorems about lines and angles. Theorems include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints.
G.CO.C.10	Prove theorems about triangles. Theorems include: measures of interior angles of a triangle sum to 180°; base angles of isosceles triangles are congruent; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point.
G.SRT.B.5	Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.
SEL.PK-12.2.2	Recognize the skills needed to establish and achieve personal and educational goals.
SEL.PK-12.4.1	Develop, implement and model effective problem-solving, and critical thinking skills.
SEL.PK-12.5.2	Utilize positive communication and social skills to interact effectively with others.
HS-ETS1-2	Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.



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8.2.12.ITH.3

Analyze the impact that globalization, social media, and access to open source technologies has had on innovation and on a society's economy, politics, and culture.

Unit Essential Questions:

- How do you prove someone innocent of a crime?
- How do you prove triangles are not congruent?
- How do you prove line segments are not congruent? Angles?
- How do you prove line segments to not be perpendicular?

Unit Enduring Understandings:

- Proper format of a two column proof.
- How to use given information and a diagram.
- How to mark diagrams based on given information. Indirect proofs lead to diagrams that should NOT make sense.
- Getting to a contradiction in logic.

Unit Learning Targets:

*Students will....*develop how to complete a two column, indirect proof.



Evidence of Learning

Summative Assessment: Indirect Proofs Assessment

Equipment Needed: Desmos

Teacher Resources: Desmos Activity

Formative Assessments:

- Class work
- Homework
- Vocab Pop Quizzes
- Quizzes
- Exam



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Lesson Plans

Lesson	Time Frame
Lesson 1 What is an Indirect Proof?	1 day
Lesson 2 How Do You Contradict Two Lines NOT Perpendicular?	1 day
Lesson 3 Indirect Proofs in General Situations.	1 day

Teacher Notes: Students should look for a contradiction to given information.

Curriculum Development Resources/Technology Resources:

Click the links below to access additional resources used to design this unit:

www.deltamath.com

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<https://tasks.illustrativemathematics.org/content-standards>

<https://nj.digitalitemlibrary.com/home>

<https://resources.newmeridiancorp.org/released-items/>



Lesson Plan 1 Template

Content Area: Math Lesson Title: What is an Indirect Proof? Time Frame: 1 day

Lesson Components

21st Century Themes

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

21st Century Skills

- ☐ Creativity and Innovation ☒ Critical Thinking and Problem Solving ☐ Information Literacy
☐ Life and Career Skills ☐ Communication and Collaboration ☐ Media Literacy ☐ ICT Literacy

Interdisciplinary Connections:

Science and Engineering

Integration of Technology:

Desmos

Equipment Needed:

Projector, laptop

Goals/Objectives	Learning Activities/ Instructional Strategies	Formative Assessment Tasks
Students will: - Determine how to prove someone NOT guilty of a crime. - Understand the possible outcomes for a situation. - Understand what a contradiction is. - Understand how a contradiction debunks a possible outcome.	Lesson Sequence - The teacher accuses someone of stealing a lunch from the office during 5th period yesterday (talk with this student before the lesson so they know it's not real). - How do we prove this student innocent? --> They were HERE during 5th period yesterday. - This contradiction debunks the possibility of the student stealing the lunch. - What are the possibilities in this situation? - How does this contradiction help us solve the problem?	- Class work - Discussion of the "crime" and determination of the possible situations. - Homework



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6. Try an example in Euclidean Geometry.
7. Use the terms: Either, Assume,... BUT, SO.
8. Students work out examples on Desmos.

Differentiation:

Word wall, fill out some of the proof prior to class.

Resources Provided:

- Problem set
- Textbook
- Online text



Lesson Plan 2 Template

Content Area: Math Lesson Title: How Do You Contradict Two Lines NOT Perpendicular?
 Time Frame: 1 day

Lesson Components

21st Century Themes

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

21st Century Skills

- ☐ Creativity and Innovation ☒ Critical Thinking and Problem Solving ☐ Information Literacy
☐ Life and Career Skills ☐ Communication and Collaboration ☐ Media Literacy ☐ ICT Literacy

Interdisciplinary Connections:

Science and Engineering

Integration of Technology:

Desmos

Equipment Needed:

Projector, laptop

Goals/Objectives	Learning Activities/ Instructional Strategies	Formative Assessment Tasks
Students will: - Decide what it means to have perpendicular lines. - Determine how to contradict NOT perpendicular lines - Use this information in a proof. - Use this information to diagram the situation.	Lesson Sequence - Present a proof with a given that states two lines are NOT perpendicular. - Ask students to pair-share to determine how to contradict this information. - Point out to students: besides making right angles, what else do perpendicular lines make? They make congruent and supplementary angles. - To contradict NOT perpendicular, we must show the two angles are congruent and supplementary.	- Homework - Class work - Class discussion



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Differentiation:

Word Wall

Resources Provided:

- Textbook
- Problem set



Lesson Plan 3 Template

Content Area: Math Lesson Title: Indirect Proofs in General Situations Time Frame: 1 day

Lesson Components

21st Century Themes

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

21st Century Skills

- ☐ Creativity and Innovation ☒ Critical Thinking and Problem Solving ☐ Information Literacy
☐ Life and Career Skills ☐ Communication and Collaboration ☐ Media Literacy ☐ ICT Literacy

Interdisciplinary Connections:

Science and Engineering

Integration of Technology:

Desmos

Equipment Needed:

Projector, laptop

Goals/Objectives	Learning Activities/ Instructional Strategies	Formative Assessment Tasks
Students will: - Identify where a contradiction is to be made. - Figure out HOW a contradiction can be made. - Model problems with proper diagrams and notation. - Identify when it is appropriate to use an indirect proof.	Lesson Sequence - Pose several indirect proof problems for students to solve on Desmos. - Before students continue with a problem, individually address them about how to get a contradiction. - Talk about using an indirect proof instead of a direct proof. When is it appropriate? Ask students to pair-share to determine examples outside of Geometry.	- Homework - Class work - Class discussion
Differentiation: Word wall, page of reasons.		
Resources Provided: - Textbook - Problem set		



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Lesson Reflection

Reflect on the lesson you have developed and rate the degree to which the lesson *Strongly*, *Moderately* or *Weakly* meets the criteria below.

Lesson Activities	Strongly	Moderately	Weakly
Are challenging Strongly and require higher-order thinking and problem-solving skills	☒	☐	☐
Allow for student choice	☐	☒	☐
Provide scaffolding for acquiring targeted knowledge/skills	☒	☐	☐
Integrate global perspectives	☐	☒	☐
Integrate 21st-century skills	☐	☒	☐
Provide opportunities for interdisciplinary connection and transfer of knowledge and skills	☐	☒	☐
Foster student use of technology as a tool to develop critical thinking, creativity and innovation skills	☐	☒	☐
Are varied to address different student learning styles and preferences	☐	☒	☐
Are differentiated based on student needs	☒	☐	☐
Are student-centered with teacher acting as a facilitator and co-learner during the teaching and learning process	☒	☐	☐
Provide means for students to demonstrate knowledge and skills and progress in meeting learning goals and objectives	☒	☐	☐
Provide opportunities for student reflection and self-assessment	☒	☐	☐
Provide data to inform and adjust instruction to better meet the varying needs of learners	☒	☐	☐

Curriculum Design Template

Content Area: Math	Grade Level: 9	Unit Title: Indirect Proofs
Created: 2024		Board Approved on:



Unit Overview Template

Content Area: Math **Grade Level:** 9 **Unit Title:** Similar Triangles and Trigonometry

Unit Summary: Students will use Euclidean Geometry to prove facts about similar triangles, and develop rules for right triangles and trigonometry.

Primary Interdisciplinary Connections: *Science and Engineering*

21st Century Themes ☐ Creativity and Innovation ☒ Critical Thinking and Problem Solving ☐ ICT Literacy

☐ Information Literacy ☐ Life and Career Skills ☐ Communication and Collaboration ☐ Media Literacy

Unit Rationale: Similar triangles lead directly into the study of basic trigonometry. Trigonometry is one of the most used forms of mathematics in physics and engineering.

Career Readiness (Standard 9):

9.4.12.CI.1 - Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).

9.4.12.CT.2 - Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).

9.4.12.TL.3 - Analyze the effectiveness of the process and quality of collaborative environments.

Learning Targets

Standards: G.SRT

Content Statements: Understand similarity in terms of similarity transformations; Prove theorems involving similarity; Define trigonometric ratios and solve problems involving right triangles; Apply trigonometry to general triangles.

CPI#:	Cumulative Progress Indicator (CPI):
G.SRT.A.2	Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar; explain using similarity transformations the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides.
G.SRT.A.3	Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.
G.SRT.B.4	Prove theorems about triangles. Theorems include: a line parallel to one side of a triangle divides the other two proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity.
G.SRT.B.5	Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.
G.SRT.C.6	Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles.
G.SRT.C.7	Explain and use the relationship between the sine and cosine of complementary angles.



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G.SRT.C.8	Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.
G.SRT.D.9	Derive the formula $A = \frac{1}{2} ab \sin(C)$ for the area of a triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side.
G.SRT.D.10	Prove the Laws of Sines and Cosines and use them to solve problems.
G.SRT.D.11	Understand and apply the Law of Sines and the Law of Cosines to find unknown measurements in right and non-right triangles (e.g., surveying problems, resultant forces).
SEL.PK-12.2.2	Recognize the skills needed to establish and achieve personal and educational goals.
SEL.PK-12.4.1	Develop, implement and model effective problem-solving, and critical thinking skills.
SEL.PK-12.5.2	Utilize positive communication and social skills to interact effectively with others.
HS-ETS1-2	Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
8.2.12.ITH.3	Analyze the impact that globalization, social media, and access to open source technologies has had on innovation and on a society's economy, politics, and culture.

Unit Essential Questions:

- When are two triangles similar?
- How do you prove the Pythagorean Theorem?
- What are trigonometric functions?
- How do we use trigonometry to solve problems?

Unit Enduring Understandings:

- What do we look for to prove triangles are similar?
- Using the sides of a triangle, how do you know it is a right triangle?
- How to use a trig chart and calculators to solve trig problems.
- When to use trigonometry and when to use the Pythagorean Theorem.

Unit Learning Targets:

Students will.... develop criteria for similar triangles, and prove the Pythagorean Theorem, then use this to develop the basic trig functions.



Evidence of Learning

Summative Assessment: Similarity Assessment

Equipment Needed: Desmos

Teacher Resources: Desmos Activity

Formative Assessments:

- Class work
- Homework
- Vocab Pop Quizzes
- Quizzes
- Exam
- Class discussion



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Lesson Plans

Lesson	Time Frame
Lesson 1 How Do We Prove Similar Triangles?	1 day
Lesson 2 Proving and Applying the Pythagorean Theorem	1 day
Lesson 3 Special Right Triangles	1 day

Teacher Notes: Students need to keep track of all definitions.

Curriculum Development Resources/Technology Resources:

Click the links below to access additional resources used to design this unit:

www.deltamath.com

www.desmos.com

www.kutasoftware.com

<https://tasks.illustrativemathematics.org/content-standards>

<https://nj.digitalitemlibrary.com/home>

<https://resources.newmeridiancorp.org/released-items/>



Lesson Plan 1 Template

Content Area: Math Lesson Title: How Do We Prove Similar Triangles? Time Frame: 1 day

Lesson Components

21st Century Themes

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

21st Century Skills

- ☐ Creativity and Innovation ☒ Critical Thinking and Problem Solving ☐ Information Literacy
☐ Life and Career Skills ☐ Communication and Collaboration ☐ Media Literacy ☐ ICT Literacy

Interdisciplinary Connections:

Science and Engineering

Integration of Technology:

Desmos

Equipment Needed:

Projector, laptop

Goals/Objectives	Learning Activities/ Instructional Strategies	Formative Assessment Tasks
Students will: - Know the difference between similar and congruent triangles. - Draw similar triangles. - Prove triangles similar. - Prove sides are proportional. - Prove products of line segments.	Lesson Sequence - Draw two triangles. What makes them similar? - Break students into groups of 3 to develop AAA similarity criteria. - Develop relationships between the sides of similar triangles. - Prove triangles similar, then sides in proportion. - Discuss the means and extremes in a proportion. - Using similar triangles, prove a proportion.	- Class work - Class discussion - Homework
Differentiation: Word wall, page of reasons.		
Resources Provided: Textbook		



Lesson Plan 2 Template

Content Area: Math Lesson Title: Proving and Applying the Pythagorean Theorem Time Frame: 1 day

Lesson Components

21st Century Themes

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

21st Century Skills

- ☐ Creativity and Innovation ☒ Critical Thinking and Problem Solving ☐ Information Literacy
☐ Life and Career Skills ☐ Communication and Collaboration ☐ Media Literacy ☐ ICT Literacy

Interdisciplinary Connections:

Science and Engineering

Integration of Technology:

Desmos

Equipment Needed:

Projector, laptop

Goals/Objectives	Learning Activities/ Instructional Strategies	Formative Assessment Tasks
Students will: - Develop special relationships between the altitude to the hypotenuse and the sides of a right triangle. - Derive the Pythagorean Theorem. - Apply the Pythagorean Theorem.	Lesson Sequence - Discuss the altitude of a triangle. Ask students to draw altitudes in non-right triangles. - How do you draw the altitude to a right triangle? - Once you have the altitude to the hypotenuse, you get 3 similar triangles. - Have students write proportions of sides in these triangles. - Rearrange the proportions until they derive the Pythagorean Theorem.	- Homework - Class work - Class discussion



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- | | | |
|--|---|--|
| | <ol style="list-style-type: none">6. Use the Pythagorean Theorem to find missing sides of right triangles.7. Use the Pythagorean Theorem to prove a triangle is right. | |
|--|---|--|

Differentiation:

Word Wall

Resources Provided:

- Textbook



Lesson Plan 3 Template

Content Area: Math Lesson Title: Special Right Triangles Time Frame: 1 day

Lesson Components

21st Century Themes

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

21st Century Skills

- ☐ Creativity and Innovation ☒ Critical Thinking and Problem Solving ☐ Information Literacy
☐ Life and Career Skills ☐ Communication and Collaboration ☐ Media Literacy ☐ ICT Literacy

Interdisciplinary Connections:

Science and Engineering

Integration of Technology:

Desmos

Equipment Needed:

Projector, laptop

Goals/Objectives	Learning Activities/ Instructional Strategies	Formative Assessment Tasks
Students will: • Prove relationships for 30-60-90 and 45-45-90 triangles. • Develop the three basic trig functions. • Use a chart to compute trig values. • Use a calculator to calculate trig values. • Solve problems using trig.	Lesson Sequence 1. Draw a square and its diagonal. 2. Using the Pythagorean Theorem, develop equations for the sides of a 45 45 90 triangle. 3. Draw an equilateral triangle. 4. Using the Pythagorean Theorem, develop equations for the sides of a 30 60 90 triangle. 5. What if the triangle has angles that measure 32, 58, and 90 degrees? Discuss trigonometry in terms of ratios of sides. 6. Name the three functions and what ratios to use for each.	• Homework • Class work • Class discussion



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7. Write SOH CAH TOA and have students determine what it means.
8. Do application problems. Make sure students draw the picture.
9. Students then work through the Desmos activity with trigonometry.

Differentiation:

Word wall, page of reasons.

Resources Provided:

- Textbook



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Lesson Reflection

Reflect on the lesson you have developed and rate the degree to which the lesson *Strongly, Moderately* or *Weakly* meets the criteria below.

Lesson Activities	Strongly	Moderately	Weakly
Are challenging Strongly and require higher-order thinking and problem-solving skills	☒	☐	☐
Allow for student choice	☐	☒	☐
Provide scaffolding for acquiring targeted knowledge/skills	☒	☐	☐
Integrate global perspectives	☐	☒	☐
Integrate 21st century skills	☐	☒	☐
Provide opportunities for interdisciplinary connection and transfer of knowledge and skills	☐	☒	☐
Foster student use of technology as a tool to develop critical thinking, creativity and innovation skills	☐	☒	☐
Are varied to address different student learning styles and preferences	☐	☒	☐
Are differentiated based on student needs	☒	☐	☐
Are student-centered with teacher acting as a facilitator and co-learner during the teaching and learning process	☒	☐	☐
Provide means for students to demonstrate knowledge and skills and progress in meeting learning goals and objectives	☒	☐	☐
Provide opportunities for student reflection and self-assessment	☒	☐	☐
Provide data to inform and adjust instruction to better meet the varying needs of learners	☒	☐	☐

Curriculum Design Template

Content Area: Math	Grade Level: 9	Unit Title: Similar Triangles and Trigonometry
Created: 2024	Board Approved on:	



Unit Overview Template

Content Area: Math **Grade Level:** 9 **Unit Title:** Three-Dimensional Geometry and Constructions

Unit Summary: Students will use a compass and straightedge to create two-dimensional figures. Then, students will use two dimensional representations to discuss three dimensional Euclidean Geometry. Students will explore these three dimensional solids in depth.

Primary Interdisciplinary Connections: *Science and Engineering*

21st Century Themes ☐ Creativity and Innovation ☒ Critical Thinking and Problem Solving ☐ ICT Literacy
☐ Information Literacy ☐ Life and Career Skills ☐ Communication and Collaboration ☐ Media Literacy

Unit Rationale: Constructions have applications in engineering. Three-dimensional solids are found in engineering, physics, chemistry, and biology.

Career Readiness (Standard 9):

9.4.12.CI.1 - Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).

9.4.12.CT.2 - Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).

9.4.12.TL.3 - Analyze the effectiveness of the process and quality of collaborative environments.

Learning Targets

Standards: G.CO; G.GMD; G.MG

Content Statements: Make geometric constructions; Explain volume formulas and use them to solve problems; Visualize relationships between two-dimensional and three-dimensional objects; Apply geometric concepts in modeling situations.

CPI#:	Cumulative Progress Indicator (CPI):
G.CO.D.12	Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.
G.CO.D.13	Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.
G.GMD.A.1	Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone. Use dissection arguments, Cavalieri's principle, and limit arguments.
G.GMD.A.2	Give an informal argument using Cavalieri's principle for the formulas for the volume of a sphere and other solid figures.
G.GMD.A.3	Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.



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G.GMD.B.4	Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.
G.MG.A.1	Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).
G.MG.A.2	Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).
G.MG.A.3	Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).
SEL.PK-12.2.2	Recognize the skills needed to establish and achieve personal and educational goals.
SEL.PK-12.4.1	Develop, implement and model effective problem-solving, and critical thinking skills.
SEL.PK-12.5.2	Utilize positive communication and social skills to interact effectively with others.
HS-ETS1-2	Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
8.2.12.ITH.3	Analyze the impact that globalization, social media, and access to open source technologies has had on innovation and on a society's economy, politics, and culture.

Unit Essential Questions:

- What are three dimensional figures made up of?
- How do you sketch 3-d figures?
- How do you plot 3-d figures?
- How do you find the surface area and volume of 3-d figures?

Unit Enduring Understandings:

- What is surface area?
- How are volumes of the different surfaces related?
- Where do we see 3-d figures being used?

Unit Learning Targets:

*Students will....*develop equations for surface area and volume, complete constructions, and plot on the xyz space.

Climate Change Example: Students may use circles, their measures, and their properties to describe the cross section of a tree and compare changes in radial diameter or circumference variations of tree trunks when considering changes in seasonal weather patterns over time.

Climate Change Example: Students may apply the concept of population density of different urban areas, including calculations of population density, and discuss different environmental factors (e.g., air and water quality, waste disposal, energy consumption) that might be exacerbated by increased population density.

Climate Change Example: Students may apply geometric methods to solve design problems such as increasing access to green spaces in cities given physical and cost constraints.



Evidence of Learning

Summative Assessment: Constructions Assessment, 3-Dimensional Figures Assessment

Equipment Needed: Desmos, compasses, straightedge

Teacher Resources: Textbook, Problem set, plastic geometric shapes, Desmos activity

Formative Assessments:

- Class work
- Homework
- Vocab Pop Quizzes
- Quizzes
- Exam
- Class discussion



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Lesson Plans

Lesson	Time Frame
Lesson 1 Volumes of Solids	1 day
Lesson 2 Surface Area of Solids	1 day
Lesson 3 Geometric Constructions	1 day

Teacher Notes: Students need to make accurate sketches. When using the compasses, have students angle the apparatus and move the page rather than the pencil.

Curriculum Development Resources/Technology Resources:

Click the links below to access additional resources used to design this unit:

www.deltamath.com

www.desmos.com

www.kutasoftware.com

<https://tasks.illustrativemathematics.org/content-standards>

<https://nj.digitalitemlibrary.com/home>

<https://resources.newmeridiancorp.org/released-items/>



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Lesson Plan 1 Template

Content Area: Math Lesson Title: Volumes of Solids Time Frame: 1 day

Lesson Components

21st Century Themes

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

21st Century Skills

- ☐ Creativity and Innovation ☒ Critical Thinking and Problem Solving ☐ Information Literacy
☐ Life and Career Skills ☐ Communication and Collaboration ☐ Media Literacy ☐ ICT Literacy

Interdisciplinary Connections:

Science and Engineering

Integration of Technology:

Desmos

Equipment Needed:

Projector, laptop

Goals/Objectives	Learning Activities/ Instructional Strategies	Formative Assessment Tasks
Students will: - Define volume. - Sketch 3-d shapes. - Relate sketches to the physical objects. - Apply volume formulas.	Lesson Sequence - Discuss volume. When do you need to use volume? - Have students carefully sketch 3-d objects: sphere, prisms, cylinders, cones. - Starting from the volume of a rectangular prism, name AND figure out the volume formulas for prisms and cylinders. - Derive the volume equations for a cone and pyramid. - Ask students where these shapes are all found. - Solve application problems in Desmos. Solve for missing lengths when given volumes as well.	- Class work - Class discussion - Homework
Differentiation: Word wall, 3-d manipulatives.		
Resources Provided: - Textbook - Problem set		



Lesson Plan 2 Template		
Content Area: Math	Lesson Title: Surface Area of Solids	Time Frame: 1 day
Lesson Components		
<u>21st Century Themes</u>		
☐ Global Awareness ☒ Financial, Economic, Business and Entrepreneurial Literacy ☐ Civic Literacy ☐ Health Literacy		
<u>21st Century Skills</u>		
☐ Creativity and Innovation ☒ Critical Thinking and Problem Solving ☐ Information Literacy ☐ Life and Career Skills ☐ Communication and Collaboration ☐ Media Literacy ☐ ICT Literacy		
Interdisciplinary Connections: Science and Engineering		
Integration of Technology: Desmos		
Equipment Needed: Projector, laptop		

Goals/Objectives	Learning Activities/ Instructional Strategies	Formative Assessment Tasks
Students will: • Determine the difference between surface area and volume. • Know when to use surface area rather than volume. • Derive surface area equations for each surface. • See that each surface has a very different surface area equation, and think about each shape differently.	Lesson Sequence 1. Discuss surface area. 2. When you design a soda bottle, what do you use volume for? Break students into pairs to model and discuss. 3. Work through surface areas for various shapes. Ask students to pair-share to derive the formulas, then decide as a whole group the final form. 4. Pass out fresh sheets of paper when asking students to determine the surface area of a cylinder. Students should be able to model and determine the formula.	• Homework • Class work • Class discussion



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Differentiation:

Word Wall, 3-d manipulatives.

Resources Provided:

- Textbook
- Problem set



Lesson Plan 3 Template

Content Area: Math Lesson Title: Geometric Constructions Time Frame: 1 day

Lesson Components

21st Century Themes

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

21st Century Skills

- ☐ Creativity and Innovation ☒ Critical Thinking and Problem Solving ☐ Information Literacy
☐ Life and Career Skills ☐ Communication and Collaboration ☐ Media Literacy ☐ ICT Literacy

Interdisciplinary Connections:

Science and Engineering

Integration of Technology:

Desmos

Equipment Needed:

Projector, laptop, compasses, straightedges

Goals/Objectives	Learning Activities/ Instructional Strategies	Formative Assessment Tasks
Students will: • Use the compass and straightedge to complete constructions. • Recognize constructions by the completed diagram.	Lesson Sequence 1. Hand out compasses and straight edges. 2. Ask students to work in groups of 3 to determine how to complete the following constructions: copy a segment length, draw a circle, bisect a segment, and copy an angle. 3. Work with the class as a whole to create the remaining constructions. 4. Challenge the students with the regular pentagon constructions. 5. Show students the construction videos on Desmos and ask students to identify what the construction is.	• Homework • Class work • Class discussion



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Differentiation:

mathisfun.com

Resources Provided:

- Textbook
- Problem set



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Lesson Reflection

Reflect on the lesson you have developed and rate the degree to which the lesson *Strongly*, *Moderately* or *Weakly* meets the criteria below.

Lesson Activities	Strongly	Moderately	Weakly
Are challenging Strongly and require higher-order thinking and problem-solving skills	☒	☐	☐
Allow for student choice	☐	☒	☐
Provide scaffolding for acquiring targeted knowledge/skills	☒	☐	☐
Integrate global perspectives	☐	☒	☐
Integrate 21st century skills	☐	☒	☐
Provide opportunities for interdisciplinary connection and transfer of knowledge and skills	☐	☒	☐
Foster student use of technology as a tool to develop critical thinking, creativity and innovation skills	☐	☒	☐
Are varied to address different student learning styles and preferences	☐	☒	☐
Are differentiated based on student needs	☒	☐	☐
Are student-centered with teacher acting as a facilitator and co-learner during the teaching and learning process	☒	☐	☐
Provide means for students to demonstrate knowledge and skills and progress in meeting learning goals and objectives	☒	☐	☐
Provide opportunities for student reflection and self-assessment	☒	☐	☐
Provide data to inform and adjust instruction to better meet the varying needs of learners	☒	☐	☐

Curriculum Design Template

Content Area: Math	Grade Level: 9	Unit Title: Three-Dimensional Geometry and Constructions
Created: 2024	Board Approved on:	



Unit Overview Template

Content Area: Math	Grade Level(s) : 9	Unit Title: Circles and Conics
Unit Summary: Students will build on their knowledge of circles by studying properties of tangents, secants, chords, and arcs. They will prove properties of tangents and establish properties of chords and their relationships to arcs. Then they will study angles formed by chords, tangents, and secants, the relationships among segments of intersecting chords, tangents, and secants. Students will use coordinate geometry to describe the standard form of an equation of a circle and apply the concept of locus to the geometry they have studied up to this point. Students will study other conic shapes such as parabolas, ellipses, and hyperbolas.		
Primary Interdisciplinary Connections: <i>Science and Engineering</i> 21st Century Themes ☒ Creativity and Innovation ☒ Critical Thinking and Problem Solving ☐ ICT Literacy ☐ Information Literacy ☐ Life and Career Skills ☒ Communication and Collaboration ☐ Media Literacy		
Unit Rationale: In this unit students will learn how to apply properties of tangents, secants, chords, and arcs of circles. They will also learn how to apply coordinate geometry to describe the standard form of an equation of a circle, parabola, ellipse, and hyperbola.		
Career Readiness (Standard 9): 9.4.12.CI.1 - Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a). 9.4.12.CT.2 - Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a). 9.4.12.TL.3 - Analyze the effectiveness of the process and quality of collaborative environments.		

Learning Targets

Standards: G.C; G.GPE	
Content Statements: Understand and apply theorems about circles; Find arc lengths and areas of circles; Translate between the geometric description and the equation for a conic section.	
CPI#:	Cumulative Progress Indicator (CPI):
G.C.A.1	Prove that all circles are similar.
G.C.A.2	Identify and describe relationships among inscribed angles, radii, and chords. Include the relationship between central, inscribed, and circumscribed angles; inscribed angles on a diameter are right angles; the radius of a circle is perpendicular to the tangent where the radius intersects the circle.
G.C.A.3	Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle.
G.C.A.4	Construct a tangent line from a point outside a given circle to the circle.
G.C.B.5	Derive using similarity the fact that the length of the arc intercepted by an angle is proportional to the radius, and define the radian measure of the angle as the constant of proportionality; derive the formula for the area of a sector.



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G.GPE.A.1	(+) Derive the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation.
G.GPE.A.2	(+) Derive the equation of a parabola given a focus and directrix.
G.GPE.A.3	Derive the equations of ellipses and hyperbolas given the foci, using the fact that the sum or difference of distances from the foci is constant.
SEL.PK-12.2.2	Recognize the skills needed to establish and achieve personal and educational goals.
SEL.PK-12.4.1	Develop, implement and model effective problem-solving, and critical thinking skills.
SEL.PK-12.5.2	Utilize positive communication and social skills to interact effectively with others.
HS-ETS1-2	Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
8.2.12.ITH.3	Analyze the impact that globalization, social media, and access to open source technologies has had on innovation and on a society's economy, politics, and culture.

Unit Essential Questions:

- What are the properties of circles and of lines and segments that intersect circles?
- When these lines and segments meet to form angles, how are the angles related to the arcs they intercept on the circle?
- How do you describe a set of points as a locus?

Unit Enduring Understandings:

- Students will get an understanding about tangents, secants, chords, arcs, and angles they form.
- Students will learn how to write an equation of a circle knowing its center and its radius.
- Students will learn to describe a locus.
- Students will explore parabolas, hyperbolas, and ellipses.

Unit Learning Targets:

Students will....

- Use the relationship between a radius and a tangent
- Use the relationship between two tangents from one point
- Use congruent chords, arcs, and central angles
- Recognize properties of lines through the center of a circle
- Find the measure of an inscribed angle
- Find the measure of an angle formed by a tangent and a chord
- Find the measure of angles formed by chords, secants, and tangents
- Find the lengths of segments associated with circles
- Write an equation of a circle, hyperbola, ellipse, and parabola
- Find the center and radius of a circle
- Draw and describe a locus



Evidence of Learning

Summative Assessment: Conics Assessment

Equipment Needed: Compasses, straightedge, graph paper, textbook, Desmos

Teacher Resources: Teacher's edition textbook, Desmos activity

Formative Assessments:

- Homework
- Classwork
- Geometer's Sketchpad assignments
- Class participation during discussion
- Exit/entry tickets
- Group work assignments



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Lesson Plans

Lesson	Time Frame
Lesson 1 Tangent Lines	1 day
Lesson 2 Inscribed Angles	1 day
Lesson 3 Angle Measurement and Segment Lengths	1 day

Teacher Notes: Allow students ample time to discover the difference between the conic equations. Allow them to use the software “Grapher” or Desmos on their laptops for this.

Curriculum Development Resources/Technology Resources:

Click the links below to access additional resources used to design this unit:

www.deltamath.com

www.desmos.com

www.kutasoftware.com

<https://tasks.illustrativemathematics.org/content-standards>

<https://nj.digitalitemlibrary.com/home>

<https://resources.newmeridiancorp.org/released-items/>



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Lesson Plan 1 Template

Content Area: Math Lesson Title: Tangent Lines Time Frame: 1 day

Lesson Components

21st Century Themes

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

21st Century Skills

- ☒ Creativity and Innovation ☒ Critical Thinking and Problem Solving ☐ Information Literacy
☐ Life and Career Skills ☐ Communication and Collaboration ☐ Media Literacy ☐ ICT Literacy

Interdisciplinary Connections:

Science and Engineering

Integration of Technology:

Desmos

Equipment Needed:

Projector, laptop

Goals/Objectives	Learning Activities/ Instructional Strategies	Formative Assessment Tasks
Students will: - Be able to use the relationship between a radius and a tangent. - Be able to use the relationship between tangents from one point.	Lesson Sequence - Introduce students to a tangent to a circle and a point of tangency. - Break students into small groups. Ask each group to use Desmos to draw a circle and a tangent to it. - Students will be asked to draw a radius from the center of the circle to the point of tangency. - Students will be asked to measure the angle formed by the tangent and the radius. They will share the results and make a conjecture. - Ask students to work together on a problem set to demonstrate mastery.	- Homework - Class work - Class discussion



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Differentiation:

Students will be asked to find the length of the radius of a circle inscribed in an equilateral triangle with sides of length s .

Resources Provided:

- Problem set
- Rulers
- Compasses
- Desmos



Lesson Plan 2 Template

Content Area: Math Lesson Title: Inscribed Angles Time Frame: 1 day

Lesson Components

21st Century Themes

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

21st Century Skills

- ☒ Creativity and Innovation ☒ Critical Thinking and Problem Solving ☐ Information Literacy
☐ Life and Career Skills ☐ Communication and Collaboration ☐ Media Literacy ☐ ICT Literacy

Interdisciplinary Connections:

Science and Engineering

Integration of Technology:

Desmos

Equipment Needed:

Projector, laptop

Goals/Objectives	Learning Activities/ Instructional Strategies	Formative Assessment Tasks
Students will: - Find the measure of an inscribed angle. - Find the measure of an angle formed by a tangent and a chord.	Lesson Sequence - Students will be working in pairs to use Demos to draw two large circles and label the centers X and Y. - On the circles, they will need to copy the given diagram. This diagram shows different inscribed angles. - In circle X, students will be asked to measure angle AXB and each numbered angle. They will be asked to measure arc AB. They will need to record results and look for the pattern. - Students will be asked to compare the results with others.	- Homework - Class work - Class discussion - Exit card



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5. Students will be asked to do similar activities for circle Y.
Students will be asked to write a conjecture about an angle whose vertex is on a circle and whose sides intersect the endpoints of a diameter of the circle.
6. Give students a definition of an inscribed angle. Introduce the Inscribed Angle Theorem.
7. Introduce students to Corollaries to the Inscribed Angle Theorem. Show some examples.
8. Ask students to complete Exit Card problems.

Differentiation:

Allow students who need it to use colored pencils to trace intercepted arcs from one endpoint to the other. This will help them to identify arcs intercepted by inscribed angles, especially when several chords are shown.

Enrichment: Students will use a right triangle inscribed in a circle to prove that the median draw to the hypotenuse of a right triangle forms two isosceles triangles

Resources Provided:

- Problem set
- Rulers
- Compasses and protractors



Lesson Plan 3 Template

Content Area: Math Lesson Title: Angle Measurements and Segment Lengths Time Frame: 1 day

Lesson Components

21st Century Themes

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

21st Century Skills

- ☒ Creativity and Innovation ☒ Critical Thinking and Problem Solving ☐ Information Literacy
☒ Life and Career Skills ☒ Communication and Collaboration ☐ Media Literacy ☐ ICT Literacy

Interdisciplinary Connections:

Science and Engineering

Integration of Technology:

Desmos

Equipment Needed:

Projector, laptop

Goals/Objectives	Learning Activities/ Instructional Strategies	Formative Assessment Tasks
Students will: - Will be able to find the measures of angles formed by chords, secants, and tangents. - Will be able to find the lengths of segments associated with circles.	Lesson Sequence - Introduce students to a definition of a secant and show some examples. - Students will be working in small groups. They will be asked to use Desmos and draw two circles X and Y. - Students will be asked to draw two intersecting secants and measure the angles they form and the intercepted arcs. - Students will be asked to change the secants' positions and do the same measurements again. - Students will be asked to compare the results and make a conjecture.	- Homework - Class work - Class discussion - Desmos activity



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- | | | |
|--|--|--|
| | <ol style="list-style-type: none">6. Students will be asked to work with circle Y, construct two secants, and measure the segments according to the given diagram. Multiply the segments and discover the pattern.7. Students will then solve examples on Desmos. | |
|--|--|--|

Differentiation:

Students may be grouped so that they are working with partners at similar ability levels.

Resources Provided:

- Rulers
- Compasses



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Lesson Reflection

Reflect on the lesson you have developed and rate the degree to which the lesson *Strongly, Moderately* or *Weakly* meets the criteria below.

Lesson Activities	Strongly	Moderately	Weakly
Are challenging Strongly and require higher-order thinking and problem-solving skills	☒	☐	☐
Allow for student choice	☐	☒	☐
Provide scaffolding for acquiring targeted knowledge/skills	☒	☐	☐
Integrate global perspectives	☐	☒	☐
Integrate 21st-century skills	☐	☒	☐
Provide opportunities for interdisciplinary connection and transfer of knowledge and skills	☒	☐	☐
Foster student use of technology as a tool to develop critical thinking, creativity and innovation skills	☒	☐	☐
Are varied to address different student learning styles and preferences	☒	☐	☐
Are differentiated based on student needs	☐	☒	☐
Are student-centered with the teacher acting as a facilitator and co-learner during the teaching and learning process	☒	☐	☐
Provide means for students to demonstrate knowledge and skills and progress in meeting learning goals and objectives	☒	☐	☐
Provide opportunities for student reflection and self-assessment	☒	☐	☐
Provide data to inform and adjust instruction to better meet the varying needs of learners	☐	☒	☐

Curriculum Design Template

Content Area: Math	Grade Level: 9	Unit Title: Circles and Conics
Created: 2024	Board Approved on:	



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GLOBAL SKILLS**

IEP AND 504 ACCOMMODATIONS AND MODIFICATIONS FOR EARLY CHILDHOOD AND ELEMENTARY SCHOOL STUDENTS:

Large print textbooks
Textbooks for at-home use
Additional time for assignments
Review of directions
Use of mnemonics
Have student restate information
Concrete examples
Adaptive writing utensils
Support auditory presentations with visuals
Use of a study carrel
Assistance in maintaining uncluttered space
Weekly home-school communication tools (notebook, daily log, phone calls or email messages)
Space for movement or breaks
Study sheets and teacher outlines
Extra visual and verbal cues and prompts
Math sheets with highlighted instructions
Graph paper to assist in organizing or lining up math problems
Use of computers and calculators
Books on tape
Graphic organizers
Quiet corner or room to calm down and relax when anxious
Preferential seating
Alteration of the classroom arrangement
Reduction of distractions
Answers to be dictated
Hands-on activities
Use of manipulatives
No penalty for spelling errors or sloppy handwriting
Follow a routine/schedule
Alternate quiet and active time
Teach time management skills
Rest breaks
Verbal and visual cues regarding directions and staying on task
Agenda book and checklists
Adjusted assignment timelines
Visual daily schedule



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GLOBAL SKILLS**

Varied reinforcement procedures
Immediate feedback
Work-in-progress check
Personalized examples

TESTING AND ASSESSMENT ACCOMMODATIONS AND MODIFICATIONS:

Answers to be dictated
Frequent rest breaks
Additional time
Oral testing
Untimed tests
Choice of test format (multiple-choice, essay, true-false)
Alternate ways to evaluate (projects or oral presentations instead of written tests)
Accept short answers
Open-book tests
Read test and directions to student
Provide study outline prior to tests
Highlight key directions
Test in alternative site
Use of calculator
Extra credit option
Preview test procedures
Simplified test wording; rephrased test questions and/or directions

GENERAL ACCOMMODATIONS AND MODIFICATIONS:

Use of alternative books or materials on the topic being studied
Computerized spell-check support
Word bank of choices for answers to test questions
Provision of calculator and/or number line for math tests
Reworded questions in simpler language
Projects instead of written reports
Highlighting important words or phrases in reading assignments
Modified workload or length of assignments/tests
Modified time demands
Modified grades based on IEP

BEHAVIOR ACCOMMODATIONS MODIFICATIONS:



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GLOBAL SKILLS**

Breaks between tasks
Cue expected behavior
Daily feedback to student
Have contingency plans
Use de-escalating strategies
Use positive reinforcement
Use proximity/touch control
Use peer supports and mentoring
Model expected behavior by adults
Have parent sign homework
Have parent sign behavior chart
Set and post class rules
Chart progress and maintain data



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GLOBAL SKILLS

IEP AND 504 ACCOMODATIONS AND MODIFICATIONS FOR MIDDLE AND HIGH SCHOOL STUDENTS:

Large print textbooks
Textbooks for at-home use
Additional time for assignments
A locker with adapted lock
Review of directions
Review sessions
Use of mnemonics
Have student restate information
Provision of notes or outlines
Concrete examples
Adaptive writing utensils
Support auditory presentations with visuals
Weekly or bi-weekly home-school communication
Space for movement or breaks
Study sheets and teacher outlines
Extra visual and verbal cues and prompts
Lab and math sheets with highlighted instructions
Graph paper to assist in organizing or lining up math problems
Use of tape recorder for lectures
Use of Interactive notebook
Use of a scribe
Use of computers and calculators
Books on tape
Graphic organizers
Quiet corner or room to calm down and relax when anxious
Preferential seating
Alteration of the classroom arrangement
Reduction of distractions
Answers to be dictated
Hands-on activities
Ability to type all assignments
Follow a routine/schedule
Teach time management and organizational skills
Rest breaks
Verbal and visual cues regarding directions and staying on task
Agenda book and checklists
Daily check-in with case manager or special education teacher
Adjusted assignment timelines
Visual daily schedule



SPRINGFIELD PUBLIC SCHOOLS

**ENGAGING STUDENTS • FOSTERING ACHIEVEMENT • CULTIVATING 21ST CENTURY
GLOBAL SKILLS**

Varied reinforcement procedures
Immediate feedback
Work-in-progress check
Personalized examples

TESTING AND ASSESSMENT ACCOMMODATIONS AND MODIFICATIONS:

Answers to be dictated
Frequent rest breaks
Additional time
Oral testing
Choice of test format (multiple-choice, essay, true-false)
Alternate ways to evaluate (projects or oral presentations instead of written tests)
Accept short answers
Open-book or open-note tests
Read test and directions to student
Provide study guides prior to tests
Highlight key directions
Test in alternative site
Use of calculator
Extra credit option
Pace long-term projects
Preview test procedures
Simplified test wording; rephrased test questions and/or directions

GENERAL ACCOMMODATIONS AND MODIFICATIONS:

Allow outlining, instead of writing for an essay or major project
Use of alternative books or materials on the topic being studied
Computerized spell-check support
Word bank of choices for answers to test questions
Provision of calculator for math tests
Film or video supplements in place of reading text
Reworded questions in simpler language
Projects instead of written reports
Highlighting important words or phrases in reading assignments
Modified workload or length of assignments/tests
Modified time demands



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Pass/no pass option
Modified grades based on IEP

BEHAVIOR ACCOMMODATIONS FOR STUDENTS:

- Breaks between tasks
- Cue expected behavior
- Daily feedback to student
- Have contingency plans
- Use de-escalating strategies
- Use positive reinforcement
- Use proximity/touch control
- Use peer supports and mentoring
- Model expected behavior by adults
- Have parent sign homework
- Set and post class rules
- Chart progress and maintain data



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Accommodations and Modifications for ESL Students

- Give tests orally
- Give instructions/directions in writing and orally
- Assign a peer tutor, same language or English speaking
- Allow use of bilingual/translation dictionary
- Provide summaries of text or study guides of particular chapters
- Allow errors in speaking
- Allow errors in writing
- Accept writing in first language
- Highlight key vocabulary
- Reduce amount of work required
- Assess comprehension through demonstration or other alternative means (gestures, drawings)
- Rephrase questions, directions, and explanations
- Reduce multiple choices on assessments
- Provide study guides and/ or outlines
- Shorten reading assignments
- Allow extended time for test/project completion
- Use of audio books
- Use of graphic organizers
- Use reduced text, so that print is not dense
- Use visuals/pictures throughout lesson/unit/assignment
- Adapt homework to reflect language proficiency/home support
- Adapt homework to reflect home support
- Provide hands-on activities and explanations
- Allow extended time to answer questions, and permit drawing, as an explanation
- Use of translation dictionaries to locate words in the native language
- Use anecdotal records and portfolio of work as forms of assessment
- Use story retellings to assess comprehension

What Does the Gifted and Talented Experience Look Like? *Springfield Public Schools*

Mission Statement

The Gifted and Talented Program of the Springfield Public Schools aims to provide a meaningful and rigorous education that instills the value of lifelong learning and empowers all students to reach their full potential and become self-fulfilled creative leaders in accordance with the comprehensive standards of our state. We accomplish this by offering challenging, real-world experiences in a student-centered environment.

We recognize that students come from diverse socioeconomic, cultural, and ethnic backgrounds, and the mission of the gifted and talented program is to provide opportunities for students to explore their intellectual, creative, and artistic gifts and talents within the classroom and with beyond-the-classroom experiences. It is essential to provide diverse, appropriate, and ongoing learning experiences and environments that incorporate students' academic, psychological, and social needs. Our responsibility is to provide students with educational alternatives that teach, challenge, and expand their knowledge, while simultaneously stressing the development of independent and self-directed learners who continuously generate questions, analyze, synthesize, and evaluate information and ideas.

New Jersey Administrative Code 6A:8-3.1 defines students who are gifted and talented as those students who possess or demonstrate high levels of ability in one or more content areas when compared to their chronological peers in the local district and who require modification of their educational program if they are to achieve in accordance with their capabilities.

Goals:

To support our mission, we have established the following goals to guide our work:

- To infuse into the general education program a broad range of activities for high-level learning that will challenge all students to perform at advanced levels, and provide extended opportunities, resources, and support in particular areas where student interest or talent is demonstrated.
- To provide a continuum of gifted education services that will strengthen the total school program, offer enriching and challenging learning opportunities for all students, and provide specialized learning experiences
- To promote achievement of students' best potentials and increased ability.

Through a productive and collaborative relationship among the building principals, classroom teachers, and the Gifted and Talented teacher, our schools can create programming that will enhance the learning experience for every student and serve the unique and specialized needs of students currently demonstrating gifted behaviors.

Elements of the Schoolwide Enrichment Model, W.I.N (What I Need), differentiated instruction, advanced classes, or individual programs into a student's regular instruction program are integral to this overarching framework for gifted education in the Springfield School District.

Reference Board Policy and Regulation 2464 – Gifted and Talented Pupils (M)

Early Childhood Center **Edward V. Walton**

Schoolwide Virtual Enrichment

All first and second grade students have access to the [Gifted and Talented Virtual Classroom](#). This virtual classroom is a space for students to complete various challenges and enrichment opportunities at their own pace. Students can receive feedback and additional adaptable resources to meet their individual learning needs. The virtual classroom design expands accessibility to enrichment resources and allows students to choose learning activities according to their unique interests and abilities. The purpose of the activities is to encourage problem-solving, develop critical thinking

skills, and expand curiosity and imagination. Activities are aligned to the New Jersey Student Learning Standards.

Gifted and Talented Teacher as a Resource

The Gifted and Talented teacher serves as a resource to all teachers within Edward V. Walton School. Teachers seeking resources for their high-ability learners will receive additional support from the Gifted and Talented teacher in various ways. This support may include additional units of study, challenging resources, and student projects.

Elementary Schools **James Caldwell** **Thelma L. Sandmeier**

The goal is to engage small groups of students in intensive learning experiences through standards-based, rigorous, and relevant units of study that supplement, not supplant, the grade-level curriculum and support students' unique learning needs.

Enrichment Experience Grade 3

Beginning in third grade, the G&T teacher will cycle through all classrooms to work on problem-solving and enrichment tasks with students. Driven by assessment data, academic performance, student interest, and teacher observation, small groups of students will meet with the G&T teacher during W.I.N. (What I Need) periods throughout the week that the teacher is assigned to their classroom teacher. Groupings will be flexible and monitored to best meet each student's needs throughout the school year. Activities will include brain teasers, puzzles, strategic thinking, problem-solving, and STEM challenges.

Targeted Gifted and Talented Programing Grades 4-5

Students may become identified as Gifted and Talented in fourth grade. Students that are identified may receive support from the G&T Teacher for up to five periods (200 minutes) a week during W.I.N. (What I Need) periods. Identified students will meet to explore grade-level content while incorporating depth and complexity in a student-centered, problem-based environment. The Gifted and Talented Program aims to provide students with various advanced and challenging learning experiences across content areas to promote independent thinking skills, refine critical thinking and communication skills, cultivate joy in learning, and expand student interests through problem-solving. The instruction that students receive incorporates 21st Century Skills and advanced content that is challenging, hands-on, and relevant to the real world.

Strategies and Practices that Support Gifted and Talented Students

- Adjusted Pace of Lessons
- Inquiry-Based Instruction
- Higher-Order Thinking Activities
- Interest-Based Content
- Real World Problem Solving/Problem Based Learning
- Independent Study/Passion Projects
- Units of Study with Like-Minded Peers

Schoolwide Virtual Enrichment

All JCS and TLS students have access to grade level-specific [Gifted and Talented Virtual Classrooms](#). These virtual classrooms are a space for students to complete various challenges and enrichment opportunities at their own pace. Students are able to receive feedback and additional opportunities based on their needs. The virtual classrooms have expanded the accessibility of enrichment resources directly to the students and allows for students to choose opportunities according to their interests and abilities. The purpose of the activities is to encourage problem solving, develop critical thinking skills, and expand curiosity and imagination in conjunction with the New Jersey Student Learning Standards.

Gifted and Talented Teacher as a Resource

In addition to classroom support, the Gifted and Talented teacher also serves as a resource to all teachers in the building. Teachers that are seeking resources for their high ability learners will receive additional support from the Gifted and Talented teacher in various ways. This may include additional units of study, challenging resources, student projects, and meeting with the G&T teacher as needed.

Additional Enrichment Opportunities

Across all grade levels 3-5, as recommended by the classroom teacher, students exhibiting a need for additional enrichment may have the opportunity to meet with the G&T teacher as the schedule allows. Groupings will be flexible and monitored to best meet the students' needs throughout the school year. Activities will include, brain teasers, puzzles, strategic thinking activities, problem-solving challenges, and STEM challenges. Students engage in an extended process of asking questions, using resources, and developing answers that lead to thinking about what and how they are learning. Students are held accountable for how they work and use their time by demonstrating their learning through products or presentations.

Students self-select to participate in individual and/or group projects based on interest and commitment. The classroom teacher and/or the enrichment teacher will help guide and monitor student exploration of chosen topics, facilitating their learning with resources and teaching of needed skills.

Secondary Schools
Florence M. Gaudineer Middle School
Jonathan Dayton High School

Grades 6-12: Access to specific content programs with higher levels of academic challenges (i.e. Pre-Algebra, Accelerated Communication Arts, and Advanced Placement Classes)

Dual Credit Courses provide students the opportunity to obtain high school credit, and college credit, simultaneously through partnerships with several institutions.

Project Lead the Way (PLTW) students become builders of technology by engaging in real world activities. Students are empowered as design thinkers collaborating on real world projects.

Gifted and Talented Identification Criteria

The Springfield Schools Gifted and Talented Program recognizes that students require differentiated learning experiences beyond the core curriculum being taught because of their advanced abilities in one or more content areas. These students may also have other cognitive qualities such as curiosity, creativity, motivation, leadership, and passion that require modifications to their academic experience.

Multiple Measures of Eligibility

Kindergarten through grade twelve identification process for gifted and talented students includes multiple measures. Multiple measures may include but are not limited to: achievement test scores; grades; student performance or products; intelligence testing; parent, student, and/or teacher recommendation; and other appropriate measures. The identification methodology is developmentally appropriate, non-discriminatory, and related to the programs and services offered by the Springfield School District. The identification procedures are reviewed annually.

According to N.J.A.C. 6A:8-3.1, all public school districts must have a board-approved gifted and talented identification process and provide services for identified students enrolled in the grades of that school district. The regulations require that identification and services be made available to students in grades K-12.

When students are recommended for the Gifted and Talented Program there are multiple measures that are considered to determine if services are necessary and appropriate. The assessments used are as follows:

- Cognitive Abilities Test (CogAT)
- Classroom Performance/Student Portfolios
- DRA2 Level
- iReady Diagnostic Scores
- Gifted Indicators Checklist
- Start Strong/NJSLA Assessment Data

The N.J.A.C. requires that students be compared to their chronological peers in the local school district. The New Jersey Department of Education has not established state-level criteria for identifying students who are gifted, such as mandated tests or assessments, grade point averages, or IQ scores. Local school districts must use multiple measures to identify students.

Procedures

<https://www.straussesmay.com/seportal/Public/DistrictPolicy.aspx?policyid=2464&id=b8a33a9f505e4998a6db3fb8e1de778b>

Gifted and Talented Program Identification Matrix

Minimum Score Required for Consideration: 14 Points

1 Point	2 Points	3 Points
Cogat Assessment Overall Stanine Score of a 7	Cogat Assessment Overall Stanine Score of an 8	Cogat Assessment Overall Stanine Score of a 9
iReady Math Assessment Just Below Current Grade Level	iReady Math Assessment On Grade Level	iReady Math Assessment ½ Year + Above Current Level
iReady ELA On Grade Level	iReady ELA ½ Year Above Current Level	iReady ELA One Full Grade Level + Above Current Level
NJSLA Math Approaching Expectations	NJSLA Math Met Expectations	NJSLA Math Exceed Expectations
NJSLA ELA Approaching Expectations	NJSLA ELA Met Expectations	NJSLA ELA Exceed Expectations
HOPE Teacher Rating Scale Raw Score: 11 - 29	HOPE Teacher Rating Scale Raw Score: 30 - 49	HOPE Teacher Rating Scale Raw Score: 50-66

Team meetings present the opportunity to review data and assess the educational needs of all students. Teacher provides examples of student work exhibiting above and beyond grade level expectations, creativity, leadership, critical and abstract thinking. Programs for gifted and talented students will be periodically evaluated for their continuing efficacy and adjusted accordingly. The parent of any student identified as gifted or talented shall be consulted regarding any program designed to address the student's particular needs.

Resource Links

https://riversideinsights.com/cognitive_abilities_test

<https://www.curriculumassociates.com/programs/i-ready-learning>

<https://www.nj.gov/education/assessment/resources/>

<https://www.routledge.com/HOPE-Teacher-Rating-Scale-Involving-Teachers-in-Equitable-Identification/Gentry-Pereira-Peters-McIntosh-Fugate/p/book/9781618214522#:~:text=The%20HOPE%20Teacher%20Rating%20Scale,making%20it%20easy%20to%20use.>

Gifted and talented student: The “*[Strengthening Gifted and Talented Education Act](#)*” defines a gifted and talented student as a “student who possesses or demonstrates a high level of ability in one or more content areas when compared to their chronological peers in the school district and who require modifications of their educational program if they are to achieve in accordance with their capabilities.”

Twice-exceptional (2E) students: A twice-exceptional (2E) student is defined as “a student who is both gifted and a student with a disability. These students may also be referred to as having dual exceptionalities or as being gifted with learning disabilities (GT/LD). This also applies to students who are gifted with ADHD or gifted with autism” (New Jersey Association for Gifted Children, www.nagc.org).

Instructional adaptation: An adjustment or modification to instruction enabling a student who is gifted and talented to participate in, benefit from, and demonstrate knowledge and application of the New Jersey Student Learning Standards in one or more content areas at the instructional level of the student, not just the student's grade level.

Identifying gifted and talented students: The focus of identification is to provide programming and services in which students' specific learning needs and potential are appropriately addressed and met. In every New Jersey school district, there are students who require modifications to the general education curriculum if they are to achieve in accordance with their abilities. By identifying a student's general intellectual ability, creativity, or specific academic area aptitudes, we are acknowledging that they need programming and services outside of the general education/grade level curriculum to advance their learning.

NJDOE Fast Facts

<https://www.nj.gov/education/standards/gifted/>

<https://www.nj.gov/education/standards/gifted/legislation.shtml>

Supplemental Resources/Programming for Gifted Students

Edward V. Walton

- PETS Program – Primary Education Thinking Skills
- Group Solutions/Group Solutions 2 – Cooperative Logic Activities
- Lollipop Logic
- Beginning Thinking Skills
- AIMS Education Programming

James Caldwell and Thelma L. Sandmeier

Math/ELA

- Project M3: Mentoring Mathematical Minds
- Junior Great Books
- AIMS Education Programming
- Borenson Hands on Equations
- BizWorld
- Perplexors
- Advanced Math Explorations grade 3-5
- Challenging Units for Gifted Learners (ELA and Math)
- Creative Curriculum Extenders
- Differentiated Lessons & Projects
- Challenge Math Grades 4+
- Differentiating Instruction with Menus (All Content Areas)
- Jacob's Ladder
- Genius Hour/Passion Project
- Spatial Reasoning
- Logic Puzzles, Brain Games, Analogies

STEM

- Engineering is Elementary
- Engineer Throughout the Year
- PBS Design Squad
- DefinedSTEM
- Project Lead the Way (PLTW)

Enrichment Events

Experience for all students to be enriched through events related to the curricular or extracurricular activities. Examples include after school clubs, PTA-sponsored events, leadership opportunities, visual and performing arts, and community service opportunities.