Unit 2: Deductive Reasoning

Content Area: **Mathematics**
Course(s): **English I, Geometry, Honors Geometry**
Time Period: **September**
Length: **2 weeks**
Status: **Published**

Unit Overview

- Analyze a biconditional statement.
- Apply the laws of logic to geometric statements.
- Justify statements about congruent segments in a two column proof using properties, definitions, postulates, and theorems from geometry.
- Justify the steps in solving an equation by using properties from algebra.
- Predict the next figure or item in the pattern.
- Provide examples of conditionals and counterexamples.
- Using a two column format prove angle congruence using properties, definitions, postulates, and theorems from geometry.

Enduring Understandings

- Spatial relationships can be clearly described with geometric properties
- Valid argument and presentation of clearly conclusive evidence is essential to writing a proof.

Essential Questions

- How are geometric properties used in proofs?
- How are undefined terms incorporated in geometric properties?
- What are possible proof formats?
- What are valid justifications in proofs and why are they necessary?

Lesson Titles/Objectives

- To apply the definition and theorems about perpendicular lines
- To apply the definitions of complementary, supplementary angles
- To know the kinds of reasons than can be used in proofs
- To plan proofs and then write them in two-column form
- To recognize the hypothesis and the conclusion of an if-then statement
- To sate and apply the theorems about angles supplementary to, or complementary to, congruent angles
- To state and use the vertical angle theorem
- To state the converse of an if-then statement

- To understand the meaning of if and only if
- To use a counterexample to disprove an if-then statement
- To use properties from algebra and properties of congruence in proofs
- To use the Midpoint Theorem and the Angle Bisector Theorem

Standards

	Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches. Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.
MA.G-CO.C	Prove geometric theorems
MA.G-GPE.B.4	Use coordinates to prove simple geometric theorems algebraically. Connections to Equations.

Indicators

MA.G-CO.C.9	Prove theorems about lines and angles.
MA.G-GPE.B.4	Use coordinates to prove simple geometric theorems algebraically. The correspondence between numerical coordinates and geometric points allows methods from algebra to be applied to geometry and vice versa. The solution set of an equation becomes a geometric curve, making visualization a tool for doing and

understanding algebra. Geometric shapes can be described by equations, making algebraic manipulation into a tool for geometric understanding, modeling, and proof.

21st Century Skills and Career Ready Practices

CRP.K-12.CRP2.1	Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real-world applications, and they make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation.
CRP.K-12.CRP4.1	Career-ready individuals communicate thoughts, ideas, and action plans with clarity, whether using written, verbal, and/or visual methods. They communicate in the workplace with clarity and purpose to make maximum use of their own and others' time. They are excellent writers; they master conventions, word choice, and organization, and use effective tone and presentation skills to articulate ideas. They are skilled at interacting with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome.
CRP.K-12.CRP8.1	Career-ready individuals readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem. They are aware of problems when they occur and take action quickly to address the problem; they thoughtfully investigate the root cause of the problem prior to introducing solutions. They carefully consider the options to solve the problem. Once a solution is agreed upon, they follow through to ensure the problem is solved, whether through their own actions or the actions of others.
CRP.K-12.CRP12.1	Career-ready individuals positively contribute to every team, whether formal or informal. They apply an awareness of cultural difference to avoid barriers to productive and positive interaction. They find ways to increase the engagement and contribution of all team members. They plan and facilitate effective team meetings.

Inter-Disciplinary Connections

LA.RI.11-12.7	Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.
LA.L.11-12.6	Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.
ARCH.9-12.9.4.12.B.(1).3	Integrate structural, environmental, safety, building envelope, and building service systems in the design of buildings and structures.

Instructional Strategies. Learning Activities. and Levels of Blooms/DOK:

- Demonstrate how to solve algebraic proofs
- Demonstrate how to solve basic congruence proofs
- Intro. applying special angles to proofs
- Intro. biconditional statements

- Intro. complementary angles
- Intro. Conclusions
- Intro. Conditional Statements
- Intro. Converse statements
- Intro. counterexamples
- Intro. finding measures of missing angles using theorems of specials angles
- Intro. finidng angle measurement with perpendicular lines
- Intro. Hypothesis
- Intro. perpendicular lines
- Intro. planning a proof
- Intro. proofs and how to use them to solve problems
- Intro. properties of congruence
- Intro. proving theorems
- Intro. reasons used in proofs
- Intro. students to algebraic proofs
- Intro. supplementary angles
- Intro. the Angle Bisector theorem
- Intro. the midpoint theorem
- Intro. theorems of perpendicular lines
- Intro. vertical angles
- Intro. what you can deduce from given information
- make connections between verbal statements and equations
- make connections definitions and equality statements-analyze given information
- Review anticipatory Set
- Review Homework
- Review HSPA warmup
- Review properties of equality from algebra
- Review Quiz
- students will be introduced to the concept of deductive reasoning
- Students will take a quiz on 2.1-2.3 basic proofs
- students will take a quiz on 2.4 - 2.6
- students will take a test on chapter 2
- Students will work independently on developing deductive reasoning skills
- Students will work independently on solving problems involving complementary and supplementary angles
- use mathematical properties to deduce new informationstandards

Modifications:

G&T Modifications

- Ask students' higher level questions that require students to look into causes, experiences, and facts to draw a conclusion or make connections to other areas of learning.
- CTE - Additional reinforcement activities soliciting a deeper understanding of curriculum.
- Employ differentiated curriculum to keep interest high.
- Generating and testing hypotheses

ELLs Modifications

- 1:1 testing
- Digital translators
- Focus on domain specific vocabulary and keywords
- Offer alternate/or modify assessments

IEP & 504 Modifications

- Focus on domain specific vocabulary and keywords
- providing students with content vocabulary prior to teaching a lesson including that vocabulary (pre-teaching)
- reducing homework length to just those most important for review

Formative Assessment

- closure algebraic formal proof
- closure geometric proof
- journal write
- pass out of class
- think-pair-share
- warm up algebraic proprieties of equality
- warm up drawing conclusions

Summative Assessment

- Test inductive reasoning, conjecturing, algebraic proofs and introduction to geometric proofs

Resources & Technology

Resources and Materials

- Geometry Text Book- McDougal – Littell
- Manipulatives
- Protractor
- Ruler
- Study Guide and Practice Sheet – Glencoe/McGraw Hill
- Teacher Created worksheets
- Teacher Generated worksheets

Technology

- Geometer sketchpad
- Mathxl
- Smart Board
- Ti-84 calculator
- Videos

TECH.8.1.12	Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
TECH.8.1.12.A.CS2	Select and use applications effectively and productively.
TECH.8.1.12.B.CS1	Apply existing knowledge to generate new ideas, products, or processes.