Unit #1: Congruence, Proof, Constructions, Parallel Lines, and Quadrilaterals/Unit Includes missing Algebra Skills

Content Area: **Mathematics**
Course(s): **Geometry**
Time Period: **Semester 1**
Length: **12 weeks**
Status: **Published**

Standards

MA.G-CO.A.1	Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.
MA.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).
MA.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.
MA.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.
MA.G-CO.B.7	Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent.
MA.G-CO.B.8	Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions.
MA.G-CO.C.9	Prove theorems about lines and angles.
MA.G-CO.C.10	Prove theorems about triangles.
MA.G-CO.C.11	Prove theorems about parallelograms.
MA.A-APR.A.1	Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.
LA.RST.11-12.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
MA.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.).
MA.A-REI.B.3	Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
MA.G-GPE.B.4	Use coordinates to prove simple geometric theorems algebraically.
MA.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).

MA.G-GPE.B.7	Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.

Enduring Understandings

1. A proof is a logical argument that uses definitions, theorems, and postulates to demonstrate that a mathematical statement is true.

2. There are several ways to make constructions and perform transformations.

3. Each type of quadrilateral has properties that make it unique.

Essential Questions

1. How can we solve linear equations?
2. How can we combine like terms?
3. How can we evaluate expressions?
4. How does writing a proof make you a more logical thinker?
5. How do you use triangle congruence to solve mathematical and real-world problems?
6. How does explaining my process help me to understand a problem solution better?
7. How can transformations and constructions be used to investigate and describe geometric situations?
8. How does geometry shape our world?
9. How can we classify lines as parallel, perpendicular, or neither on the coordinate plane?
10. When parallel lines are cut by a transversal, what is the relationship between pairs of angles formed?
11. How are special quadrilaterals similar to and different from each other?
12. How can we use the distance formula and slope to classify quadrilaterals?

Knowledge and Skills

Introduction to Geometry, Basic Definitions, and Congruent Triangles:

- Solve multi-step linear equations
- Simplify expressions
- Evaluate expressions
- Recognize building blocks of Geometry
- Correctly interpret geometric diagrams
- Write two column proofs
- Identify the tools and procedures used in constructions
- Perform useful constructions
- Draw logical conclusions based on given information
- Recognize and apply operational properties of segments and angles
- Prove triangles congruent
- Apply the principle of CPCTC
- Recognize basic properties of circles

- Identify medians and altitudes of triangles
- Name the various triangles and their parts
- Use angle-side theorems in proofs and applied problems
- Find the slope of a line
- Classify lines as parallel, perpendicular, or neither
- Apply the distance formula
- Find the midpoint of a segment on the coordinate plane

Parallel Lines, Polygons, and Quadrilaterals:

- Use different methods to prove lines parallel
- Identify pairs of angles formed from a transversal cut through parallel lines
- Identify properties of polygons
- Identify special types of quadrilaterals
- Identify properties of parallelograms, rectangles, rhombuses, squares, kites, and trapezoids
- Prove that quadrilaterals are parallelograms
- Classify quadrilaterals as parallelograms, rectangles, rhombuses, or squares on the coordinate plane
- Apply theorems about interior and exterior angles of triangles
- Use formulas that apply to polygons

Transfer Goals

Recognize and solve practical or theoretical problems involving Geometry, including those for which the solution approach is not obvious, by using mathematical reasoning and strategic thinking.

Problems often have multiple methods for being solved and there is often an optimal technique.

Resources

Informal Geometry, by Cox

Geometry for Enjoyment and Challenge, by Rhoad

Moises Geometry, by Moise

Khan Academy

PurpleMath

KutaSoftware

CK-12

Quizlet

Albert I/O

Desmos

Problem-Attic

Classkick