

Unit C - Lines in a Plane

Overview

In this unit students develop proofs to fairly complex problems. Along with two column proofs students are encouraged to give verbal and/or paragraph arguments always with the idea of a clear, logical argument with mathematical justification as a priority.

A major focus in this unit is on quadrilaterals. Properties of quadrilaterals are introduced through various discovery activities in order to build a quadrilateral tree and to be able to classify the special quadrilaterals. Parallelograms are explored in further detail as students learn about sufficient conditions for parallelograms. Coordinate plane geometry is used to classify quadrilaterals.

Finally, the students mover beyond two dimensional shapes and study lines and planes in three dimensional space.

21st Century Capacities: Analyzing

Stage 1 - Desired Results

| | | |
|---|---|---|
| ESTABLISHED GOALS/ STANDARDS | Transfer: | |
| <p>MP 1 Make sense of problems and persevere in solving them</p> <p>MP3 Construct viable arguments and critique the reasoning of others</p> <p>CCSS.MATH.CONTENT.HSG.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.</p> <p>CCSS.MATH.CONTENT.HSG.CO.C.9 Prove theorems about lines and angles.</p> <p>CCSS.MATH.CONTENT.HSG.CO.C.11</p> | <p><i>Students will be able to independently use their learning in new situations to...</i></p> <ol style="list-style-type: none"> 1. Draw conclusions about graphs, shapes, equations, or objects. (Analyzing) 2. Make sense of a problem, initiate a plan, execute it, and evaluate the reasonableness of the solution. (Analyzing) 3. Justify reasoning using clear and appropriate mathematical language. | |
| | Meaning: | |
| | <p>UNDERSTANDINGS: <i>Students will understand that:</i></p> <ol style="list-style-type: none"> 1. Effective problem solvers work to make sense of the problem before trying to solve it 2. Mathematicians compare the effectiveness of various arguments, by analyzing and critiquing solution pathways. 3. Mathematicians analyze characteristics and properties of geometric shapes to develop mathematical arguments about geometric relationships. | <p>ESSENTIAL QUESTIONS: <i>Students will explore & address these recurring questions:</i></p> <ol style="list-style-type: none"> A. What strategies can I use to solve the problem? B. What do I need to support my answer? C. How does classifying bring clarity? D. What makes these shapes the same? Different? |

Geometry Level 1 Curriculum

| Prove theorems about parallelograms. | Acquisition: | |
|--|---|--|
| <p>CCSS.MATH.CONTENT.HSG.GPE.B.4 Use coordinates to prove simple geometric theorems algebraically.</p> | <p><i>Students will know...</i></p> <ol style="list-style-type: none"> 1. If two angles are both supp and comp, then they are both right angles 2. The perpendicular bisector theorem and its converse 3. The formula for slope 4. Horizontal lines have zero slope while vertical lines have no slope 5. Parallel lines have equal slope 6. The slope of perpendicular lines are negative reciprocals 7. The exterior angle inequality theorem 8. alt. int (alt, ext. or corr) angles congruent \Rightarrow lines 9. If 2 int (ext) angles are supplementary \Rightarrow lines 10. If two coplanar lines are perp. to a third line, they are parallel 11. Five ways to prove a quadrilateral is a parallelogram 12. The definition of each quadrilateral 13. Properties of special quadrilaterals and applications of those props 14. The properties of parallelograms in depth 15. A trapezoid is a quadrilateral with exactly one pair of parallel sides 16. Four ways to determine a plane 17. Vocabulary: midpoint, distance, equidistance, plane, coplanar, noncoplanar, interior, exterior, alternate, corresponding, transversal, polygon, convex polygon, diagonals, base angles of a trapezoid, foot of a line, skew | <p><i>Students will be skilled at...</i></p> <ol style="list-style-type: none"> 1. Applying the midpoint formula 2. Creating a diagram for a proof when none is given 3. Using indirect proofs 4. Recognizing special angles pairs formed by transversals 5. Identifying visually whether a slope is positive, negative, zero or if there is no slope 6. Use the relationships of the slopes of parallel and perpendicular lines to solve problems and proofs 7. Identifying the exterior angle, adjacent interior angle and remote interior angles of a triangle 8. Using various methods to prove lines parallel 9. Applying parallel lines and the angles formed by the transversal to solve problems and proofs 10. Identifying polygons and non polygons 11. Naming polygons via their vertices 12. Identifying properties of specific quadrilaterals relating to their diagonals, sides and angles 13. Prove that a quadrilateral is a parallelogram. 14. Classifying quadrilaterals based on definitions and properties 15. Applying the properties of parallelograms and of special quadrilaterals to solve problems and proofs 16. Proving info about special quadrilaterals on the coordinate plane 17. Determining intersections within the 3D world 18. Visualizing 3D scenarios given in written form |
| <p>CCSS.MATH.CONTENT.HSG.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).</p> | | |
| <p>CCSS.MATH.CONTENT.HSG.GPE.B.7 Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.*</p> | | |