

Development of Major Content Strands in Geometry Connections

Chp	Transformations and Symmetry	Relationships Between 2D or 3D Objects	Properties of Plane Figures and 3D Solids	Investigation and Proof	Measurements of Plane Figures
1	Students are introduced to rigid transformations (translation, rotation, and reflection) and use these transformations to recognize different types of symmetry within shapes.		Students determine which shapes have rotation symmetry and/or reflection symmetry. Students analyze properties of shapes when sorting shapes using a Venn Diagram.	Students pose and investigate their own mathematical questions, such as “ <i>What happens when...?</i> ”. Students also begin to study what makes an argument convincing.	Students do a preliminary investigation of how the perimeter and area of a figure changes as it is enlarged proportionally in Lesson 1.1.3.
2	Translation and rotation is used to recognize the relationships between angles formed when parallel lines are cut by a transversal. Students also use	Students learn about the geometric relationships between pairs of angles (such as vertical angles) in complex diagrams. Students learn to recognize the relationship between the measures of the angles (such as complementary or supplementary).	Students learn that the sum of the angles of a triangle is 180° . Students learn how to recognize if three lengths can form a triangle (Triangle Inequality). Students reason that due to symmetry, the base angles of an isosceles triangle are congruent.	Students learn about conditional statements and use arrow diagrams to represent the direction of logic. Students learn to write a conjecture and examine two forms of proof: diagram proof and proof by contradiction.	Students learn how to find the length of a side of a right triangle when given the measures of two other sides. Students also learn how to find the area and perimeter of triangles, trapezoids, and parallelograms, as well as composite shapes.
3	Dilation of two-dimensional shapes is used to introduce similar figures.	Students investigate similar shapes and learn that two shapes are congruent when they are similar and the ratio of corresponding sides is 1. Students also develop AA \sim , SAS \sim , and SSS \sim shortcuts.	This thread is spiraled through homework.	Students learn to organize evidence leading to a conclusion in a flowchart.	Students use information about similar shapes to find the measures of missing side and angle measures.
4	This thread is spiraled through homework.	Students use the common ratios of similar figures to find tangent ratios in right triangles and to build a Trig Table.	Students discover the relationship between the tangent ratios of the acute angles of a right triangle.	Students test conjectures based on the relationship between the tangent (slope) ratio and the slope angle.	Students learn how to find the length of a leg of a right triangle given the length of the other leg and an acute angle.
5	Students use the symmetry of equilateral triangles to discover the special ratio of sides in a 30° - 60° - 90° triangle.	Students use similarity to discover new special right triangles (such as Pythagorean Triples).	In an optional lesson, students understand that in certain circumstances (SSA), more than one triangle is possible.	This thread is spiraled through homework.	Students extend their use of trig to find the length of any side or any angle of a triangle when given sufficient information.
6	Students use their understanding of transformations and symmetry to design a snowflake in Activity 6.2.4.	Students study the conditions for triangle congruence and develop shortcuts for SSS \cong , SAS \cong , AAS \cong , ASA \cong , and HL \cong .	Students begin to use coordinate geometry to study the geometric properties of a shape on a coordinate grid.	Students learn about converses and learn how to document evidence that two triangles are congruent using a flowchart.	Students begin to use coordinate geometry to find the perimeter and area of a shape on coordinate axes.

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Chp	Transformations and Symmetry	Relationships Between 2D or 3D Objects	Properties of Plane Figures and 3D Solids	Investigation and Proof	Measurements of Plane Figures
7	Students use reflection and symmetry to deduce properties of the diagonals of a rhombus. Rotation symmetry also helps students recognize congruent triangles and prove properties of special quadrilaterals. Students use reflection to solve shortest-distance problems.	Students construct a large regular tetrahedron using smaller regular tetrahedra, and then make comparisons between the two 3-dimensional objects. Students also use congruent triangles to prove new properties of special quadrilaterals.	Students study the properties of special quadrilaterals and use algebra to test for parallel, congruent, or perpendicular sides. Students also study special properties of a circle in Lesson 7.1.1.	Students now provide reasons for evidence in their flowcharts to prove that triangles are either similar or congruent. Students also are introduced to the 2-column proof format. An “Explore – Conjecture – Prove” mathematical process is formalized.	Students find the measurements (such as side length, perimeter, or area) of two-dimensional figures on a coordinate grid.
8	This thread is spiraled through homework.	Students investigate the ratios of the perimeters and areas of similar figures. Students use the ratio of the areas of similar figures to develop a method to find the area of a circle.	Students study the angles of regular polygons and discover what makes a pinwheel a regular polygon.	Students investigate what happens to the area of a regular polygon as the number of sides approaches infinity.	Students develop multiple strategies to find the area of a regular polygon. Students develop a strategy to find the area and circumference of a circle, as well as the area of a sector and length of an arc.
9	This thread is spiraled through homework.	Students investigate the ratios of the surface areas and volumes of similar solids.	Students learn to represent 3D solids in multiple ways, including nets, mat plans, and front/right/top views. Students use the properties of rhombi to develop construction techniques.	This thread is spiraled through homework.	This thread is spiraled through homework.
10	This thread is spiraled through homework.	Students study the relationships between angles and arcs and discover the relationship between the lengths of the segments when two chords intersect in a circle.	Students study the properties of chords, tangents, arcs, and angles in a circle.	Students prove conjectures about circles, such as the line perpendicular to a line tangent to a circle must pass through the center of the circle.	Students learn about the measurement of arcs.
11	This thread is spiraled through homework.	Students study the relationships between angles and arcs formed when secants intersect or a line is tangent to a circle.	Students study the properties of platonic solids, as well as cones, pyramids, and spheres.	This thread is spiraled through homework.	Students develop strategies to find the measure of arcs intercepted by tangents and/or secants.
12	This thread is spiraled through homework.	This thread is spiraled through homework.	Students study the geometric definitions of conic sections, and develop Euler’s Formula for Polyhedra.	This thread is spiraled through homework.	This thread is spiraled through homework.

Chp	Tools for Analyzing and Measuring Shapes	Measurements of 3D Solids	Geometric Construction	Algebra	Probability
1	Students use Venn diagrams to classify shapes. Students also study types of symmetry as a way to describe shapes.		Students construct regular polygons using a hinged mirror.	Students will practice writing and solving linear equations, graphing a rule, and using a table to organize information.	Students will learn how to find the probability of simplistic events.
2	Students develop the Pythagorean Theorem to be able to find the length of a side of a right triangle. Students develop formulas to find the area of triangles, parallelograms, and trapezoids, as well as composite shapes.			Students write and solve linear equations from angle relationships. Students review how to solve a system of linear equations, find the slope of a line, how to multiply binomials, and the meaning of square root. Students learn the relationship of the slope of parallel lines and of perpendicular lines.	This thread is spiraled through homework.
3	This thread is spiraled through homework.		Students use rubber bands to construct a shape that is similar to a given shape.	Students continue to write and solve equations based on geometric relationships. They also review how to solve quadratic equations using the Quadratic Formula. They also set up and solve proportional equations based on similar figures.	This thread is spiraled through homework.
4	Students learn about the tangent ratio, which enables them to solve for the side of a right triangle when given the measure of an acute angle and the length of a leg.			Students extend their understanding of slope and slope triangles as they learn about tangent ratios. Students write and solve quadratic equations based on the area of rectangles and the perimeter of right triangles. Students learn to write and solve trigonometric equations involving tangent. Students are introduced to the concept of inverse functions.	Students will extend their understanding of probability to include a study of independent and dependent events. Students will develop probability models (systematic lists, tree diagrams, and area models) to represent the possible outcomes when more than one event is involved.
5	Students learn about the sine and cosine ratios, completing their right triangle trigonometry. Students also develop the Law of Sines and the Law of Cosines.		Students construct triangles using linguini and rulers in order to study the ambiguous case of triangles.	Students extend the ability to write and solve trigonometric equations to now include sine and cosine. Students are introduced to a strategy of rationalizing the denominator.	This thread is spiraled through homework.
6	Students start to use algebra tools to analyze shapes on a coordinate grid.		Students construct a snowflake in Lesson 6.2.5.	Students analyze a shape on a coordinate grid, using slope and distance.	Students will analyze the probability of winning in a “Monty Hall” scenario.

vii: Gray shading signifies major content focus. Diagonal lines indicate no focus for the thread in this chapter.

Chp	Tools for Analyzing and Measuring Shapes	Measurements of 3D Solids	Geometric Construction	Algebra	Probability
7	Students use algebra tools to analyze shapes on a coordinate grid. They also use symmetry and transformations to investigate and prove properties of special quadrilaterals.	Students find the shortest distance between two points on the surface of a cylinder and a cube in Lesson 7.1.3.	Students construct a regular tetrahedron by folding four circles. Students construct regular polygons using a hinged mirror.	During a study of coordinate geometry, students use slope of parallel and perpendicular sides to demonstrate properties of quadrilaterals. Students also review how to graph lines from a rule and how to find the point of intersection of two lines.	This thread is spiraled through homework.
8	Students develop formulas for the area and circumference of a circle. They use proportional reasoning to develop a method to find the area of a sector and the length of an arc.		Student construct polygons and pinwheels with triangles in Lesson 8.1.1.	Students write and solve equations to find the measure of interior and exterior angles of a regular polygon, such as $\frac{180^\circ(n-2)}{n} = 108^\circ$. Other topics spiraled in homework include solving systems of equations and graphing parabolas.	This thread is spiraled through homework.
9	Students develop formulas to find the volume and surface area of prisms and cylinders.	Students learn how to find the surface area and volume of prisms and cylinders.	Students learn how to construct special triangles, perpendicular bisectors, parallel lines, etc.	This thread is spiraled through homework.	This thread is spiraled through homework.
10	Students learn how to find the measure of an arc. They also use relationships to find the length of chords, the measures of inscribed angles, etc. in a circle.	This thread is spiraled through homework.	Students fold tracing paper to find diameters of a circle to find the center. They also use tracing paper to find the circumcenter of a triangle.	Students develop the general equation of a circle and study the translation of a relation on a graph. They also review how to solve equations involving fractions in order to solve equations involving a weighted average. Solving word problems and writing and solving equations based on a geometric relationship are spiraled in the homework.	Students will apply their understanding of the central angle of a circle to find the probability of outcomes on a spinner. They will also use the probability of possible outcomes to find the expected value of a game or situation.
11	Students develop formulas to find the volume and surface area of pyramids, cones, and spheres. They use relationships to find the length of secants and the arcs they intercept.	Students learn how to find the surface area and volume of pyramids, cones, and spheres.	Students use nets to build pyramids. Students create a coordinate grid on a spherical model (such as an orange).	Student understanding of a coordinate grid is extended to the surface of a sphere, where students use latitude and longitude to locate points on the Earth. Students write general equations to represent relationships in a circle.	This thread is spiraled through homework.
12	Students develop Euler's Formula for Polyhedra.	This thread is spiraled through homework.	Students use string and tracing paper to construct ellipses, parabolas, and hyperbolas.	Students investigate the equations of other conic sections, such as the ellipse and the hyperbola. Some topics spiraled in the homework include absolute value and solving equations.	Activity 12.2.4 requires students to find the probability that a goat eats a poisoned weed using area.

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