Geometry, Part 2
Course Outline & Objectives

Course Description:

Students will become proficient in understanding the anatomy of triangles and what makes triangles similar and will master right triangles and basic trigonometry. Students will learn what defines a quadrilateral and will learn the various types, as well as circles, including arc measures, and the areas and lengths of sectors. Students will go on to learn to find the area and perimeter of various shapes and will learn to solve for the surface area and volume of three-dimensional shapes. Finally, students will learn the basic types of transformations and will learn to conduct compositions of transformations.

Credits - One Semester (0.5 Carnegie unit / CA: 5 credits) | Prerequisites: Algebra 1; Geometry, Part 1

Course Outline

Unit 1: Right Triangles

1.1 Pythagorean Theorem and Its Converse
1.2 Special Right Triangles
1.3 Basic Trigonometric Functions
1.4 Angles of Elevation and Depression
1.5 Law of Sine and Cosine

Common Core Standards

In Unit 1, students will learn to:
Define sine, cosine, and tangent and explain their relationship to right triangles using the mnemonic SOH-CAH-TOA. Apply the Pythagorean Theorem and its converse to solve problems involving right triangles. Use the formulas for special right triangles to find the length of missing sides of right triangles. Identify and distinguish between the angle of elevation and the angle of depression, and apply these concepts to solve real-world problems. Apply the Law of Sine and Cosine to find missing sides and angles in triangles. Demonstrate mastery of the above concepts by solving practice problems correctly.
[G.SRT.4, G.SRT.6, G.SRT.7, G.SRT.8, G.SRT.10, G.SRT.11]

Unit 2: Quadrilaterals and Polygons
2.1 Polygon Theorems
2.2 Properties of Parallelograms and Proofs
2.3 Rectangle, Rhombus, and Square
2.4 Trapezoids and Kites
2.5 Classifying Quadrilaterals

In Unit 2, students will learn to:
Identify and name polygons based on the number of sides and their properties. Use the exterior and interior angle theorems to find the sum of the angles in a polygon. Determine the conditions that guarantee a quadrilateral is a parallelogram. Classify quadrilaterals based on their properties. Apply the properties and theorems for rectangles, rhombi, squares, trapezoids, and kites to solve problems involving missing sides and angles. Given four points on the coordinate plane, classify a quadrilateral as a rectangle, rhombus, square, trapezoid, or kite based on its properties.
[G.CO.1, G.CO.10, G.CO.11]

Course Outline

Unit 3: Circles

3.1 Area and Circumference of a Circle
3.2 Central Angles, Chords, and Arcs
3.3 Inscribed Angles and Intercepted Arcs
3.4 Tangent and Tangent Circles
3.5 Chords, Secants, and Tangents
3.6 Cyclic Quadrilaterals
3.7 Inscribed and Circumscribed Polygons
3.8 Area of Sectors and Segments of Circles
3.9 Equation of Circles and Graphing Circles

Unit 4: Transformations

4.1 Identify Rigid Transformations
4.2 Rotations
4.3 Reflections
4.4 Translations
4.5 Dilations and Scale Factors
4.6 Compositions of Transformations

Common Core Standards

In Unit 3, students will learn to:
Calculate the area and circumference of a circle given the radius or diameter, and vice versa. Identify and apply the properties and theorems related to central angles, arcs, inscribed angles, intercepted arcs, chords, tangents, and secants. Recognize and solve problems related to cyclic quadrilaterals and inscribed and circumscribed polygons. Find the area of circular sectors and segments given the angle specified in radians and degrees. Calculate the radius or central angle of a circular sector given its area. Understand and apply the equation and graph of a circle. Understand the basic concepts of conic sections and their examples in real-life.
[G.CO.1, G.C.2, G.C.3, G.C.4, G.C.5, G.GPE.1, G.GPE.2, G.GPE.3, G.GMD.1]

In Unit 4, students will learn to:
Understand the concept of transformation and be able to define it in terms of changes in position, size, and orientation, including translations, rotations, reflections, and dilations. Recognize the properties of transformations, including the preservation of distance, angle measure, orientation, and scale factor.
Recognize and describe patterns in the effects of transformations on geometric figures. Perform translations, rotations, reflections, and dilations on geometric figures using various methods, such as transformation rules, and write the new coordinates of the transformed figure. Apply compositions of transformations to create new transformations by understanding the sequence in which transformations are applied and how they affect the original shape.
[G.CO.2, G.CO.3, G.CO.4, G.CO.5, G.SRT.1, G.SRT.1.a, G.SRT.1.b]

Course Outline

Unit 5: Area and Perimeter

5.1 Area and Perimeter of Triangles
5.2 Area and Perimeter of Quadrilaterals
5.3 Area of Regular Polygons and Tessellations
5.4 Area and Perimeter of Composite Figures
5.5 Area and Perimeter of Similar Figures
5.6 Area and Perimeter in the Coordinate Plane

Common Core Standards

In Unit 5, students will learn to:
Find the area and perimeter of triangles, quadrilaterals, regular polygons, composite figures, similar figures, and figures in the coordinate plane. Calculate the area of a triangle using different formulas, whichever is appropriate, and these include getting half the product of the base and the height, using trigonometry, as well as Heron's formula. Use the most appropriate formula to be used to calculate the area of a specific kind of quadrilateral. Recognize the role of the apothem in solving for the area and perimeter of regular polygons. Define tessellations and recognize the conditions that must be met for shapes to tessellate. Calculate the area of composite figures by breaking them down into smaller shapes.

Recognize the role of scale factors in calculating the area and perimeter of similar figures, emphasizing that the area ratio is the square of the perimeter ratio. Find the area and perimeter of figures in the coordinate plane using the appropriate formula by applying the concept of distance formula to calculate lengths.
[G.GPE.7, G.GMD.1, G.SRT.1.b, G.SRT.9]

Unit 6: Volume and Surface Area

6.1 Space and Figures and Their Nets
6.2 Solids and Cross Sections
6.3 Surface Area of Prisms and Cylinders
6.4 Surface Area of Pyramids and Cones
6.5 Volume of Prisms and Cylinders
6.6 Volume of Pyramids and Cones
6.7 Volume and Surface Area of Spheres
6.8 Volume and Surface Area of Composite Figures
6.9 Cavalieri's Principle
6.10 Effects of Changing Dimensions

In Unit 6, students will learn to:
Define and recognize the relevance of nets in geometry, construct and visualize nets, develop spatial reasoning skills, and improve critical thinking by comparing nets for 3D figures. Determine the properties of cross-sections of 3D shapes, including horizontal, vertical, and diagonal cross-sections, emphasizing the ability to identify, draw, visualize, and analyze the 3D shape based on its cross-sections. Calculate the surface area and volume of prisms, cylinders, pyramids, cones, spheres, and composite solids and their real-life applications. Use the appropriate formula to solve problems involving the surface area and volume of prisms, cylinders, pyramids, cones, spheres, and composite solids and their real-life applications. Apply Cavalieri's Principle to compare volumes of different shapes, analyze cross-sectional areas to determine volume equality, and identify geometric shapes with equal volumes by recognizing that shape alone does not determine volume, with emphasis on the importance of visualizing and interpreting cross-sectional areas.

Apply appropriate formulas to solve problems related to finding the surface area of prisms, cylinders, pyramids, and cones. Explore real-world examples where Cavalieri's Principle can be applied. Recognize the relationship between dimensions and how it impacts solids' volume and surface area. Recognize that altering a solid's length, width, or height will result in corresponding volume and surface area changes.
[G.GMD.1, G.GMD.2, G.GMD.3, G.GMD.4, G.MG.1, G.MG.3]