Geometry CP - Curriculum
Revised - 8/15/05

COURSE DESCRIPTION:

This course is designed for students to better their understanding of Geometry. Topics addressed include: measurement in the plane, measurement in space, points, lines, planes, logic, angles, the coordinate plane, geometric figures, transformations, triangles, parallel lines, triangle congruence, quadrilaterals, similarity and proportion, right triangle trigonometry, and chords, secants and tangents.

The course will combine traditional approaches to learning with hands-on experiences using alternative assessments. Offering students this blend of instructional approaches will address the many learning styles within the classroom.

Students will be able to understand how Geometry relates to the real world and how often math is used in their lives today and in the future.

CORE CURRICULUM CONTENT STANDARDS:

STANDARD 4.2 (GEOMETRY AND MEASUREMENT) ALL STUDENTS WILL DEVELOP SPATIAL SENSE AND THE ABILITY TO USE GEOMETRIC PROPERTIES, RELATIONSHIPS, AND MEASUREMENT TO MODEL, DESCRIBE AND ANALYZE PHENOMENA.

STANDARD 4.5 (MATHEMATICAL PROCESSES) ALL STUDENTS WILL USE MATHEMATICAL PROCESSES OF PROBLEM SOLVING, COMMUNICATION, CONNECTIONS, REASONING, REPRESENTATIONS, AND TECHNOLOGY TO SOLVE PROBLEMS AND COMMUNICATE MATHEMATICAL IDEAS.

CUMULATIVE PROGRESS INDICATORS:

STANDARD 4.2 - MATHEMATICS

Building upon knowledge and skills gained in preceding grades, by the end of Grade 12, students will:

A. Geometric Properties

1. Use geometric models to represent real-world situations and objects and to solve problems using those models (e.g., use Pythagorean Theorem to decide whether an object can fit through a doorway).
2. Draw perspective views of 3D objects on isometric dot paper, given 2D representations (e.g., nets or projective views).
3. Apply the properties of geometric shapes.
   - Parallel lines . transversal, alternate interior angles, corresponding angles
   - Triangles
     a. Conditions for congruence
     b. Segment joining midpoints of two sides is parallel to and half the length of the third side
     c. Triangle Inequality
   - Minimal conditions for a shape to be a special quadrilateral
   - Circles . arcs, central and inscribed angles, chords, tangents
   - Self-similarity
4. Use reasoning and some form of proof to verify or refute conjectures and theorems.
   - Verification or refutation of proposed proofs
   - Simple proofs involving congruent triangles
   - Counterexamples to incorrect conjectures

B. Transforming Shapes

1. Determine, describe, and draw the effect of a transformation, or a sequence of transformations, on a geometric or algebraic object, and, conversely, determine whether and how one object can be transformed to another by a transformation or a sequence of transformations.
2. Recognize three-dimensional figures obtained through transformations of two-dimensional figures (e.g., cone as rotating an isosceles triangle about an altitude), using software as an aid to visualization.
3. Determine whether two or more given shapes can be used to generate a tessellation.
4. Generate and analyze iterative geometric patterns.
   - Fractals (e.g., Sierpinski.s Triangle)
   - Patterns in areas and perimeters of self-similar figures
   - Outcome of extending iterative process indefinitely

C. Coordinate Geometry

1. Use coordinate geometry to represent and verify properties of lines.
   - Distance between two points
   - Midpoint and slope of a line segment
   - Finding the intersection of two lines
   - Lines with the same slope are parallel
   - Lines that are perpendicular have slopes whose product is .1
2. Show position and represent motion in the coordinate plane using vectors.
   - Addition and subtraction of vectors

D. Units of Measurement

1. Understand and use the concept of significant digits.
2. Choose appropriate tools and techniques to achieve the specified degree of precision and error needed in a situation.

- Degree of accuracy of a given measurement tool
- Finding the interval in which a computed measure (e.g., area or volume) lies, given the degree of precision of linear measurements

E. Measuring Geometric Objects

1. Use techniques of indirect measurement to represent and solve problems.
- Similar triangles
- Pythagorean theorem
- Right triangle trigonometry (sine, cosine, tangent)

2. Use a variety of strategies to determine perimeter and area of plane figures and surface area and volume of 3D figures.
- Approximation of area using grids of different sizes
- Finding which shape has minimal (or maximal) area, perimeter, volume, or surface area under given conditions using graphing calculators, dynamic geometric software, and/or spreadsheets
- Estimation of area, perimeter, volume, and surface area

STANDARD 4.5 – MATHEMATICS

At each grade level, with respect to content appropriate for that grade level, students will:

A. Problem Solving

1. Learn mathematics through problem solving, inquiry, and discovery.
2. Solve problems that arise in mathematics and in other contexts (cf. workplace readiness standard 8.3).
   - Open-ended problems
   - Non-routine problems
   - Problems with multiple solutions
   - Problems that can be solved in several ways
3. Select and apply a variety of appropriate problem-solving strategies (e.g., .try a simpler problem. or .make a diagram.) to solve problems.
4. Pose problems of various types and levels of difficulty.
5. Monitor their progress and reflect on the process of their problem solving activity.

B. Communication

1. Use communication to organize and clarify their mathematical thinking.
   - Reading and writing
   - Discussion, listening, and questioning
2. Communicate their mathematical thinking coherently and clearly to peers, teachers, and others, both orally and in writing.
3. Analyze and evaluate the mathematical thinking and strategies of others.
4. Use the language of mathematics to express mathematical ideas precisely.

C. Connections

1. Recognize recurring themes across mathematical domains (e.g., patterns in number, algebra, and geometry).
2. Use connections among mathematical ideas to explain concepts (e.g., two linear equations have a unique solution because the lines they represent intersect at a single point).
3. Recognize that mathematics is used in a variety of contexts outside of mathematics.
4. Apply mathematics in practical situations and in other disciplines.
5. Trace the development of mathematical concepts over time and across cultures (cf. world languages and social studies standards).
6. Understand how mathematical ideas interconnect and build on one another to produce a coherent whole.

D. Reasoning

1. Recognize that mathematical facts, procedures, and claims must be justified.
2. Use reasoning to support their mathematical conclusions and problem solutions.
3. Select and use various types of reasoning and methods of proof.
4. Rely on reasoning, rather than answer keys, teachers, or peers, to check the correctness of their problem solutions.
5. Make and investigate mathematical conjectures.
    - Counterexamples as a means of disproving conjectures
    - Verifying conjectures using informal reasoning or proofs.
6. Evaluate examples of mathematical reasoning and determine whether they are valid.

E. Representations

1. Create and use representations to organize, record, and communicate mathematical ideas.
    - Concrete representations (e.g., base-ten blocks or algebra tiles)
    - Pictorial representations (e.g., diagrams, charts, or tables)
    - Symbolic representations (e.g., a formula)
    - Graphical representations (e.g., a line graph)
2. Select, apply, and translate among mathematical representations to solve problems.
3. Use representations to model and interpret physical, social, and mathematical phenomena.

F. Technology

1. Use technology to gather, analyze, and communicate mathematical information.
2. Use computer spreadsheets, software, and graphing utilities to organize and display quantitative information.
3. Use graphing calculators and computer software to investigate properties of functions and their graphs.
4. Use calculators as problem-solving tools (e.g., to explore patterns, to validate solutions).
5. Use computer software to make and verify conjectures about geometric objects.
6. Use computer-based laboratory technology for mathematical applications in the sciences.

UNIT – MEASUREMENT IN A PLANE –

Perimeter and Area, Area of Triangles and Parallelograms, Pythagorean Theorem, Area of Trapezoids, Area of Regular Polygons, Arc Length and Circumference, and the Area of the Circle, Sectors.

The students will be able to:

- Understand basic terminology of Geometry related to area and perimeter.
    - Perimeter, dimensions, length and width, perimeter formulas, square units, area, Rectangle Area Formula, area additivity, non-overlapping regions, lattice point, Right Triangle Area Formula, altitude/height of a triangle, Triangle Area Formula, altitude/height of a trapezoid, Trapezoid Area Formula, Parallelogram Area Formula, square root, Pythagorean Theorem, Pythagorean Converse Theorem, Pythagorean Triple, circumference, pi, Circle Circumference Formula, arc length, sector, and Circle Area Formula., arc of circle, central angle of circle, minor arc, semicircle, measure of minor arc, measure of major arc, concentric circles,
- Become familiar with the tools needed to be successful in Geometry.
- Write the formula for the perimeter of any polynomial or the circumference of a circle.
- Write the formula for the area of a square, rectangle, trapezoid, parallelogram, triangle and circle.
- Find the perimeter and area of a floor plan..
- Estimate the area of an island.
- Find the perimeter and area of a right triangle.
- Find the perimeter and area of any triangle.

- Find the perimeter and area of a trapezoid.
- Find the length of the diagonal of a rectangular field.
- Estimate the area of a circle.

INSTRUCTIONAL STRATEGIES:
MEASUREMENT IN A PLANE
Traditional Strategies:

- Lecture
- Black Board Work
- Use of Open-ended problems, written and oral exercises, and quantitative comparison activities.
- Vocabulary

Alternative Assessment:

- Cooperative Learning
- Students find the perimeter of their school building.
- Students use concepts in this chapter to find the broadcast area of four local radio stations.
- Students find the area of Puerto Rico.
- Use of technology-based resources

EVALUATION/ASSESSMENT OF STUDENTS:
MEASUREMENT IN A PLANE

- Teacher generated quizzes and tests.
    - Multiple Choice Questions
    - Open-ended Questions
    - Writing Exercises
    - Quantitative Comparison Questions
- Book generated activities, quizzes, and tests.
- Homework
- Seat Work
- Class Participation
- Alternative Assessment
    - Listed Above
    - Writing Assignment:
        - Example:
            - Describe how to find the area of an island.
            - Identify the challenges.

UNIT – MEASUREMENT IN SPACE –
POINTS, LINES AND PLANES IN SPACE, PARALLEL AND PERPENDICULAR LINES AND PLANES, PRISMS AND CYLINDERS, PYRAMIDS AND CONES, SPHERES AND SECTIONS, REFLECTION SYMMETRY IN SPACE, VIEWING SOLIDS AND SURFACES, MAKING SURFACES, AND MAPS AND THE FOUR COLOR THEOREM, SURFACE AREAS OF PRISMS AND CYLINDERS, SURFACE AREAS OF PYRAMIDS AND CONES, PROPERTIES OF VOLUME, MULTIPLICATION, AREA AND VOLUME, VOLUMES OF PRISMS AND CYLINDERS, VOLUMES OF PYRAMIDS AND CONES, THE VOLUME OF A SPHERE, AND THE SURFACE AREA OF A SPHERE
The students will be able to:

- Understand basic terminology of geometry related to three-dimensional figures.
    - Point-Line-Plane postulate, intersecting planes, line perpendicular to a plane, parallel planes, distance between parallel planes, distance to a plane from a point, dihedral angle, skew lines, surface, solid, rectangular solid, box, faces of a box, opposite faces, cube, edges of a box, vertices of a box, cylinder, cylindrical solid, base of a cylinder, lateral

surface of a cylinder, surface area, prism, right prism, right cylinder, oblique prism, oblique cylinder, lateral faces of a prism, lateral edges of a prism, regular prism, cone, conic solid, conic surface, base of a conic solid, vertex of a conic solid, pyramid, lateral faces of a pyramid, lateral edges of a pyramid, right pyramid, oblique pyramid, regular pyramid, axis of a cone, right cone, oblique cone, lateral surface of a cone, lateral edge of a cone, height or altitude of a pyramid, height or altitude of a cone, slant height of a pyramid, slant height of a cone, truncated surface, sphere, radius of a sphere, center of a sphere, radii of a sphere, diameter of a sphere, great circle, small circle, hemisphere, great circle route, plane section, conic section, perpendicular bisector of a segment, reflection image of a point over a line, reflecting plane, congruent figures, directly congruent, oppositely congruent, reflection-symmetry, bilateral symmetry, views, elevations, polyhedron, tetrahedron, hexahedron, octahedron, dodecahedron, Surface area (S.A.), Lateral area (L.A.), Right Prism/Cylinder Lateral Area Formula, Prism/Cylinder Lateral Area Formula, Pyramid/Cone Lateral Area Formula, Regular Pyramid/Cone Lateral Area Formula, unit cube, volume, capacity, volume additivity, Box Volume Formula, Cube Volume Formula, cube root, Prism/Cylinder Volume Formula, Pyramid/Cone Volume Formula, Sphere Volume Formula, hemisphere, and Sphere Surface Area Formula

- Convey ideas about planes with precision.
- Draw/construct a line perpendicular to a plane.
- Sketch the surface of a brick.
- Describe what is meant by a great circle route.
- Sketch the conic sections resulting in a circle, ellipse, parabola, and hyperbola.
- Determine the number of symmetry planes for a common cardboard box.
- Sketch three views of a house.
- Draw/construct a net of a cylinder.
- Cut out of a piece of paper a net of a polyhedron.
- Find the amount of paper needed to produce a shopping bag.
- Cut a net of a regular pyramid out of a piece of paper and construct a three-dimensional model.
- Find the lateral area of a right pyramid.
- Find the surface area of a right cone.
- Show that two solids with the same surface area do not necessarily have the same volume..
- Find the lateral edge length of a cube that has a given volume.
- Give some examples illustrating Cavalieri's Principle on volume of prisms and cylinders.
- Find how much material is needed to produce a bowling ball without holes.
- Find how much material is needed to make a beach ball with a radius of 18 cm.
- Color a map of Africa with the least number of colors so that each country has the same color throughout, countries that share borders have a different color and if two countries meet ata corner they can have the same color..

INSTRUCTIONAL STRATEGIES:

MEASUREMENT IN SPACE

Traditional Strategies:

- Lecture
- Black Board Work
- Use of Open-ended problems, written and oral exercises.
- Vocabulary

Alternative Assessment:

- Cooperative Learning
- Students relate geometric concepts to real life situations.
- Do-Now Problems

- Problem Solving
- Sketch the hierarchy of cylindrical or conic surfaces.
- Find the areas of each polygon on a soccer ball and see how their combined measure compares with the measure calculated from the formula for the surface area of a sphere.
- Use of technology based resources

EVALUATION/ASSESSMENT OF STUDENTS:
MEASUREMENT IN SPACE

- Teacher generated quizzes and tests.
    - Multiple Choice Questions
    - Open-ended Questions
    - Written Exercises
- Book generated activities, quizzes, and tests.
- Homework
- Seat Work
- Class Participation
- Alternative Assessments (listed above)

UNIT – POINTS, LINES AND PLANES –
DOTS AS POINTS, LOCATIONS AS POINTS, ORDERED PAIRS AS POINTS, POINTS IN NETWORKS, PERSPECTIVE DRAWING, EUCLIDEAN GEOMETRY, BETWEENNESS AND DISTANCE, GOOD DEFINITIONS, AND DEDUCTIVE REASONING

The students will be able to:

- Understand basic terminology of Geometry related to points, lines and planes.
    - Pixel, matrix, resolution, discrete line, discrete geometry, oblique line, horizontal line, vertical line, number line, coordinate, distance, ordered pair, plane/coordinate geometry, Cartesian plane, coordinate plane, x-coordinate, y-coordinate, x-axis, y- axis, standard form of a linear equation, slope-intercept form of a linear equation, Königsberg Bridge Problem, arc, network, graph theory, node, vertex (vertices), traversable network, even node, odd node, vanishing point, perspective drawings, line of sight, vanishing line, circularity, undefined terms, figure, space, collinear, coplanar, one-, two-, three-dimensional, postulate, theorem, Euclidean geometry, Point-Line-Plane Postulate, parallel lines, coincidental lines, betweenness of numbers/points, segment, endpoint, ray, opposite rays, distance, and length of a line segment.
- Tell the difference between discrete and continuous lines.
- Explain why distance is always a positive number.
- Graph the line of an equation given in either slope-intercept or standard form.
- Draw a network with more arcs than nodes.
- Sketch a building in one or two point perspective.
- List undefined terms commonly found in geometry.
- Apply the Point-Line-Plane postulate.
- Find the coordinate of a point half way between two other points.

INSTRUCTIONAL STRATEGIES:
POINTS, LINES AND PLANES
Traditional Strategies:

- Lecture
- Black Board Work
- Use of Open-ended problems, written and oral exercises.
- Vocabulary

Alternative Assessment:

- Cooperative Learning
- Do-Now Problems
- Problem Solving.
- Use of technology based resources

EVALUATION/ASSESSMENT OF STUDENTS:
POINTS, LINES AND PLANES

- Teacher generated quizzes and tests.
  - Multiple Choice Questions
  - Open-ended Questions
  - Writing Exercises
- Book generated activities, quizzes, and tests.
- Homework
- Seat Work
- Class Participation
- Alternative Assessment
  - Listed Above
  - Write a report on an artist who uses dots of color to create paintings.
  - Draw a one-point perspective of a city street.
  - Write a report on the history of the Braille Alphabet (discrete figures composed of raised dots).

UNIT –GEOMETRIC FIGURES –
ANGLES AND THEIR MEASURE, POLYGONS, ARCS AND ROTATIONS, PROPERTIES OF ANGLES, ALGEBRA PROPERTIES USED IN GEOMETRY, PARALLEL LINES, PERPENDICULAR LINES, DRAWING PARALLEL AND PERPENDICULAR LINES.

The students will be able to:

- Understand basic terminology of geometry related to geometric figures.
  - Angle, sides of an angle, $\angle$, $\angle$A, $\angle$ABC, $\angle$1, straight angle, zero angle, interior of an angle, exterior of an angle, measure of an angle, m$\angle$ABC, degree, º, angle measure postulate, zero angle, straight angle, angle addition property, angle bisector, image, pre-image, clockwise direction, magnitude of rotation, zero angle, acute angle, right angle, obtuse angle, straight angle, complementary angles, supplementary angles, complements, supplements, adjacent angles, linear pair, linear pair theorem, vertical angles, acute triangle, right triangle, obtuse triangle, vertical angle theorem, postulate of equality, reflexive property of equality, symmetric property of equality, transitive property of equality, postulate of equality and operations, addition property of equality, multiplication property of equality, postulates of inequality and operations, transitive property of inequality, addition property of inequality, multiplication properties of inequality, postulates of equality and inequality, inequality, equality to inequality, equation to inequality property, substitution property, proof argument, justification, transversal, corresponding angles, slope, corresponding angles postulate, parallel lines and slopes theorem, transitivity of parallelism theorem, perpendicular, two perpendiculars theorem, perpendicular to parallels theorem, perpendicular lines and slopes theorem, bisector of a segment, perpendicular bisector , $\perp$, bisector, construction, unmarked straightedge, compass, algorithm, convex set, non-convex set, if-then statement, conditional antecedent, consequent hypothesis, conclusion implies, instance of a conditional, counterexample to a conditional, converse, midpoint, equidistant, $\leftrightarrow$, if and only if, Biconditional, circle, center, radius, diameter of a circle, interior of a circle,

union of sets, intersections of sets, null set, empty set, { }, Δ, polygon, side of polygon, vertex, vertices of a polygon, consecutive vertices, sides, adjacent vertices, sides adjacent, vertices, sides diagonal, *n*-gon, triangle, quadrilateral, pentagon, hexagon, heptagon, octagon, nonagon, decagon, polygonal region, convex polygon, equilateral, isosceles/scalene triangles, hierarchy, family tree, automatic drawer, automatic drawing tool, static mode, dynamic mode, window, menu, triangle inequality postulate, conjecture, specific, generalization, proof of a conjecture, and refining a conjecture

- Use the Angle Measure postulate to find the measure of given angles.
- Draw an eight-sided concave region.
- Rewrite two sentences as a conditional statement.
- Express the converse of a given conditional statement.
- List three properties of a good definition.
- Find the union or intersection of two intersecting lines.
- Sketch a six-sided polygon.
- Determine when a triangle cannot be possible given the measures of all three sides.
- Find the measure of two complimentary angles.
- Find the measures of two supplementary angles given measures expressed as algebraic expressions.
- Prove a given point on segment AB is the midpoint.
- Find the slope of a line passing through two given points.
- Given parallel lines and a transversal, find the measures of each angle formed.
- Define perpendicular bisector.

INSTRUCTIONAL STRATEGIES:
GEOMETRIC FIGURES
Traditional Strategies:

- Lecture
- Black Board Work
- Use of open-ended problems, written and oral exercises.
- Vocabulary

Alternative Assessment:

- Cooperative Learning
- Do-Now Problems
- Problem Solving
- Develop a drawing of word programs.
- Develop a chart of word problems.
- Express a number of old sayings as if-then statements.
- Use of technology based resources

EVALUATION/ASSESSMENT OF STUDENTS:
GEOMETRIC FIGURES

- Teacher generated quizzes and tests.
    - Multiple Choice Questions
    - Open-ended Questions
    - Writing Exercises
    - Word Problems
- Book generated activities, quizzes, and tests.
- Homework
- Seat Work
- Class Participation

- Alternative Assessment
    - Listed Above
    - Choose a sport and report on how knowledge of angles and distance contributes to success.
    - Do a research project on the geometry of a rainbow.
    - Make a poster of selected straightedge and compass constructions for display in class.
    - Make a list of ten real-world examples of vertical, supplementary and complimentary angles.

UNIT –TRANSFORMATIONS –
REFLECTING POINTS, REFLECTING FIGURES, APPLICATIONS OF REFLECTIONS, COMPOSING REFLECTIONS OVER PARALLEL LINES, COMPOSING REFLECTIONS OVER INTERSECTING LINES, TRANSLATIONS AND VECTORS, ISOMETRIES, CONGRUENT FIGURES

The students will be able to:

- Understand basic terminology of geometry related to reflections and congruence.
    - Pre-image, reflecting line, line of reflection, transformation, reflection image of a point, mapping, preserved property, reflection image of a figure, reflection of a figure, distance between two parallel, lines, angle of incidence, angle of reflection, composite of two transformations, $T^{\circ} S$, $T(S(P))$, $T^{\circ}S(P)$, translation, slide, reflection postulate, direction of translation, magnitude of translation, rotation, two-reflection theorem for translations, center of rotation, figure reflection theorem, vector, vector AB, initial point, terminal point, horizontal component, vertical component, order-pair description of a vector, isometry, concurrent lines, glide reflection, horizontal component, vertical component, concurrent lines, ordered-pair description of a vector, glide reflection, congruent figures, $F \cong G$, congruence transformation, directly congruent, oppositely congruent.
- Find the coordinates of the image of a point reflected over the y-axis.
- Draw a reflected image of a triangle over the x-axis.
- Demonstrate the use of reflected images when playing miniature golf.
- Describe the result of two reflections over parallel lines.
- Identify the properties that rotations preserve form the following list: angle measure, betweenness, collinearity, distance and orientation.
- Use a vector to slide a figure three units to the left.
- Sketch the hierarchy of isometries.

INSTRUCTIONAL STRATEGIES:
TRANSFORMATIONS –
Traditional Strategies:

- Lecture
- Black Board Work
- Use of open-ended problems, written and oral exercises.
- Vocabulary

Alternative Assessment:

- Cooperative Learning
- Do-Now Problems
- Problem Solving
- Use of technology based resources

EVALUATION/ASSESSMENT OF STUDENTS:
TRANSFORMATIONS –

- Teacher generated quizzes and tests.
    - Multiple Choice Questions
    - Open-ended Questions
    - Writing Exercises
    - Word Problems
- Book generated activities, quizzes, and tests.
- Homework
- Seat Work
- Class Participation
- Alternative Assessment
    - Listed Above
    - Design a five-hole miniature golf course indicating the optimal shots for a hole-in-one using reflections.
    - Make a poster containing ten real-life instances of isometries.
    - Make your own kaleidoscope and describe the geometric aspects of it.

UNIT –BASIC PROOFS USING CONGRUENCE –
CORRESPONDING PARTS OF CONGRUENT FIGURES, CONGRUENCE AND EQUALITY, ONE STEP CONGRUENCE PROOFS, PROOFS USING TRANSITIVITY, PROOFS USING REFLECTIONS, AUXILLIARY FIGURES AND UNIQUENESS, SUMS OF ANGLE MEASURES IN POLYGONS

The students will be able to:

- Understand basic terminology of geometry related to basic proofs using congruence. corresponding parts, corresponding parts of congruent figures (CPCF) theorem, A-B-C-D theorem, equivalence properties of $\cong$theorem, reflexive property of $\cong$, symmetric property of $\cong$, transitive property of $\cong$, segment congruence theorem, angle congruence theorem, given, to prove paragraph form , two-column form, interior angles, exterior angles, alternate interior angles, AIA$\cong\rightarrow$//lines theorem, //lines$\rightarrow$AIA$\cong$theorem, alternate exterior angles, equidistant, perpendicular bisector theorem, uniquely determined auxiliary figure, uniqueness of parallels theorem, playfair's parallel postulate, non-Euclidean geometric, extended ratio, triangle-sum theorem, quadrilateral-sum theorem, polygon-sum theorem
- Given two named triangles, sketch the situation and name all sets of congruent sides and angles.
- Express congruent parts of congruent figures as equalities.
- Make justified conclusions from given information.
- Given steps of a formal proof, list the justification for each step.
- Use reflections to prove two figures are congruent.
- Describe an instance where an auxiliary figure would help in proving congruence.
- Use the Triangle-Sum theorem to find the measures of the angles in a triangle.

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INSTRUCTIONAL STRATEGIES:
BASIC PROOFS USING CONGRUENCE –
Traditional Strategies:

- Lecture
- Black Board Work
- Use of open-ended problems, written and oral exercises, and quantitative comparison activities.
- Vocabulary

Alternative Assessment:

- Cooperative Learning
- Do-Now Problems
- Problem Solving

- Develop a drawing of word programs.
- Develop a chart of word problems.
- Use of technology based resources

EVALUATION/ASSESSMENT OF STUDENTS:
BASIC PROOFS USING CONGRUENCE

- Teacher generated quizzes and tests.
    - Multiple Choice Questions
    - Open-ended Questions
    - Writing Exercises
    - Word Problems
    - Quantitative Comparison Questions
- Book generated activities, quizzes, and tests.
- Homework
- Seat Work
- Class Participation
- Alternative Assessment
    - Listed Above
    - Compare a (TV) lawyer's arguments with a geometric proof.
    - Ask a carpenter how templates are used to ensure congruence.

UNIT –POLYGONS AND SYMMETRY –
REFLECTION-SYMMETRIC FIGURES, ISOCELES TRIANGLES, TYPES OF QUADRILATERALS, PROPERTIES OF KITES, PROPERTIES OF TRAPEZOIDS, ROTATION SYMMETRY, REGULAR POLYGONS, APPLICATIONS USING REGULAR POLYGONS.

The students will be able to:

- Understand basic terminology of geometry related to polygons and symmetry.
    - Reflection-symmetirc figure, symmetry line, line symmetry, Flip-flop theorem, segment symmetry theorem, vertex angle, Side-switching theorem, angle symmetry theorem, rohombus, Circle symmetry theorem, symmetric figures theorem, rectangle Median of a triangle, base angles, square, base of an isosceles triangle, isosceles triangle symmetry theorem, isosceles triangle coincidence theorem, corollary, isosceles triangle base angles theorem, centroid, equilateral triangle symmetry theorem, kite equilateral triangle angle theorem, trapezoid, hierarchy of quadrilaterals, bases of trapezoid, pair of base angles, isosceles trapezoid, quadrilateral hierarchy theorem, ends of a knife , kite symmetry theorem, symmetry diagonal, kite diagonal theorem, rhombus diagonal theorem, chord, trapezoid angle theorem, isosceles trapezoid symmetry theorem, isosceles trapezoid theorem, rectangle symmetry theorem, center of symmetry, rotation-symmetric figure, n- fold rotation symmetry, regular polygon, regular pentagon, regular hexagon, equiangular polygon, equiangular polygon, center of a regular polygon theorem, center of a regular polygon, bye, minor arc of a chord, pairing, round robin tournament.
- Determine the number of reflection lines of symmetry can be found in a given figure .
- Find the measures of the angles of an isosceles triangle given algebraic expressions for each angle measure.
- Sketch the network showing the relationships of all quadrilaterals (Quadrilateral Heirarchy).
- Given the measure of one angle of a kite, fine the measures of the remaining three angles.
- Sketch a figure that is rotation symmetric.
- Find the sum of the measures of any regular polygon.

- Utilize regular polygons to determine the round-robin schedule of a chess league.

INSTRUCTIONAL STRATEGIES:
POLYGONS AND SYMMETRY –
Traditional Strategies:

- Lecture
- Black Board Work
- Use of open-ended problems, written and oral exercises, and quantitative comparison activities.
- Vocabulary

Alternative Assessment:

- Cooperative Learning
- Do-Now Problems
- Problem Solving.
- Use of technology based resources

EVALUATION/ASSESSMENT OF STUDENTS:
POLYGONS AND SYMMETRY

- Teacher generated quizzes and tests.
  - Multiple Choice Questions
  - Open-ended Questions
  - Writing Exercises
  - Word Problems
  - Quantitative Comparison Questions
- Book generated activities, quizzes, and tests.
- Homework
- Seat Work
- Class Participation
- Alternative Assessment
  - Listed Above
  - Find ten examples of corporate logos (on the internet), copy them and find the lines of symmetry for each.
  - Collect five magazine covers and look for patterns of symmetry.
  - Make a drawing of a name or word that when rotated 180˚ it spells the same.

UNIT –TRIANGLE CONGRUENCE –
DRAWING TRIANGLES, TRIANGLE CONGRUENCE THEOREMS, PROOFS USING TRIANGLE CONGRUENCE THEOREMS, OVERLAPPING TRIANGLES, THE SSA CONDITION ANF THE HL THEOREM, TESSELLATIONS, PROPERTIES OF PARALLELOGRAMS, SUFFICIENT CONDITIONS FOR PARALLELOGRAMS, EXTERIOR ANGLES
The students will be able to:

- Understand basic terminology of geometry related to triangle congruence.
  - Sufficient condition, SSS, SAS, ASA, AAS, congruence theorem, Included angle, included side, overlapping figures, isosceles triangle base angle, non-overlapping figures, SSA condition, legs, hypotenuse, HL condition, HL congruence theorem, SSA congruence theorem, tessellation, Tessellates, fundamental region, exterior angle, Interior angle, properties of a parallelogram, triset, parallelogram symmetry theorem, sufficient conditions for a parallelogram theorem, exterior angle theorem, exterior angle inequality, unequal sides theorem, unequal angles theorem
- Show how two triangles appear to be congruent.

- Given SSS, SAS, AAS, and ASA Congruence theorems, recognize which applie to a given situation..
- Prove figures congruent using at least one of the following SSS, SAS, AAS, and ASA Congruence theorems.
- Give an example of overlapping triangles and show how to prove the triangles are congruent.
- Show the one case where the SSA Congruence theorem is applicable.
- Give an example of tessellations in your neighborhood.
- Prove the distance between two parallel lines is constant.
- List what is needed in order for a figure to be a parallelogram.
- Show how the measure of an exterior angle of a triangle is equal to the sum of the measures of the opposite interior angles.

INSTRUCTIONAL STRATEGIES:
TRIANGLE CONGRUENCE –
Traditional Strategies:

- Lecture
- Black Board Work
- Use of open-ended problems, written and oral exercises, and quantitative comparison activities.
- Vocabulary

Alternative Assessment:

- Cooperative Learning
- Do-Now Problems
- Problem Solving
- Use of technology based resources

EVALUATION/ASSESSMENT OF STUDENTS:
TRIANGLE CONGRUENCE

- Teacher generated quizzes and tests.
    - Multiple Choice Questions
    - Open-ended Questions
    - Writing Exercises
    - Word Problems
    - Quantitative Comparison Questions
- Book generated activities, quizzes, and tests.
- Homework
- Seat Work
- Class Participation
- Alternative Assessment
    - Listed Above
    - Illustrate Morley's Theorem.
    - Find a building under construction, sketch it and locate the triangles and quadrilaterals.

UNIT –INDIRECT AND COORDINATE PROOFS –
THE LOGIC OF MAKING CONCLUSIONS, NEGATIONS, RULING OUT POSSIBILITIES, INDIRECT PROOFS, PROOFS WITH COORDINATES, THE DISTANCE FORMULA, EQUATIONS FOR CIRCLES, MEANS AND MIDPOINTS, THREE-DIMENSIONAL COORDINATES.

The students will be able to:

- Understand basic terminology of Algebra related to system of open sentences in two variables.

    - Coordinate geometry, analytic geometry, Law of Transitivity, negation, not-p, truth value, inverse, contrapositive, Law of Ruling Out Possibilities, Trichotomy Law, direct reasoning, direct proofs, indirect reasoning, contradiction, indirect argument, Law of Indirect Reasoning, indirect proof, convenient location for a figure, Distance Formula on the Coordinate Plane, Equation for a Circle, mean, Number Line Midpoint Formula, Coordinate Plane Midpoint Formula, Midpoint connector Theorem, medial triangle, three-dimensional coordinate system, z-coordinate, ordered triple, x-axis, y-axis, z-axis, Three-Dimension Distance Formula, Box Diagonal Formula, Equation for a Sphere, Three-Dimension Midpoint Formula.
- Give a simple example of the Law of Transitivity.
- Write the negation of a statement.
- Use a grid to rule out possibilities in a mystery or puzzle.
- Use an Indirect Proof to show the statement $2 + 5x = 5x – 8$ is never true.
- Show that a quadrilateral on coordinate plane is a parallelogram.
- On a coordinate plane find the distance between two points.
- Use the equation for a circle to sketch a circle on a coordinate plane.
- Find the midpoint of a segment on a coordinate plane
- Locate the center of a rectangular prism in a three-dimensional coordinate system.

INSTRUCTIONAL STRATEGIES:
INDIRECT AND COORDINATE PROOFS –
Traditional Strategies:

- Lecture
- Black Board Work
- Use of open-ended problems, written and oral exercises, and quantitative comparison activities.
- Vocabulary

Alternative Assessment:

- Cooperative Learning
- Do-Now Problems
- Problem Solving/Word Problems
- Use of technology based resources

EVALUATION/ASSESSMENT OF STUDENTS:
INDIRECT AND COORDINATE PROOFS

- Teacher generated quizzes and tests.
    - Multiple Choice Questions
    - Open-ended Questions
    - Writing Exercises
    - Word Problems
    - Quantitative Comparison Questions
- Book generated activities, quizzes, and tests.
- Homework
- Seat Work
- Class Participation
- Alternative Assessment
    - Listed Above
    - Develop a graph of inequalities in three variables.
    - Sketch a three-dimensional figure in a three-dimensional coordinate system.
    - Students' research linear programming.

UNIT –SIMILARITY AND PROPORTION

RATIO, PROPORTION AND SIMILARITY, PROVING TRIANGLES SIMILAR, SIMILARITY IN RIGHT TRIANGLES, PROPORTIONS, AREAS AND PERIMETER OF SIMILAR FIGURES

The students will be able to:

- Understand basic terminology of geometry related to similarity and proportion.
    - SSS Similarity Theorem, AA Similarity Theorem, SAS Similarity Theorem, size change, size transformation, center of size transformation, size-change factor k, expansion, contraction, identity transformation, Size-Change Preservation Properties Theorem, Figure Size-Change Theorem, ratio, proportion, proportional, extremes, means, Means-Extreme Property, similar figures, F-G, similarity transformation, Similar Figures Theorem, ration of similitude, Fundamental Theorem of Similarity.
- Perform the S_k transformation on a quadrilateral on a coordinate plane.
- State why the numbers 2, 4, 6 and 8 are not proportional.
- Show how corresponding sides of similar triangles are proportional.

INSTRUCTIONAL STRATEGIES:
SIMILARITY AND PROPORTION –
Traditional Strategies:

- Lecture
- Black Board Work
- Use of open-ended problems, written and oral exercises, and quantitative comparison activities.
- Vocabulary

Alternative Assessment:

- Cooperative Learning
- Do-Now Problems
- Problem Solving/Word Problems
- Use of technology based resources

EVALUATION/ASSESSMENT OF STUDENTS:
SIMILARITY AND PROPORTION

- Teacher generated quizzes and tests.
    - Multiple Choice Questions
    - Open-ended Questions
    - Writing Exercises
    - Word Problems
    - Quantitative Comparison Questions
- Book generated activities, quizzes, and tests.
- Homework
- Seat Work
- Class Participation
- Alternative Assessment
    - Listed Above
    - Research the Golden Triangle and write a report on findings.

UNIT –RIGHT TRIANGLE TRIGONOMETRY
SSS SIMILARITY THEOREM, THE AA AND SAS SIMILARITY THEOREM, THE SIDE-SPLITTING THEOREM, GEOMETRIC MEANS IN RIGHT TRIANGLES, SPECIAL RIGHT TRIANGLES, THE TANGENT OF AN ANGLE, THE SINE AND COSINE RATIOS, MORE WORK WITH VECTOR S AND AREA

The students will be able to:

- Understand basic terminology of geometry related to similar triangles and trigonometry.
    - Reciprocals Property, Side-Splitting Theorem, Side-Splitting Converse Theorem, arithmetic mean, geometric mean, Geometric Mean Theorem, Right-Triangle Altitude Theorem, 45-45-90 triangle, Isosceles Right Triangle Theorem, inscribed figure, 30-60-90 triangle, 30-60-90 triangle theorem, leg opposite an angle, leg adjacent to an angle, tangent of an angle *A,* tan *A*, $\tan^{-1}x$, trigonometric ratio, sine of an angle *A,* sin *A*, cosine of an angle *A*, cos *A,* velocity, SAS Triangle Area Formula, Polygon circumscribed about a circle, Circle inscribed in a polygon, Polygon inscribed in a circle, Circle circumscribed about a polygon.
- Compare the lengths of the sides of two triangles and state if they are similar triangles.
- Apply the Side-Splitting theorem to tell if the two triangles are similar.
- Define the term Geometric Mean.
- Given the hypotenuse of a right triangle is 2 cm. long, find the length of the two legs of a 30-60-90 triangle.
- Find the tangent of a right triangle with a 26º angle.
- Solve simple trigonometry problems.

INSTRUCTIONAL STRATEGIES:
RIGHT TRIANGLE TRIGONOMETRY –
Traditional Strategies:

- Lecture
- Black Board Work
- Use of open-ended problems, written and oral exercises, and quantitative comparison activities.
- Vocabulary

Alternative Assessment:

- Cooperative Learning
- Do-Now Problems
- Problem Solving/Word Problems
- Use of technology based resources

EVALUATION/ASSESSMENT OF STUDENTS:
RIGHT TRIANGLE TRIGONOMETRY

- Teacher generated quizzes and tests.
    - Multiple Choice Questions
    - Open-ended Questions
    - Writing Exercises
    - Word Problems
    - Quantitative Comparison Questions
- Book generated activities, quizzes, and tests.
- Homework
- Seat Work
- Class Participation
- Alternative Assessment
    - Listed Above
    - Find tall objects around the campus and estimate their height using trigonometry or similar triangles..

UNIT – CHORDS, SECANTS AND TANGENTS
CHORD LENGTH AND ARC MEASUREMENT, INSCRIBED ANGLES, CENTER OF THE CIRCLE, ANGLES FORMED BY CHORDS OR SECANTS, TANGENTS TO

CIRCLES AND SPHERES, ANGLES FORMED BY TANGENTS, LENGTHS OF CHORDS, SECANTS AND TANGENTS, ISOPERIMETRIC INEQUALITIES

The students will be able to:

- Understand basic terminology of geometry related to circles.
    - Intercepted arc, Arc-Chord ≅Theorem, Chord-Center theorem, picture angle of a camera lens, inscribed angle, inscribed angle, Inscribed Angle Theorem, right-angle method to find, the center of a circle, Angle-Secant theorem, tangent to a circle, point of tangency, Radius-Tangent Theorem, tangent to a sphere, common tangents, tangent-Chord theorem, tangent-secant theorem, secant length theorem, power of a point *P* for a circle, tangent Square theorem, isoperimetric theorem, isoperimetric inequality, isoperimetric theorem
- Describe a minor and major arc.
- Solve simple problems involving inscribed angles.
- Find the where the center of a broken dinner plate would have been before being broken.
- Find the measure of vertical angles formed by the intersection of two secants.
- Determine how far it is to the horizon from a point 100 meters above the surface of the moon (lunar horizon is 1750 meters).
- Find the measure of the minor arc included a 30º angle formed by the intersection of two tangents.
- Determine the figure that would have the maximum area of a set of geometric figures having the same perimeter..

INSTRUCTIONAL STRATEGIES:
CHORDS, SECANTS AND TANGENTS –
Traditional Strategies:

- Lecture
- Black Board Work
- Use of open-ended problems, written and oral exercises, and quantitative comparison activities.
- Vocabulary

Alternative Assessment:

- Cooperative Learning
- Do-Now Problems
- Problem Solving/Word Problems
- Use of technology based resources

EVALUATION/ASSESSMENT OF STUDENTS:
CHORDS, SECANTS AND TANGENTS

- Teacher generated quizzes and tests.
    - Multiple Choice Questions
    - Open-ended Questions
    - Writing Exercises
    - Word Problems
    - Quantitative Comparison Questions
- Book generated activities, quizzes, and tests.
- Homework
- Seat Work
- Class Participation
- Alternative Assessment
    - Listed Above
    - Use knowledge gained in this unit to find the “picture angle” of the camera.

EVALUATION/ASSESSMENT OF CURRICULUM:

This course of study will be evaluated/assessed by instructional staff during the first year of implementation for the purpose of necessary revision at the end of the first year. In addition, this course of study will be reviewed according to the Five Year Curriculum Review schedule. (see attached)

RESOURCES/BIBLIOGRAPHY:

"New Jersey Core Curriculum Content Standards for Technological Literacy" New Jersey Sate Department of Education, 2004

"New Jersey Mathematics Curriculum Framework", Joseph G. Rosentein, Janet H. Caldwell, Warren D. Crown, 2004

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GEOMETRY, Laurie Bass, Art Johnson, Basia Rinesmith Hall and Dorothy Wood, Prentice Hall, 2001