GEOMETRY

GOALS: Students will develop skill and understanding in:

1. Compass and straight edge constructions
2. The use of formal logic in geometric and algebraic proofs
3. The meaning of points, lines, and planes
4. The concepts of congruency and congruent triangles
5. The properties of special segments in triangles
6. The classification and measure of polygons and quadrilaterals
7. The concepts of transformations
8. The concepts of similarity and similar triangle
9. Right triangle relationships
10. Circle relationships
11. The calculation of perimeters and areas of polygons
12. The exploration of loci

OBJECTIVES: Students will be able to:

(Parentheticals refer to Geometry, An Integrated Approach, Larson, Boswell, and Stiff, 1995)

Goal 1. Compass and straight edge constructions

1.1 Explore shapes and optical illusions (1.1 – 1.2)
1.2 Identify congruent and similar objects (1.3)
1.3 Identify symmetry (1.4)
1.4 Find the midpoint of a segment and the slope of a line (1.4 – 1.5)
1.5 Determine parallel and perpendicular lines (1.5)
1.6 Find the perimeter and area of a figure (1.6)
1.7 Produce compass and straightedge constructions (1.7)

Goal 2. The use of formal logic in geometric and algebraic proofs

2.1 Use inductive reasoning to find a pattern (2.1)
2.2 Identify and describe points, lines and planes (2.1)
2.3 Utilize definitions, postulates and theorems (2.1 – 2.6)
2.4 Measure angles and segments (2.2)
2.5 Use the coordinate distance formula (2.3)
2.6 Determine the hypothesis and conclusion of a conditional statement (2.4)
2.7 Find a converse of a conditional statement (2.4)
2.8 Use algebraic and congruence properties (2.5)
2.9 Formulate direct proofs using deductive reasoning (2.6)

Goal 3. The meaning of points, lines, and planes

3.1 Identify relationships between lines and planes (3.1)
3.2 Find the equation of a line (3.2)
3.3 Solve a system of linear equations (3.2)
3.4 Identify and use properties of parallel lines (3.4)
3.5 Use the laws of logic in problem solving (3.3)

Goal 4. The concepts of congruency and congruent triangles

4.1 Classify triangles by angle measure and length of sides (4.1)
4.2 Measure the angles of a triangle (4.2)
4.3 Use the SSS, SAS, AAS, and ASA congruence patterns (4.3 – 4.6)
4.4 Use properties of isosceles and right triangles (4.5 – 4.7)
4.5 Construct a perpendicular line, bisect an angle, bisect a segment, copy a triangle (4.7)

Goal 5. The properties of special segments in triangles

5.1 Identify and use perpendicular bisectors, angle bisectors, medians, altitudes and midsegments of triangles (5.1 –5.3)
5.2 Locate the circumcenter, incenter, orthocenter, and centroid (5.2)
5.3 Identify triangle inequalities (5.4)
5.4 Compare sides and angles of different triangles (5.5)
5.5 Apply properties of triangles and inequalities to real life problems (5.6)

Goal 6. The properties of geometric inequalities

6.1 Identify types of polygons (6.1)
6.2 Find the measure of interior and exterior angles of polygons. (6.2)
6.3 Utilize properties of parallelograms (6.3)
6.4 Prove quadrilaterals to be parallelograms (6.4)
6.5 Identify and categorize rhombi, rectangles, and squares (6.5)
6.6 Identify isosceles and non-isosceles trapezoids and their characteristics (6.6)

Goal 7. The concepts of transformations

7.1 Identify image, preimage, isometry, rigid and non-rigid transformations (7.1)
7.2 Use reflections and line symmetry (7.2)
7.3 Use rotations and rotational symmetry (7.3)
7.4 Use translations (7.4)
7.5 Use glide reflections and compositions (7.5)

Goal 8. The concepts of similarity and similar triangle

8.1 Find and simplify the ratios of two quantities (8.1)
8.2 Solve problems using proportions (8.1- 8.2)
8.3 Identify similar polygons and use properties thereof (8.3)
8.4 Prove two triangles similar using AA, SSS, and SAS (8.4 - 8.5)
8.5 Use triangle proportionality theorems (8.6)

Goal 9. Right triangle relationships

9.1 Prove right triangles congruent (9.1)
9.2 Find the geometric mean of two numbers (9.1)
9.3 Use the Pythagorean Theorem and converse (9.2 - 9.3)
9.4 Find the length of sides of 30-60-90 and 45-45-90 triangles (9.4)
9.5 Find the trig ratios of acute angles (9.6)
9.6 Solve a right triangle (9.6)

Goal 10. Circle relationships

10.1 Identify parts of circles (10.1)
10.2 Use properties of tangents (10.2)
10.3 Find the measure of central angles and arcs (10.3)
10.4 Identify and use properties of chords and arcs (10.4)
10.5 Use properties of inscribed angles (10.5)
10.6 Find the measure of angles formed by tangents, chords, and angles (10.6)

Goal 11. The calculation of perimeters and areas of polygons

11.1 Find the perimeter of a polygon (11.1)
11.2 Find the area of a square and rectangle (11.1)
    11.1.1 a parallelogram and triangle (11.2)
    11.1.2 a trapezoid (11.3)
    11.1.3 regular polygons (11.4)
    11.1.4 circles and sectors (11.6)
11.3 Find the circumference of a circle and length of an arc (11.5)

Goal 12. The calculation of space measurements

12.1 Identify polyhedra and parts thereof (12.1)
12.2 Find the surface area and volume of:
    12.2.1 prisms and cylinders (12.2, 12.4)
    12.2.2 pyramids and cones (12.3, 12.5)
    12.2.3 spheres (12.6)
12.3 Use properties of similar solids to find dimensions and volumes (12.7)

Goal 13. The exploration of loci

12.3 Find a locus in a plane (13.1)
12.4 Find a locus in space (13.2)
12.5 Problem solving with loci (13.3)
12.6 Solve a system of linear equations and inequalities (13.4)
12.7 Find cross sections of a solid (13.5)