SAMPLE DRAFT (10/18/10)

GEOMETRY
USING THE COMMON CORE

The following three standards should be imbedded throughout the course: (*Modeling)

*N.Q.1 **Use units** as a way to understand problems and to guide the solution of multi-step problems; choose and **interpret units consistently in formulas**; choose and interpret the scale and the origin in graphs and data displays.

*N.Q.2 **Define appropriate quantities** for the purpose of descriptive modeling.

*N.Q.3 Choose a level of **accuracy** appropriate to **limitations** on measurement when reporting quantities.

1. Geometric Terms

G.CO.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**.

2. Properties and Proofs of Parallel & Perpendicular Lines

G.CO.9 **Prove theorems about lines and angles**. Theorems include: vertical angles are congruent; when a **transversal** crosses **parallel lines**, **alternate interior angles** are congruent and **corresponding angles** are congruent; points on a **perpendicular bisector** of a line segment are exactly those equidistant from the segment's endpoints.

G.CO.10 **Prove theorems about triangles**. Theorems include: measures of interior angles of a triangle sum to 180°; base angles of isosceles triangles are congruent; **the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length**; the medians of a triangle meet at a point.

G.GPE.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).

3. Congruence

G.CO.3 Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the **rotations** and **reflections** that carry it onto itself.

G.CO.5 Given a geometric figure and a **rotation**, **reflection**, or **translation**, **draw the transformed figure** using, e.g., graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another.

G.CO.6 Use geometric descriptions of **rigid motions** to **transform figures** and to **predict the effect** of a given rigid motion on a given figure; given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent.

G.CO.7 Use the **definition of congruence** in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent.

G.CO.8 Explain how the criteria for **triangle congruence** (**ASA**, **SAS**, and **SSS**) follow from the definition of congruence in terms of rigid motions.

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G.CO.11 **Prove theorems** about **parallelograms**. Theorems include: opposite sides are congruent, opposite angles are congruent, the diagonals of a parallelogram bisect each other, and conversely, rectangles are parallelograms with congruent diagonals.

4. Similarity and Right Triangles

G.SRT.1 Verify experimentally the properties of dilations given by a center and a scale factor:

G.SRT.1a A **dilation** takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged.

G.SRT.1b The **dilation** of a **line segment** is longer or shorter in the ratio given by the scale factor.

G.SRT.2 Given two figures, use the **definition of similarity** in terms of similarity **transformations** to decide if they are similar; explain using similarity transformations the meaning of similarity for triangles as the equality of all **corresponding pairs of angles** and the **proportionality of all corresponding pairs of sides**.

G.SRT.3 Use the properties of **similarity transformations to establish the AA** criterion for two triangles to be similar.

G.SRT.4 **Prove theorems** about **triangles**. Theorems include: a **line parallel to one side of a triangle divides the other two proportionally**, and conversely; the **Pythagorean Theorem** proved using triangle similarity.

G.SRT.5 Use **congruence** and **similarity** criteria for **triangles** to solve problems and to prove relationships in **geometric figures**.

G.SRT.6 Understand that by **similarity**, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of **trigonometric ratios** for acute angles.

G.C.5 Derive using **similarity** the fact that the length of the arc intercepted by an angle is proportional to the radius, and define the radian measure of the angle as the constant of proportionality; derive the formula for the area of a sector.

5. Circles

G.C.1 **Prove** that **all circles are similar**.

G.C.2 Identify and describe relationships among **inscribed angles**, **radii**, and **chords**. Include the relationship between **central**, **inscribed**, and **circumscribed angles**; **inscribed angles on a diameter are right angles**; the **radius of a circle is perpendicular to the tangent** where the radius intersects the circle.

6. Constructions

G.CO.12 Make formal geometric **constructions** with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). Copying a **segment**; copying an **angle**; **bisecting a segment**; **bisecting an angle**; constructing **perpendicular lines**, including the **perpendicular bisector of a line segment**; and constructing a **line parallel to a given line through a point** not on the line.

G.CO.13 **Construct** an **equilateral triangle**, a **square**, and a **regular hexagon inscribed in a circle**.

7. Coordinate Geometry

G.GPE.1 Derive the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation.

G.GPE.2 Derive the equation of a parabola given a **focus** and **directrix**.

G.GPE.4 **Use coordinates to prove simple geometric theorems algebraically**. For example, prove or disprove that a figure defined by four given points in the coordinate plane is a

rectangle; prove or disprove that the point (1, √3) lies on the circle centered at the origin and containing the point (0, 2).

G.GPE.6 **Find the point** on a directed line segment between two given points that **partitions the segment in a given ratio**.

*G.GPE.7 **Use coordinates to compute perimeters** of polygons and areas of triangles and rectangles, e.g., using the distance formula.

G.CO.2 Represent **transformations** in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch).

G.CO.5 Given a geometric figure and a **rotation**, **reflection**, or **translation**, **draw the transformed figure** using, e.g., graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another.

8. Solid Geometry

G.CO.4 Develop **definitions** of **rotations**, **reflections**, and **translations** in terms of angles, circles, perpendicular lines, parallel lines, and line segments.

*G.MG.1 Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).

G.GMD.1 Give an informal argument for the formulas for the **circumference** of a circle, **area** of a circle, **volume** of a **cylinder**, **pyramid, and cone**. Use dissection arguments, Cavalieri's principle, and informal limit arguments.

*G.GMD.3 Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.

G.GMD.4 Identify the **shapes** of two-dimensional **cross-sections** of three-dimensional objects, and identify three-dimensional objects generated by **rotations** of two-dimensional objects.

G.MG.2 Apply concepts of **density based on area and volume** in modeling situations (e.g., persons per square mile, BTUs per cubic foot).*