Geometry Inquiry Based Curriculum Map

Instructions: Please briefly describe a potential problem/project scenario aligning with one or more of the mathematical concepts / skills within a unit.

The following units are an amalgamation of Indiana, Texas and Common Core Content Standards for Mathematics. In addition to the content standards, tasks should promote the full integration of the Common Core Standards for Mathematical Practice, which develop skills such as problem-solving and persevering, abstract reasoning, modeling, and use of appropriate tools.

Unit		Concepts/Skills	Problem / Project Scenarios *Briefly describe a potential problem scenario or activity that applies to one or multiple associated mathematical concepts / skills. Please limit to a couple sentences and include relevant links if applicable (optional).*
Points, Lines, Angles, and Planes		**Students find lengths of midpoints of lines. They describe and use parallel and perpendicular lines.** 1. Find the lengths and midpoints of line segmentss in one- or two-dimensional coordinate systems. 2. Construct congruent segments and angles, angle bisectors, and parallel and perpendicular lines using a straightedge and a compass. 3. Understand and use the relationships between special pairs of angles formed by parallel lines and transversals. 4. Use coordinate geometry to find slopes, parallel lines, perpendicular lines, and equations of lines.	**Problem Scenario / Ideas:** ● Students develop a light-rail system for their town by superimposing a coordinate plane on a town map. Students find distances between stops. ● Students develop a “Math Taboo” game to review and learn definitions about math. (from http://samjshah.com/) ● Students develop a mini-golf course, including paths for hole-in-one for each hole ● Students create sculptures with random materials and identify/name points, lines, planes, parallel lines, perpendicular lines, skew lines, angles, segments, etc. in their sculptures. ● students can create a sundial and try it out on a sunny day
Polygons		**Students identify and describe polygons.** 1. Identify and describe convex, concave, and regular polygons. 2. Find measures of interior and exterior angles of polygons, justifying the method used. 3. Use properties of congruent and similar polygons to solve problems.	**Problem Scenario / Ideas:** ● Burn Area and Perimeter (from FireFightermath.org) ● Students create a family tree using geometric shapes to represent different family members. ● Minigolf course (See above) ● Students paint a tessellation mural. Each group has a piece of the mural and they have to decide how their piece will connect to other group’s pieces with regular polygons. Once they’ve decided on which polygons to use to connect their pieces, they create a

		4. Apply transformations to polygons in order to determine congruence, similarity, symmetry, and tessallations. 5. Find and use measures of sides, perimeters, and areas of polygons, and relate these measures to each other using formulas.	tessellation design for their piece. They paint their piece on canvas. All the pieces get put together to make the mural. • Similarity can be taught by having students pick an image and choose a scale factor to recreate the image with. It also covers measurement standards. • Can we make an "edgier" brownie pan? (from emergentmath.wordpress.com) • Community Garden: students plot out a piece of land and design various flower/vegetable beds to create a community/school garden. Students can practice using area, perimeter, tessellating patterns, symmetry, convex/concave shapes. Lots of ideas! • Design a Quilt activity - using Google Drawings for a pre-activity to transformations • Tricky Transformations Investigation - using GeoGebra web app to have students construct their knowledge of translations, rotations and reflections.
Quadrilaterals		**Students identify and describe simple quadrilaterals.** 1. Describe, classify and understand relationships among the quadrilaterals square, rectangle, rhombus, parallelogram, trapezoid, and kite. 2. Use properties of congruent and similar quadrilaterals to solve problems involving lengths and areas. 3. Find and use the measures of sides, perimeters, and areas of quadrilaterals, and relate these measures to each other using formulas.	**Problem Scenario / Ideas:** • Quadrilateral Dominoes (from notjustsums.com) • Family tree (see above) • "Name that Quad!" Students write clues to describe each of the quadrilaterals based off of key characteristics. Students have to create values for those characteristics as *most important* to determining the quad to *least important*. Students take turns giving each other the clues and seeing how many clues it takes them to correctly identify the quadrilateral.
Triangles		**Students identify and describe types of triangles. They identify and draw altitudes, medians, and angle bisectors.** 1. Identify and describe types of triangles that are right, acute, obtuse, scalene, isosceles, equilateral, and equiangular. 2. Define, identify and construct altitudes, medians, angle bisectors, and perpendicular bisectors. 3. Construct triangles congruent to given triangles. 4. Use properties of congruent and	**Problem Scenario / Ideas:** • Draw me a rocket! SSS, ASA, SAS constructions task (from greatmathsteachingideas.com) • Which triangle is more equilateral? (from mrhonner.com) (attempted solution here) • Family tree • Mini-golf course • Build trestle bridges (can design digitally or build with balsa wood). Must prove that corresponding triangles on opposite trestles are congruent. • Students make a pinhole camera. • Students assess two schematics for ramps (a 45-45-90 and a 30-60-90) and decide which has the longer/shorter hypotenuse. • Triangle Congruency - Roadkill Cafe • Finding the center of gravity of a triangle (medians): Salty Triangles! (from

		similar triangles to solve problems involving lengths and areas. 5. Prove and use theorems involving segments divided proportionally. 6. Prove that triangles are congruent or similar and use the concept of corresponding parts of congruent triangles. 7. Find the measures of sides, perimeter, and areas of triangles, and relate these measures to each other using formulas. 8. Prove, understand, and apply the inequality theorems: triangle inequality, inequality in one triangle, and hinge theorem.	http://function-of-time.blogspot.com/)
Right Triangles		**Students prove the Pythagorean Theorem and use it to solve problems.** 1. Prove and use the Pythagorean theorem. 2. Use special right triangles (30-60 and 45-45-) to solve problems. 3. Define and use the trigonometric functions (sine, cosine, tangent) in terms of angles of right triangles.	**Problem Scenario / Ideas:** ● FirefighterMath.org: Sloped Distance. ● Building a soccer goal (from aol.com) ● Shoelaces Problem (from http://kevinbertman.edublogs.org) ● 3 Acts - TV Spachttp://mrpiccmath.weebly.com/1/post/2012/01/3-acts-tv-space.htmle (from mrpiccmath.weebly.com)
Circles		**Students define ideas related to circles.** 1. Find the center of a given circle. 2. Define and identify relationships among radius, diameter, arc, measure of an arc, chord, secant, and tangent. 3. Define, find, and use measures of arcs and related angles. 4. Define, find, and use measures of circumference, arc length, and	**Problem Scenario / Ideas:** ● The new food recommendations from the USDA: MyPlate ● Students investigate satellite positions: What's the fewest number of geosynchronously orbiting satellites necessary to cover the earth? ● Robot Rainbow Art (from emergentmath.wordpress.com) ● Design/construct gears. These could be for 3D art, a kids toy, or some engineering design. ● Students build paddle wheel boats.

		areas of circles and sectors.	
Solids		**Students describe and make polyhedral and other solids.** 1. Describe the polyhedron that can be made from a given net. Describe the net for a given polyhedra. 2. Identify and know properties of congruent and similar solids. 3. Find and use measurements of sides, volume of solids	**Problem Scenario / Ideas:** ● Fearless Frames Task (from map.mathshell.org). ● Bestsize Cans Task (from map.mathshell.org). ● Calculating Compound Volume formative assessment lesson (from map.mathshell.org) ● I Love Parade - students design and build a parade float using polyhedrons. Good project to work with ratios & proportions as well as surface area. ● Run an Empty Bowls event at your school. Students create clay bowls to sell at the events. Students can also create boxes (draw nets and cut them out) to hold their bowls. ● Students build a package meeting certain requirements using the least material possible. ● Surface Area investigation posed by two cola can boxes.(from mrpiccmath.weebly.com) ● How Many Gumballs Do You Have to Sell to Make a Profit?
Geometric Measurement and Dimension		**Understand similarity in terms of similarity transformations** 1. Verify experimentally the properties of dilation given by a center and a scale factor. 2. Explain volume formulas and use them to solve problems. 3. Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid and cone. 4. Determine how changes in dimensions affect the perimeter, area, and volume of common geometric figures and solids.	**Problem Scenario / Ideas:** ● The Pizza Casbah 30-inch pizza challenge. (from emergentmath.wordpress.com)
Polar Coordinates and Curves		**Graph polar coordinates and curves** 1. Be familiar with polar coordinates. In particular determine polar coordinates of a point given in rectangular coordinates and vice	● Anything with airplanes: traveling, airplanes within an area and how radars are used. ● Vectors: The Harbor Master or similar app can be used to experience trajectory and currents.

		versa. 2. Represent equations given in rectangular coordinates in terms of polar coordinates. 3. Be familiar with, and apply, polar coordinates and vectors in the plane.	