MEDFORD HIGH SCHOOL
COURSE SYLLABUS

Department: Mathematics
Course Title: Geometry
Level and/or Grade: Honors/Grades 9/10
Prerequisite: A- or better in Algebra 1

Course Description:

This course extends the study of geometry by emphasizing precision and developing reasoning and proof. Students will demonstrate a high level of abstract and quantitative reasoning as they communicate understanding. They explore more complex geometric situations and deepen their explanations of geometric relationships using formal mathematical arguments. Analytic geometry connects algebra and geometry resulting in more powerful methods of analysis and problem solving. The course focuses on proving congruence and demonstrating similarity through transformations and proportional reasoning; applying trigonometry to general triangles; deriving and using equations of conic sections in the coordinate plane; explaining and using volume formulas to solve problems; as well as understanding and applying the rules of probability to make decisions.

Learning Standards*: Through communication, representation, reasoning, making connections, and problem solving, students will be able to...

Number and Quantity:
- Define appropriate quantities for descriptive modeling.
- Choose a level of accuracy appropriate to limitations on measurements.

Geometry:
- Represent transformations in the plane; compare transformations; describe the rotations and reflections that carry a polygon onto itself.
- Develop definitions of transformations in terms of angles, circles, perpendicular lines, parallel lines and line segments.
- Specify a sequence of transformations that will carry a figure onto another.
- Understand congruence in terms of rigid motions.
- Explain how the criteria for triangle congruence follow from the definition of congruence in terms of rigid motion.
- Prove geometric theorems about line and angles, triangles, parallelograms and polygons.
- Make formal geometric constructions with a variety of tools.
- Understand similarity in terms of similarity transformations.
- Prove theorems involving similarity.
- Define trigonometric ratios and use the relationship between sine and cosine of complementary angles.
- Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.
- Understand and apply theorems about circles.
- Describe relationships among inscribed angles, radii, and chords.
- Construct the inscribed and circumscribed circles of a triangle and prove properties of angles for a
quadrilateral inscribed in a circle. Construct tangents to a circle.

- Derive the formula for the relationship between the number of sides and sums of interior and exterior angle sums.
- Find arc lengths and area of sectors of circles.
- Derive the equation of a circle using the Pythagorean Theorem and by completing the square.
- Derive the equations for parabolas, ellipses and hyperbolas.
- Use coordinates to prove simple geometric theorems algebraically.
- Use the slope criteria to solve geometric problems.
- Use coordinates and the distance formula to compute perimeters and areas.
- Explain volume formulas circumference and area of circles, volume of a cylinder, cone, and pyramid. Use dissection arguments, Cavalieri’s principle and informal limit arguments.
- Use the formulas to include the formulas for spheres to solve problems.
- Visualize relationships between two-dimensional and three-dimensional objects.
- Use geometric shapes, their measures and their properties to describe objects.
- Apply the concepts of density based on area and volume in real situations.
- Apply geometric methods to solve design problems.
- Use dimensional analysis for unit conversions to confirm that expressions and equations make sense.

**Statistics and Probability:**

- Understand independence and conditional probability and use them to interpret data.
- Use the rules of probability to compute probabilities of compound events in a uniform probability model.
- Use probability to evaluate outcomes of decisions.

*from the 2011 Massachusetts Curriculum Framework for Mathematics*

**Course Alignment with 21st Century Learning Expectations:**

Students will…

1. **Become self-directed learners as they**
   - Set goals and responsibility for learning.
   - Select strategies for problem solving.
   - Monitor one’s own learning through reflection.

2. **Communicate effectively as they**
   - Express ideas precisely and with coherence.
   - Use a variety of representations to express mathematics to multiple audiences.
   - Use appropriate vocabulary and symbolic notation effectively.

3. **Apply problem-solving skills and critical and creative thinking as they**
   - Apply mathematical knowledge to new, non-routine situations.
   - Evaluate and test different routes to solving a problem.
   - Demonstrate persistence.

4. **Use technology appropriately as a tool for learning, collaboration, presentation, research, and design as they**
   - Demonstrate proficiency with the graphing calculator as a tool for learning.
   - Communicate and collaborate with educators and peers using online systems.
   - Use technology strategically for independent learning, calculation and representation.

5. **Act with integrity, respect and responsibility toward themselves, others, and the environment as they**
   - Actively participate in class and demonstrates respectful behavior.
   - Respond to new and diverse perspectives.
   - Critique the work of others and accept the critique of others.
6. Exhibit flexibility and adaptability as they
   - Recognize mistakes as an essential part of learning.
   - Revise thinking to apply in context.
   - Approach new experiences with confidence.

7. Collaborate in diverse groups to share knowledge, build consensus, and achieve goals as they
   - Work in pairs and small groups to discuss and problem solve.
   - Construct team positive interactions.
   - Discuss a variety of viewpoints and demonstrate logical reasoning to make decisions.

8. Practice leadership in and service to their community as they
   - Support their peers in learning mathematics.
   - Participate in departmental activities that promote the understanding mathematics.
   - Use mathematical models to solve community problems.

9. Become contributing citizens in a global society as they
   - Understand the role of mathematics in shaping the world.
   - Exchange ideas and resources beyond the classroom.
   - Make career choices that positively impact future of the mathematical learning.

Assessment:

- See attached grading policy.