MEDFORD HIGH SCHOOL
COURSE SYLLABUS

Department:	Mathematics
Course Title:	Critical Thinking in Mathematics
Level and/or Grade:	Standard; Grade 12
Prerequisite:	Passing grade in Algebra 2

Course Description:

This course provides students with an investigative approach to problem solving. Students will use discrete models to interpret data, make inferences, and solve problems that answer questions to real situations. They will determine "reasonableness" and evaluate representations. Students will use a variety of strategies including arithmetic, geometric, algebraic, and statistical as they analyze and solve problems. Students will communicate their understanding verbally, written, and using models. Topics include: graph theory, combinatorics, growth, statistical modeling, iteration and recursion, voting methods and fair division, symmetry and more.

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

Number Sense and Operations*:*
- Investigate special topics in number theory, e.g., the use of prime numbers in cryptography.

Patterns, Relations and Algebra*:*
- Prove by means of mathematical induction.
- Use matrices to solve problems.
- Describe, complete, extend, analyze, generalize, and create a wide variety of patterns, including iterative and recursive patters such as Pascal's triangle.
- Identify arithmetic and geometric sequences and finite arithmetic and geometric series. Use the properties of such sequences and series to solve problems, including finding the general term and sum recursively and explicitly.
- Demonstrate an understanding of the binomial theorem and use it in the solution of problems.

Geometry*:*
- Investigate the notion of fractal.
- Use symmetries to solve problems.
- Use graphs to investigate probabilistic processes and optimization problems.

Data Analysis, Statistics, & Probability:
- Investigate a variety of mathematical concepts, including statistical methods.
- Use combinatorics to solve problems.
- Explore designs of surveys, polls, and experiments to assess the validity of their results.

Course Alignment with High School Expectations for Student Learning:

Students will…

1. Analyze, interpret, evaluate and use logical reasoning to solve problems using a variety of resources and strategies.
    - Build new mathematical knowledge through problem solving.
    - Adapt and apply a variety of appropriate strategies to solve problems; reflect on the process of mathematical problem solving.
    - Monitor and reflect on the process of mathematical problems solving.
    - Recognize reasoning and proof as fundamental aspects of mathematics.
    - Make and investigate mathematical conjectures.
    - Solve problems that arise in mathematics and other contexts; use connections among mathematical ideas.
    - Analyze problems; choose the best strategy; determine the reasonableness of the solution.
2. Communicate effectively to a variety of audiences.
    - Communicate mathematical thinking coherently and clearly to peers, teachers, and others - orally and through written work.
    - Use the language of mathematics to express ideas precisely.
3. Create works using a variety of communication forms.
    - Present arguments through writing; solve problems through projects, homework, tests, and quizzes; use technology; make oral presentations.
4. Develop skills and knowledge to reach personal and career goals.
    - Develop 'habits of mind': work beyond center of competence; gain attitude of persistence; seek feedback; develop confidence.
5. Work cooperatively to achieve objectives.
    - Work in pairs, small groups, and part of the whole class to solve problems.
    - Analyze and evaluate the mathematical thinking and strategies of others.

Assessment:

- See attached grading policy.