



Course Name	Instructor	Instructor E-mail & Availability
Math Modeling	Mr. Lutter	glutter@aurorak12.org
Course Website	Class Meeting Times & Location:	Prerequisites
	1:50-2:45 PM M – F Rm 363	

Course Description

In this course, students develop a mathematical disposition by encouraging recognition of mathematical opportunities in everyday events. The Common Core Standards of Mathematics are supported in this approach to interpret modeling not as a collection of isolated topics but in relation to the content standards. The modules were written with the intention of being a combination of classroom discussions, group, and individual work. Students use a TI-83 graphing calculator and Web-based java applets and activities to investigate engaging concepts. To develop effective communication skills, students are required to prepare written reports of their findings and reflections to describe their development as a learner.

Standards

Number and Quantity: Quantities (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.
2. Define appropriate quantities for the purpose of descriptive modeling.
3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

Algebra: Creating Equations (A-CED)

1. Create equations and inequalities in one variable and use them to solve problems. *Include equations arising from linear and quadratic functions, and simple rational and exponential functions.*
2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
3. Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. *For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.*

Functions: Interpreting Functions (F-IF)

1. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. *Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.*
2. Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.
3. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.

Functions: Building Functions (F-BF)

1. Write a function that describes a relationship between two quantities.
2. Find inverse functions.
3. Understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents.

Functions: Linear, Quadratics and Exponential Models (F-LE)

1. Distinguish between situations that can be modeled with linear functions and with exponential functions.
2. Interpret the parameters in a linear or exponential function in terms of a context.

Geometry: Similarity, Right Triangles, Trigonometry (G-SRT)



1. Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.

Geometry: Modeling with Geometry (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).
2. Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).

Statistics and Probability: Making Decisions (S-MD)

4. Weigh the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values.
5. Use probabilities to make fair decisions (e.g., drawing by lots, using a random number generator)
6. Analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, pulling a hockey goalie at the end of a game).

CCSS.Math.Practice.MP1 Make sense of problems and persevere in solving them.

CCSS.Math.Practice.MP2 Reason abstractly and quantitatively.

CCSS.Math.Practice.MP3 Construct viable arguments and critique the reasoning of others.

CCSS.Math.Practice.MP4 Model with mathematics.

CCSS.Math.Practice.MP5 Use appropriate tools strategically.

CCSS.Math.Practice.MP6 Attend to precision.

CCSS.Math.Practice.MP7 Look for and make use of structure.

CCSS.Math.Practice.MP8 Look for and express regularity in repeated reasoning.

Learning Outcomes by Quarter

Quarter 1

4-5 weeks Could King Kong Exist? MP 1-8, N-Q 1-3 Choosing a College MP 1-8, N-Q 2 A Tour of Jaffa MP 1-8, N-Q 2, G-MG3 Gauging Rainfall MP 1-8, N-Q 3, G-MG 1, 3
Number and Quantity Assessment MP 1-8, N-Q 1-3
2-3 weeks Sunken Treasure MP 1-8, A-CED 1, G-MG 3 Surveying the Ancient World MP 1-8, G-SRT 8, G-MG 3
Modeling with Geometry Assessment

Quarter 2

3-4 weeks. Maps and Statistics. Food Deserts in the Denver Metro Area. MP 1-8, G-MG 1,3, S-MD 4-6.
1-2 weeks Narrow Corridor MP 1-8, A-CED 1-2, F-IF 7, F-BF 1, G-SRT 8 Similarity, Right Triangles, Trigonometry Assessment
MP 1-8, G-SRT 8
Estimating Temperatures MP 1-8, A-CED 3, F-IF 6 1-2 weeks
Creating Equations Assessment MP 1-8, A-CED 1-3
A Model Solar System MP 1-8, N-Q 1-3, F-LE 1 3-4 weeks Unstable Table MP 1-8, A-CED 1, F-IF 4, F-BF 4, F-LE 5
Viral Marketing MP 1-8, F-LE 1, 5
Linear, Quadratic, and Exponential
Models Assessment MP 1-8, F-LE 1, 5

Quarter 3

Bending Steel MP 1-8, F-IF 4,6 2-3 weeks A Bit of Information MP 1-8, F-IF 4, F-BF 1,5
Interpreting Functions Assessment MP 1-8, F-IF 4,6 State Apportionment MP 1-8, F-BF 1 2-3 weeks Rating Systems
MP 1-8, F-BF 1, S-MD 5-7
Building Functions Assessment MP 1-8, F-BF 1, 5 On Safari MP 1-8, N-Q 1, F-IF 4, S-MD 5,7 1-2 weeks
Making Decisions Assessment MP 1-8, S-MD 5-7



Quarter 4. Final project. Students will pick a real world problem and model it mathematically.

Required Supplies

Grading

Students will be graded on a 4 point scale for all assignments

The Common Core Standards give 6 stages within a complete cycle of modeling:

- 1) Identifying variables in the situation and selecting those that represent essential features,
- 2) Formulating a model by creating and selecting geometric, graphical, tabular, algebraic, or statistical representations that describe relationships between the variables,
- 3) Analyzing and performing operations on these relationships to draw conclusions,
- 4) Interpreting the results of the mathematics in terms of the original situation,
- 5) Validating the conclusions by comparing them with the situation, and then either improving the model or, if it is acceptable,
- 6) Reporting on the conclusions and the reasoning behind them.

Point	Letter Grade	Explanation
4.0	A	<p>The student:</p> <ul style="list-style-type: none"> • Identifies variables, computes and interprets results, reports findings, and justifies the reasonableness of the results and procedures within the context of the task. • Uses a variety of models, symbolic representations, and technology tools to demonstrate a solution to a problem. <p>No major errors or omissions regarding the score 4.0 content.</p>
3.5		In addition to score 3.0 performance, partial success at score 4.0 content
3.0	A	<p>The student:</p> <ul style="list-style-type: none"> • Identifies variables, computes and interprets results, and reports findings using a mixture of representations. • Illustrates the relevance of the mathematics involved. • Identifies extraneous or missing information. • Uses models and symbols to represent and solve a problem, and accurately explain the solution representation. <p>No major errors or omissions regarding the score 3.0 content.</p>
2.5	B	No major errors or omissions regarding score 2.0 content, and partial success at score 3.0 content
2.0	C	<p>The student:</p> <ul style="list-style-type: none"> • Identifies variables and computes and interprets results. • Uses models to represent and solve a problem, and translate the solution to mathematical symbols. <p>No major errors or omissions regarding the score 2.0 content.</p>
1.5	D	Partial success at score 2.0 content, and major errors or omissions regarding score 3.0 content
1.0	D	The student:



		<ul style="list-style-type: none"> Identifies variables and performs necessary computations. With prompting and support, uses models to solve a problem. <p>With help, partial success at score 2.0 content and score 3.0 content.</p>
Below 1.0 or No Evidence	F	Even with help, the student cannot demonstrate understanding of the simple details.

Sources:

<https://www.ocf.berkeley.edu/~mimiyang/misc/rubric.pdf>

https://www.ocf.berkeley.edu/~mimiyang/misc/rubric_supplement.pdf

<http://essentialsguides.sfinstructionalresources.wikispaces.net/file/view/Rubric+for+8SMP.pdf>

School Policies

REQUESTS FOR HOMEWORK

Students requiring homework assignments due to extended excused absences (three days or more) should initially contact the attendance office. The attendance office will notify teachers and collect assignments from individual teachers. Assignments should be ready for pick up 24 hours after a request has been made. Please call the attendance office to check homework status.

MAKE-UP WORK DURING ABSENCES

Any time a student misses a class for any reason whatsoever, that student will be expected to contact each teacher and complete the make-up work in order to achieve the learning objective. This includes field trips, school activities, suspensions, group sessions, truancies, and the like. Make-up work is required and students who have been absent from class must request make-up work from the teacher no later than the next class meeting. Teachers will determine a reasonable amount of time for make-up work when students are absent, using a two days for every one day absent guideline.

Teachers may provide an "alternative" learning experience for make-up work to any student who requests it upon returning to class. For example, a student may have been absent from a class at which the daily learning objective was achieved by means of a class discussion. At the teacher's sole discretion, students who were absent during that discussion might be assigned a two or three-page written essay due three or four days after the student's return to class as an 'alternative' learning experience for that objective.

Teachers will give academic credit to all make-up work that complies with the above guidelines. The only exception is that teachers have the choice whether or not to give academic credit to the make-up work from an unexcused absence. If the absence was unexcused, the teacher should provide feedback but is not required to give credit for the work.

TARDY POLICY

After three tardies teachers will conference with the student and contact home. After 5 tardies students can be referred to the Learning Center and additional consequences may be assigned.

PASSES

Students who leave the classroom or are excused from class must have a pass with correct validation by the teacher. School officials may send for a student using an authorized Administrative Pass. Students who are without official passes will be subject to disciplinary action. Passes will not be given in the first 10 minutes or last 10 minutes of class.

NON-ACADEMIC TECHNOLOGICAL DEVICES

Aurora Public Schools believes in providing environments that optimize learning and teaching and are safe, secure, and well maintained. As such, all personal electronic devices* shall not be seen nor heard during the school day in academic areas of the building from 7:30 A.M. to 3:45 P.M. *Cell phones, iPods, headphones, portable speakers, MP3s, tablets, cameras, etc. **Aurora Central High School is not responsible for lost,**



stolen or damaged electronic devices. *This includes electronic devices that are confiscated by staff.* Aurora Central High School reserves the right to not investigate lost, stolen or damaged electronic devices.

Classroom Policies

No cell phones.
No food.

The students' role is to:

- Decide which aspects of the problem are most important to keep.
- Analyze the information they have and what mathematics they currently know that can be applied to it.
- Mathematical instincts and knowledge are applied to the model, and interesting ideas are gained through creating examples, making approximations, and using theorems and algorithms.
- Results are analyzed for practicality, reasonableness, and acceptableness.

The teachers' role is to:

- Create an environment where students are safe to discuss their mathematical thinking.
- Differentiate levels of support for students to engage in the lesson.
- Anticipate student responses to prompts.
- Monitor for student progress towards the standards.

Tear off and return THIS PAGE only and return to _____(teacher).

I have carefully read the expectations of this course and agree to support the goals and initiatives of the course. I will show up, speak up, stand up and go further than I ever thought possible.

Student name: _____(print)

Grade _____ Period _____

Student Signature: _____

Parent/Guardian Name: _____

Parent/Guardian Signature: _____



Aurora Central High School Syllabus 2016-17

Parent/Guardian Phone Number:

Parent/Guardian Email: _____