Math

* In math modeling we learn about a variety of different topics, including some number theory and precalculus. I am also self-studying for the AP BC Calculus exam. The teaching style is focused around doing problems to motivate mathematical ideas, and there are many labs which involve solving problems and writing solutions in Mathematica. One such problem was the Egg Problem, which addressed solving simultaneous modular equations. My write up is shown below.
* HiMCM
* HiMCM is …
  + problem we chose was…
* Our school also participated in HiMCM, the High School Math Competition in Modelling. This is a contest where a group of 3-4 students writes a mathematical modelling paper addressing one of two open-ended problems. My group chose Problem A, which asked us to develop a mathematical strategy to rate roller coasters and determine the best roller coaster based on data from a given database and additional data found online. We also had to design an app to rate roller coasters (without actually coding it). My group developed a “sub-score” for each roller coaster criteria we chose to consider, which was calculated based on a roller coaster’s value for a property and the distance to the desired value. We then took a weighted average of the sub-scores to get the roller coaster’s score. Our paper is shown below.
* Egg problem

Physics

* Physics is phun
* In physics I follow the calculus track, which lines up approximately with the AP Physics C curriculum. So far we have covered most of mechanics, including kinematics, forces, energy, momentum, and work, and we are in the middle of studying rotational motion. I enjoy physics because everything can be built up logically from a few, observed physical assumptions. The class is also very fun and interesting because the teacher, Mr. Ellis, explains the content very well, includes many demos and labs, and gives us interesting and challenging problems to work on. The first lab we did was calculating the acceleration due to gravity by dropping a penny. My lab report is shown below. At the end of every chapter there is an “uber problem”, which is a big problem that helps connect the concepts of the chapter. At the end of our momentum unit, I derived a formula for the angle between two objects after a 2-dimensional collision, and the derivation is shown below.
* Penny lab
* Uber collision angle

French

* I am in advanced French class, which uses an immersive style of teaching where we only speak in French. It is an interesting class, and the teacher is understanding when students make mistakes in French, as long as we do not switch to English. We learn through various readings, films, class discussions, and projects. Every term we have to record our pronunciation of a short reading, and my recording for A term is shown below. To learn about of French cuisine, our teacher had everyone choose a French dish to prepare and present upon. We had a potluck lunch, and all the food was delicious. I chose to make gratin, and my presentation can be downloaded here.
* Recipe presentation
* Chapitre 1 pronunciation
* Short Story

STEM

* For STEM I everyone has an independent research project, and my project is on integrating sonification into education, specifically in a lesson on joint and combined variation. Sonification is the process of translating data into sound to generate “sound graphs”. I am hoping that these sound graphs will help students get a feel for joint and combined variation the way visuals graph can help students understand direct and inverse variation, and will be more effective than visual graphs because joint and combined variation handles multivariate data. For my testing, I have a pair of google forms which each have a couple surveys, tests, and a video lesson on joint and combined variation. <a> Click here </a> to see the form with the lesson with sonification. In mid-December, we had a practice science fair where everyone presented their research up to that point with a three-fold poster, and the file for my poster is shown below.
* Poster
* Link to forms
* Sonification of PV=nRT

STW

* In Science and Technical Writing we learn to write and read technical writing. The class lines up very closely with STEM class, and many of our assignments for STW relate to our STEM I projects. For example, I took notes on scientific journal articles and researched other technical sources to gain background knowledge for the field of my <a> STEM project </a>: sonification. In addition, I wrote a literature review to summarize the background for my project. We also had a unit on statistics, and I was grouped with two other students to give a presentation to the class on t-tests. Here is a link to the presentation.
* Lit review
* Notes file
* Stats presentation

CS

* In Computer Science I am in the advanced track because I took AP CSA at AMSA, before coming to MAMS. In the beginning of the year, everyone made websites together, but in September we started java and I started working on an exploratory CS project. The goal of my project is to develop an android app with a virtual deck of cards which can be manipulated however the users wish. I started this project last year, but though I made the basic classes for a card, a deck, a player, and had a couple of simple games, the app was almost entirely text based. This year I am improving the user interface by letting the users drag animated cards around and deal cards to different players. The app will also allow users to create a basic game where they can decide how many players there are, what cards each player starts with, and move the cards around between players as they wish. Currently, I have a version which has some bugs and only allows for these parameters to be changed manually in the code. You can download my current version here or see the screenshot to the left.
* Our school also participates in ACSL, the American Computer Science League. I am competing in the senior division, and for the first round I had to write a program that found the sum of all n-digit numbers formed from a big number less than 10^50. My solution to this problem can be downloaded here. You will need a java environment to run the program, such as eclipse.
* Solution to ACSL?
* Project

Humanities

* In humanities we learn history and literature in a combined setting. We started the year with a discussion of our summer reading, *Walden,* by Henry David Thoreau, then we wrote and performed short plays inspired by *Walden*. Click here for a link to the script for my group’s skit. We then read and discussed two short stories by Ray Bradbury, “August 2026: There Will Come Soft Rains” and “The Pedestrian.” I wrote an essay comparing the two short stories, which is shown below. Afterwards, we learned about various ancient civilizations including Ancient China, Ancient India, Sumer, Ancient Egypt, and Ancient Greece. Following this, we had a unit on satire and then on a unit on the impact of race in American culture.
* Walden skit
* Bradbury essay