Math Syllabus 2020

Class objective:

Our main objective is to become mathematically literate world citizens. In order to understand and interact with the world around us, we need to not only understand how to do math, but we also need to know how and when to use it.

In this class, we will develop the tools and intuition necessary to live in our technological world.

Test preparation:

A part of this class will be devoted to developing your test-taking skills. We will do this by first introducing a concept from a fundamental level, so that you feel that you really understand the idea and feel very comfortable with it. Only after we understand the concept will we then study test problems that make use of it. It is far more important that you understand the ideas being taught than for you to be good at taking tests.

About two months before we start to take standardized exams (the SAT), we will start to practice test questions seriously. By this point, we should have the background knowledge to understand the concepts being tested, and we can use this to our advantage when taking the exam.

Homework:

You will be assigned homework periodically throughout the course. The due date for the assignment will be given with the assignment. These assignments will be graded and will constitute 50% of your overall grade for the class.

Tests and quizzes:

Tests will be given at the conclusion of the unit. Quizzes may be given at any time, including surprise quizzes. Together, tests and quizzes will count for 20% of your final class grade.

Participation:

The only way to learn math is by doing math. Your participation in class discussions will be essential to learning the material most effectively. You will receive a grade based on your class participation. Some examples of ways to participate in class include: asking a question, reading a word problem to the class, or volunteering to work out an answer on the board. I will be keeping track of which students participate in the classes, which will constitute 20% of your overall class grade.

Projects:

There will be occasional projects relating to math concepts. Details about these projects will be given when the project is assigned. Together, these projects will constitute the final 10% of your overall grade.

Separation of classes:

To begin, all students will be in one math class together. However, at some point it may be necessary to split into two different classes. This will be done to make sure that each student is being challenged at their math ability level. We don’t split the class to show that some scholars are better students than others; instead we will split only to make sure that each student is getting the best education possible. I will let you know with some advance warning if we decide to split the class.

Classroom Expectations:

- Pencil and paper ready at the start of every class period
- Calculator brought to class every day
- Homework is submitted before the start of class

Schedule:

Unit 1: Math and English

- Classroom directions and classroom interactions
- Arithmetic Operators
- Common Math Terms
- English language “clues”

Unit 2: Math Fundamentals

- Order of operations
- Distributive law
- Manipulating fractions
- Decimals
- Exponents and Roots
- Charts and Graphs

Unit 3: Algebra I

- English for Algebra
- Expressions vs. Equations
- Linear equations in 1 variable
- Radical and Rational equations in 1 variable
- Linear equations in 2 variables
- Quadratic equations in 2 variables
- Higher-order equations in 2 variables
- Graphing equations
- Simultaneous Equations
- Inequalities (1 and 2 variables)
- Complex Numbers and Absolute Values

Unit 4: Algebra II

- What is a function?
- Polynomial functions
- Rational functions
- Conic sections
- Function transformations
- Exponential and logarithmic functions
- Graphing functions
- Systems of equations
- Systems of inequalities

- Probability and counting
- Statistical analysis

Unit 5: Geometry

- Shapes features of shapes
- Lines, rays and segments
- Angles and measures
- Triangles
- Quadrilaterals
- Polygons
- Trigonometry of triangles

Unit 6: Trigonometry

- Exponents and logarithms
- Imaginary numbers and the complex plane
- The unit circle
- Trigonometric definitions from the unit circle
- Sine and Cosine
- Conic sections
- Sequences and Series

Unit 7: Calculus I

- Limits and infinity
- The limit definition of the derivative
- Taking derivatives
- Differentiation and equations of motion
- Differentiation techniques
- Applications of derivatives

Unit 8: Calculus II

- Anti-derivatives
- Integration and the Fundamental Theorem of Calculus
- Integration and equations of motion
- Integration techniques
- Applications of integrals
- L'Hopital's rule
- Sequences and series
- Taylor series and Taylor expansions

Interlude: Math for SAT

- This will be a 6- to 8-week interlude in which we practice SAT-style problems and prepare to take standardized tests.
- This interlude will likely happen between Units 5 and 6.

Week-by-week Syllabus

Spring Term: 1/27/20 – 5/20/20

Unit 1: Math and English

Week 1: 1/27/19 – 1/31/20

- Math Vocabulary
- Introduction to numbers/number theory
- Speaking fractions/decimals
- Speaking expressions/equations
- Geometry

Week 2: 2/3/20 – 2/7/20

- Geometry
- Graphs and Tables
- Operators
- Equalities vs. Expressions
- Unit 1 quiz

Unit 2: Math Fundamentals

Week 3: 2/10/20 – 2/14/20

- Order of operations
- Continuation of fractions
- GCF, LCM
- Ratios

Week 4: 2/17/20 – 2/21/20

- Percentages/Percent change
- Averages
- Exponents
- Roots/fractional exponents
- Rationalizing fractions/Scientific Notation

Week 5: 2/24/20 – 2/28/20

- Irrational numbers/Interval notation
- Absolute Value
- Fundamentals review
- Unit 2 quiz

Unit 3: Algebra I

Week 6: 3/2/20 – 3/6/20

- Linear equations (1 variable), rational equations, radical equations
- Domain and extraneous solutions; solving for expressions
- Solving simultaneous equations
- (More) simultaneous equations

- Solving inequalities

Week 7: 3/9/20 – 3/13/20

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Week 8: 3/16/20 – 3/20/20

- Quadratic equations
- Applications of quadratic equations
- Pi Day fun

Unit 4: Algebra II

Week 9: 3/30/20 – 4/3/20

- Introduction to graphing; graphing linear equations in all forms; slope
- Polynomial equations and roots; connection between roots and x-intercepts
- Graphing quadratics and polynomials
- Graphing practice
- Solving problems through graphing

Week 10: 4/7/20 – 4/10/20

- Continuation of projectile motion
- Introduction to functions – day 1
- Introduction to functions – day 2
- Functional transformations (Absolute value and rational graphs)
- Exponential and Logarithmic functions

Week 11: 4/13/20 – 4/17/20

- Practice with functions
- SAT prep

Week 12: 4/20/20 – 4/24/20

- Practice with functions
- SAT prep
- Conic sections – day 1
- Conic sections – day 2

Unit 5: Geometry

Week 13: 4/27/20 – 4/30/20

- Systems of equations
- Systems of equations
- Systems of equations
- Systems of inequalities
- Systems of inequalities

Week 14: 5/4/20 – 5/8/20

- Quiz
- Statistics and probability

Review: Units 1-4

Week 15: 5/11/20 – 5/15/20

- Miscellaneous topics in algebra – Review
- Cumulative final

Interlude: Applied math project

Week 16: 5/18/20 – 5/20/20

Summer Term: 6/1/20 – 8/7/20

Unit 6: Trigonometry

Week 17: 6/1/20 – 6/5/20

- The unit circle
- Sine and Cosine as functions

Week 18: 6/8/20 – 6/12/20

- Conic sections

Week 19: 6/15/20 – 6/19/20

- Imaginary numbers and the complex plane

Unit Interlude: Standardized test preparation and review

Fall Term: 8/24/20 – 12/11/20

Unit Interlude: Standardized test preparation and review

Spring Term: 1/25/21 – 5/21/21

Unit 7: Calculus I

Week 1: 1/25/21 – 1/29/21

- Limits week 1

Week 2: 2/1/21 – 2/4/21

- Limits week 2
- Formal definition of a limit
- Limits quiz

Weeks 3-4: 2/8/21 – 2/19/21

- Velocity and acceleration
- Limit definition of the derivative

Weeks 5-6: 2/22/21 – 3/5/21

- Shortcuts for differentiation

Weeks 7-8: 3/8/21 – 3/19/21

- Applications of differentiation
- Related rates
- Cumulative exam

Week 9: 3/29/21 – 4/2/21

- The definite integral

Weeks 10-11: 4/5/21 – 4/16/21

- The antiderivative
- Fundamental theorem of calculus

Weeks 11-12: 4/19/21 – 4/30/21

- Shortcuts for integration

Weeks 13-16: 5/3/21 – 5/21/21

- Applications of integration
- Review
- Cumulative exam (based on Calculus AB exam)