

# Intermediate Math Course Syllabus (Summer 2022)

**Course Aims:** The Intermediate Math Course is an intensive, 12-week long course that aims to prepare students for the NSB High School Regional and Middle School National Competitions. This course will teach the topics that most frequently show up in the Mathematics category and topics in the Energy category which pertain to mathematics. Students should note that the course will be rigorous and fast-paced, but if one puts in the work, they will see significant improvement in their mathematics abilities and Science Bowl skills.

**Prerequisites:** Not required, but an Algebra 2 level of mathematics or equivalent is recommended.

## What's Included:

- Weekly lectures on Zoom
- List of recommended reading material and supplemental resources
- 1-on-1 advising about study planning (by appointment)
- Access to exclusive discord server
- Seminars about study tips, buzzing strategies, teamwork skills
- Weekly Office Hours
- Packet readings to test retention of course material

## Lesson Plan:

<b>Week 1:</b> Jun 9th 5-7 PM PDT	Algebra Part 1: Single variable equations (linear and quadratic), rate problems and proportions, manipulating expressions (factoring, difference of squares, sum of cubes, rationalizing the denominator, SFFT)
<b>Week 2:</b> Jun 16th 5-7 PM PDT	Algebra Part 2: Quadratics and Polynomials, Vieta's formulas, Functions, graphing (slope, intercepts), intro to systems of equations
<b>Week 3:</b> Jun 23rd 5-7 PM PDT	Algebra Part 3: Complex Numbers, Exponents and Logarithms, Special Functions (Floor, Ceiling, Absolute Value, Square Root)
<b>Week 4:</b> Jun 30th 5-7 PM PDT	Geometry Part 1: Pythagorean theorem, Special triangles (Isosceles/Equilateral/Right), Special Triangle Lines (perp bisector, angle bisector, altitude), Quadrilaterals (and quadrilateral classification), polygons (angles, area)

<b>Week 5:</b> Jul 7th 5-7 PM PDT	Geometry Part 2: Circles, angles, arc measure, area, inscribed angles, tangents, power of a point 3D geometry: Prisms, pyramids, regular polyhedra, spheres, cones, surface area, volume
<b>Week 6:</b> Jul 14th 5-7 PM PDT	Analytic Geometry: Trigonometry, coordinate geometry, law of sines/cosines, trigonometric identities, distance to a line and plane formulas, transformations of the plane, conic sections
<b>Week 7:</b> Jul 21st 5-7 PM PDT	Counting: Complementary counting, permutations and combinations, principle of inclusion and exclusion pascal's triangle, binomial theorem, counting on a grid, stars and bars
<b>Week 8:</b> Jul 28th 5-7 PM PDT	Probability: Complementary probability, conditional probability and Bayes theorem, geometric probability, expected value
<b>Week 9:</b> Aug 4th 5-7 PM PDT	Number Theory Part 1: Integers, divisibility, factorization, primes, GCD and the Euclidean Algorithm, LCM, number and sum of divisors
<b>Week 10:</b> Aug 11th 5-7 PM PDT	Number Theory Part 2: Number Bases, decimals and fractions, intro to modular arithmetic Factors: Factorials and their factors, perfect numbers, intro to diophantine equations
<b>Week 11:</b> Aug 18th 5-7 PM PDT	A brief introduction to Calculus: Limits, Derivatives, L'Hopital's, Integrals and Geometric Integrals (integral of a circle), Partial Derivatives
<b>Week 12:</b> Aug 25th 5-7 PM PDT	Miscellaneous: Statistics, Named Theorems, Introduction to Vectors and Matrices Intro to Calculus: Sequences and Series (arithmetic, geometric), convergence Tips and Tricks

Note: If you are unable to attend a lesson, we can send you a recording of the lecture