

# Invention Math Academy

Online Mathematics courses

Fall semester 8/24 to 12/21

Our goal is to provide an extra curriculum to strengthen the math foundation.

Lecture recording and notes will be available to students in google classroom

Course Registration: [inventionmath.org](http://inventionmath.org)

Contact Email: [hungzen@inventionmath.org](mailto:hungzen@inventionmath.org)

## Sunday Course

Date: 8/24, (No class 8/31 Label day), 9/7, 9/14, 9/21, 9/28, 10/5, (No class 10/12 columbus day), 10/19, 10/26, 11/2, 11/9, 11/16, 11/23, (No class on 11/30), 12/7, 12/14, 12/21  
totally 15 courses

Course/ Instructor	Lecture Time(Sunday)	Prerequisite	Tuition
02--Math Dr. Hungzen Liao	PM 6:00--7:00(central time)	Complete Singapore math 1 or equivalent material	\$330
03A--Math Dr. Wei Yang	PM 4:00--5:00(central time)	02A,B--Math	\$330
04A--PreAlgebra Ms. Chen Li	PM 3:00--4:00(central time)	03A,B--Math	\$330
05A--Algebra Mr. Tom Weng	PM 4:00--5:00(central time)	04A,B--PreAlgebra	\$330
06A--Algebra Ms. Chen Li	PM 4:30--5:30(central time)	05A,B--Algebra	\$330

07A--Algebra Dr. Qiang Zhao	PM 3:00--4:00(central time)	06A,B--Algebra	\$330
08A--Algebra Dr. Hungzen Liao	PM 3:00--4:00(central time)	07A,B--Algebra	\$330
09A--PreCalculus Dr. Qiang Zhao	PM 4:30--5:30(central time)	08A,B--Algebra	\$330
10A--Calculus AB Dr. Hungzen Liao	PM 4:30--5:45(central time)	09A,B--Precalculus	\$400
08A--Mathcounts/AMC Dr. Wei Yang	PM 5:30--6:45(central time)	07B-Mathcounts/AMC	\$400

### Saturday Course

Date: 8/23, 8/30, 9/6, 9/13, 9/20, 9/27, 10/4, (No class on 10/11), 10/18,  
10/25, 11/1, 11/8, 11/15, 11/22, (No class on 11/29), 12/6, 12/13 totally 15 courses

Course/ Instructor	Lecture Time(Saturday)	Prerequisite	Tuition
AP Physics Dr. Wei Yang	PM 6:00--7:00(central time)	08A-Mathcounts/AMC	\$330
06 Mathcounts Dr. Wei Yang	PM 4:00--5:15(central time)	6th grade	\$400

### Course Instructors:

Dr. Qiang Zhao (07-Algebra, 09-PreCalculus) – Mathematics Professor at Texas State University


Ms. Chen Li (04-PreAlgebra, 06-Algebra) -- 18 years of teaching experience, “Teacher of the Year” Award (2021) at a public middle school in Austin.

Dr. Hungzen Liao (02-Math and Reasoning, 08-Algebra, 10-Calculus) – Over 15 years of teaching experience at a private high school and college in Austin

Dr. Wei Yang (03- Math and Reasoning, 07--Mathcounts/AMC) – Clements high school math teacher. Over 15 years of teaching experience at university and private school.

Mr. Weng (05-Algebra, 08-Algebra) – 20 years of college math teaching experience, coaching students for engineering and computer science majors.

Payment info: Please write students' name in memo

<p>1.Venmo(last 4 digits of phone 8194) <a href="https://venmo.com/u/hungzen">https://venmo.com/u/hungzen</a></p> <p>2.Paypal <a href="https://www.paypal.me/HungzenLiao973">https://www.paypal.me/HungzenLiao973</a></p>	<p>3.Zelle account: hungzen@gmail.com</p> <p>Scan in your banking app to pay HUNG at h...n@gmail.com.</p>  <p><b>Zelle</b></p>
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### IMA Course Description:

#### 02- Math

This is a one-year enhancement course recommended for students in 2nd grade. Semester 1 will cover: Numbers to 1000, Addition, Subtraction, Multiplication, Division, Time, and Money. Semester 2 will cover Review multiplication table and application, Fractions, Patterns, Length, Weight, Volume, Geometry, Data and graph, Problem solving.

### **03- Math**

This is a one-year enhancement course recommended for students in 3rd grade. Semester 1 will cover Number sense, Properties, Fractions. Semester 2 will cover Fractions, Decimals, Geometry, Units of measurement, Data and graphs.

Prerequisite: 02-Math and Reasoning or approved by Dr. Liao.

### **04-PreAlgebra (1<sup>st</sup> Semester: 04A-PreAlgebra, 2<sup>nd</sup> Semester: 04B-PreAlgebra)**

This is a one-year enhancement course recommended for students in 4<sup>th</sup> grade. The course will cover the following topics: comparing integers, operations of integers (+, -, X, /), fractions, operations of fractions (+, -, X, /), solving one-step and two-step equations, divisibility rules, measurement, geometry (angle measure, perimeter and area), patterns and sequences. Prerequisite: 03-Math and Reasoning or approved by Dr. Liao.

### **05-Algebra (1<sup>st</sup> Semester: 05A-Algebra, 2<sup>nd</sup> Semester: 05B-Algebra)**

This is a one-year enhancement course recommended for students in 5<sup>th</sup> grade. The course will cover many topics taught in Texas middle schools. Topics (two semesters) include fraction, operations of fractions, equation with fractions, rounding decimals, linear equations and inequalities with decimal coefficients and fractions, mean median and mode, radical, exponent, least common multiple(L.C.M), prime factorization of integers, percentage change (increase/decrease), ratio, direct proportion, inverse proportion, markup, discount, scale drawing, speed-distance problems, rectangular coordinate system, point, line segment, square root of whole numbers, Pythagorean theorem, area of triangle, box-method. The course will also teach mental mathematics and will enhance student mental calculation skills in arithmetic. Students will spend 5 minutes in each class practicing mental mathematics skills. Prerequisite: 04-PreAlgebra or approved by Dr. Liao.

### **06-Algebra (1<sup>st</sup> Semester: 06A-Algebra, 2<sup>nd</sup> Semester: 06B-Algebra)**

This is a one-year enhancement course recommended for students in 6<sup>th</sup> grade. Topics (two semesters) include distance formula, midpoint formula, graph of a linear equation, equation of a line, intercepts, slope, slope-intercept formula, point-slope formula, graphing, parallel lines, perpendicular lines, system of linear equations, simple and compound interest, financial applications, population growth, linear inequality, system of linear inequalities, triangle inequality theorem, absolute value equation, absolute value inequality, polynomial, operations of polynomials, FOIL expansion, factoring a polynomial, factoring trinomials of the type  $ax^2+bx+c$ . Prerequisite: 05-Algebra or approved by Dr. Liao.

### **07-Algebra (1<sup>st</sup> Semester: 07A-Algebra, 2<sup>nd</sup> Semester: 07B-Algebra)**

This is a one-year enhancement course recommended for Students in 7<sup>th</sup> grade. Topics (two semesters) include solving complicated equations in one variable, quadratic equation, completing square, quadratic formula, discriminant, quadratic type equation, systems of linear and quadratic equations, linear inequality, quadratic inequality, polynomial inequality, integer exponent, quadratic and exponential functions, long division, synthetic division, operations of rational expressions (+, -, X, /), data analysis, least common denominator, rational function, rational equation, equation with compound rational expression, radical expressions, radical equations, rational exponent, relation between rational exponents and radicals, radical

equation. Prerequisite: 06-Algebra or approved by Dr. Liao.

### **08-Algebra (1<sup>st</sup> Semester: 08A-Algebra, 2<sup>nd</sup> Semester: 08B-Algebra)**

This is a one-year enhancement course recommended for Students in 8<sup>th</sup> grade. Topics (two semesters) include complex number, operations of complex numbers (+, -,  $\times$ , /), complex conjugate, review of linear and quadratic functions and their properties, graph transformation, polynomial function and graph, division algorithm, remainder theorem, factor theorem, rational zeros of a polynomial function, conjugate pairs theorem, complex zeros of a polynomial function, irrational zero theorem, radical function, piecewise-defined function, vertical, horizontal, and slant asymptotes of a rational function, polynomial inequalities, rational inequalities, inverse function, exponential function, logarithmic function, equation on exponential functions, equation on logarithmic functions, Sequences, sum of an arithmetic sequence, sum of a geometric sequence. Prerequisite: 07-Algebra or approved by Dr. Liao.

### **06-Geometry, 07-Geometry**

This is a one-year enhancement course for high school Geometry. Geometry is the study of points, lines, surfaces, shapes, 3-dimensional solids, and the relationships that exist between them. Topics (two semesters) include elements of plane geometry, reasoning and proofs, transforming figures, triangles and geometric constructions, congruent triangles, similar triangles, polygons, circles, three-dimensional figures, and circle theorems. Prerequisite: 06-Algebra (Fall) or approved by Dr. Liao. This course is recommended for students in 6<sup>th</sup>, 7<sup>th</sup>, 8<sup>th</sup> grades.

### **06-MathCounts/AMC, 07-Mathcounts/AMC**

This is a one-year course preparing middle school students for success on MathCounts and the AMC 8 tests. Prerequisite: 05-Algebra or approved by Dr. Liao. This course is recommended for students in 6<sup>th</sup>, 7<sup>th</sup> grades. Students are recommended to take 06-MathCounts/AMC and 06-Algebra at the same time. Topics include mental mathematics, digit root, operation puzzles, number puzzles, continued fractions, properties involving fractions, operations with decimals, repeating decimals, converting repeating decimals to fractions, operations with repeating decimals, operations with percent and interest, problems on fractions, rates, ratios, and continued ratios, mean-median problems, distance-speed problems, substance-concentration-dilution problems, pattern and odd/even parity problems, floor/ceiling functions, modular arithmetic, finding last digits, floor/ceiling equations, exponential equations, Venn diagram, inclusion-and-exclusion problems, counting rules, the Pythagorean theorem, perimeter and area problems.

### **08-MathCounts/AMC**

This is a one-year advanced course preparing middle school students for success on MathCounts and the AMC 8 tests. Prerequisite: 06-MathCounts/AMC or approved by Dr. Liao. This course is recommended for students in 7<sup>th</sup>, 8<sup>th</sup> grades. Students are recommended to take 08-MathCounts/AMC and 07-Algebra at the same time. Topics include fractions and repeating decimals, repeating patterns, infinite geometric series, applications of

Vieta's theorem, converse problems, inclusion-and-exclusion, permutations and combinations, mixed problems on permutation and combination, generalized permutations and combinations, counting geometric figures, discrete probability, probability distribution, independence of events, complicate radical equations, complicated absolute equations, system of equations, Cramer's rule, non-linear equations, non-linear algebraic techniques, binary, octal, and hexadecimal number systems, converting repeating decimal between different number systems, inequalities in geometry, problem solving techniques using area, problem solving techniques using similar triangles, triangle midsegment, hard problems involving area.

### **10/12-AMC (2-year course stacked for 10-AMC and 12-AMC)**

This is a topic-based problem-solving course preparing high school students for success on the AMC 10/12 tests. Topics covered will be different for any two consecutive years, and thus students can take the course for up to two years. Prerequisite: 08-MathCounts/AMC or approved by Dr. Liao. This course is recommended for students in 8<sup>th</sup>, 9<sup>th</sup>, 10<sup>th</sup> grades. Topics for the 2020-2021 year (Fall and Spring semesters) include 4-step research procedure (pattern  $\rightarrow$  guess  $\rightarrow$  conjecture  $\rightarrow$  proof) in mathematical problem solving, divisibility, divisors, the Euclidean algorithm, Diophantine's equations, Fermat numbers, Euler's function, Fermat little theorem, Wilson's theorem, proof strategies, induction, strong induction, proof by contradiction, research problems and talks, linear congruence equations, system of linear congruence equations, Chinese remainder theorem, applications of Chinese remainder theorem, non-linear congruence equations, factorial function and prime factors, tangle lines of a circle, geometric constructions, power of a point theorem, inequalities in mathematics competition. Topics for the 2021-2022 year will be completely different.

### **09-PreCalculus (1<sup>st</sup> Semester: 09A-PreCalculus, 2<sup>nd</sup> Semester: 09B-PreCalculus)**

This is a one-year enhancement course for high school Pre-Calculus. Topics include (two semesters) overview of functions and graphs, trigonometry, trigonometric equations, identities, inverse trigonometric functions, complex numbers, exponential forms of complex numbers, De Moivre's Theorem, vectors, polar equations, parametric equations, dot and cross product, conic sections, probability, statistics and matrices.

### **10-Calculus (1<sup>st</sup> Semester: 10A-Calculus, 2<sup>nd</sup> Semester: 10B-Calculus)**

This is a year-long calculus class. Topics include concepts of limit, continuous functions, Intermediate Value Theorem, the definition of the derivative, properties of the derivative, rules of the derivative, tangent lines equations, derivative exponential, logarithm and trigonometric functions, the implicit derivative, the derivative of the inverse functions, L'Hopital rule and the applications including increasing or decreasing interval of functions, extreme value, concavity, points of inflection and curve sketching. The topics in the second semester include Riemann sum, definite integrals, properties of integration, basic rules of integration, Fundamental theorem of calculus, integration by substitution, area bounded by curves and disk/washer method.