DSM Academy Mathematics Courses (Spring 2023)

All courses will be delivered via Zoom. Lecture recording and notes will be available to students.

<mark>***Early bird discount**</mark>: sign up and pay tuition by <mark>January 6, 2023</mark>.
Course Registration: https://www.dsm-academy.net/
Contact: DSMAcademy.Shen@gmail.com, js48@txstate.edu

WeChat: jianshentx   **DSM Academy WeChat Group:**

Sunday Mathematics Programs (Grades 1—12)

15 Lectures (January 15 – May 14, 2023) Meet once a week on Sunday.				
Dates	Jan 15, ~~22~~, 29, Feb 5, 12, 19, 26, March 5, ~~12, 19~~, 26, April 2, 9, 16, 23, 30, May 7, 14 No Class on Jan 22 (Chinese New Year), March 12, 19 (Spring Break)			
Course and Instructor	Lecture Time (Sunday)	T.A. Lab Time (Saturday)	Prerequisite	Tuition
01- Math and Reasoning Dr. Fang Xu	Sunday 5:15—6:30 PM (Central Time)	Saturday 6:00-6:30 PM (Central Time)	01- Math and Reasoning (Fall Semester)	$290 (regular) *Early Bird: $270
02-Math and Reasoning Dr. Hungzen Liao	Sunday 5:15—6:30 PM (Central Time)	Saturday 6:00-6:30 PM (Central Time)	02- Math and Reasoning (Fall Semester)	$290 (regular) *Early Bird: $270
03-Math and Reasoning (Section 1) Ms. Zhen Wang	Sunday 4:00—5:15 PM (Central Time)	Saturday 6:00-6:30 PM (Central Time)	03- Math and Reasoning (Fall Semester)	$290 (regular) *Early Bird: $270
03-Math and Reasoning (Section 2) Ms. Zhen Wang	Sunday 5:15—6:30 PM (Central Time)	Saturday 6:00-6:30 PM (Central Time)	03- Math and Reasoning (Fall Semester)	$290 (regular) *Early Bird: $270
04A-PreAlgebra Ms. Chen Li	Sunday 4:30--5:30 PM (Central Time)	Saturday 6:45-7:15 PM (Central Time)	03-Math and Reasoning (Spring Semester)	$320 (regular) *Early Bird: $300
04B-PreAlgebra Ms. Chen Li	Sunday 5:40--6:40 PM (Central Time)	Saturday 6:45-7:15 PM (Central Time)	04A-PreAlgebra	$320 (regular) *Early Bird: $300
05A-Algebra Dr. Jian Shen	Sunday 1:50--2:50 PM (Central Time)	Saturday 6:00-6:30 PM (Central Time)	04B-PreAlgebra	$320 (regular) *Early Bird: $300
05B-Algebra Dr. Jian Shen	Sunday 3:00--4:00 PM (Central Time)	Saturday 6:00-6:30 PM (Central Time)	05A-Algebra	$320 (regular) *Early Bird: $300

06A-Algebra Ms. Chen Li	Sunday 1:50—2:50 PM (Central Time)	Saturday 6:45-7:15 PM (Central Time)	05B-Algebra	$320 (regular) *Early Bird: $300
06B-Algebra Ms. Chen Li	Sunday 3:00--4:00 PM (Central Time)	Saturday 6:45-7:15 PM (Central Time)	06A-Algebra	$320 (regular) *Early Bird: $300
07A-Algebra Dr. Qiang Zhao	Sunday 1:50—2:50 PM (Central Time)	Saturday 6:45-7:15 PM (Central Time)	06B-Algebra	$320 (regular) *Early Bird: $300
07B-Algebra Dr. Qiang Zhao	Sunday 3:00--4:00 PM (Central Time)	Saturday 6:45-7:15 PM (Central Time)	07A-Algebra	$320 (regular) *Early Bird: $300
08B-Algebra Dr. Hungzen Liao	Sunday 3:00--4:00 PM (Central Time)	Saturday 6:45-7:15 PM (Central Time)	08A-Algebra	$320 (regular) *Early Bird: $300
09B-Precalculus Dr. Qiang Zhao	Sunday 4:10—5:25 PM (Central Time)	TBA	09A-Algebra	$320 (regular) *Early Bird: $300
07-Mathcounts/AMC Dr. Jianbo Peng	Sunday 4:15--5:25 PM (Central Time)	Saturday 6:00-6:30 PM (Central Time)	06-Mathcounts/AMC (Fall Semester)	$400 (regular) *Early Bird: $380
08-Mathcounts/AMC Dr. Jian Shen	Sunday 4:00—5:00 PM (Central Time)	None	08-Mathcounts/AMC (Fall Semester)	$400 (regular) *Early Bird: $380
10-AMC ** Dr. Jianbo Peng	Sunday 5:30--6:45 PM (Central Time)	None	10-AMC (Fall Semester)	$400 (regular) *Early Bird: $380
12-AMC ** Dr. Jianbo Peng	Sunday 5:30--6:45 PM (Central Time)	None	12-AMC (Fall Semester)	$400 (regular) *Early Bird: $380

** 10-AMC and 12-AMC are stacked together as 10/12-AMC.

Course Instructors:
Dr. Jian Shen (05A-Algebra, 05B-Algebra, 08-Mathcounts/AMC)
- Professor and Associate Chair, Mathematics Department of Texas State University
- Faculty Teaching Award (2020), Mathematics Department of Texas State University
- Member of the Texas State Mathworks Summer Camp Team since 2003
- Member of the 1986 Chinese IMO (International Mathematical Olympiad) Team

Dr. Jianbo Peng (07-Mathcounts/AMC, 10-AMC, 12-AMC) -- Member of the 1994 Chinese IMO Team
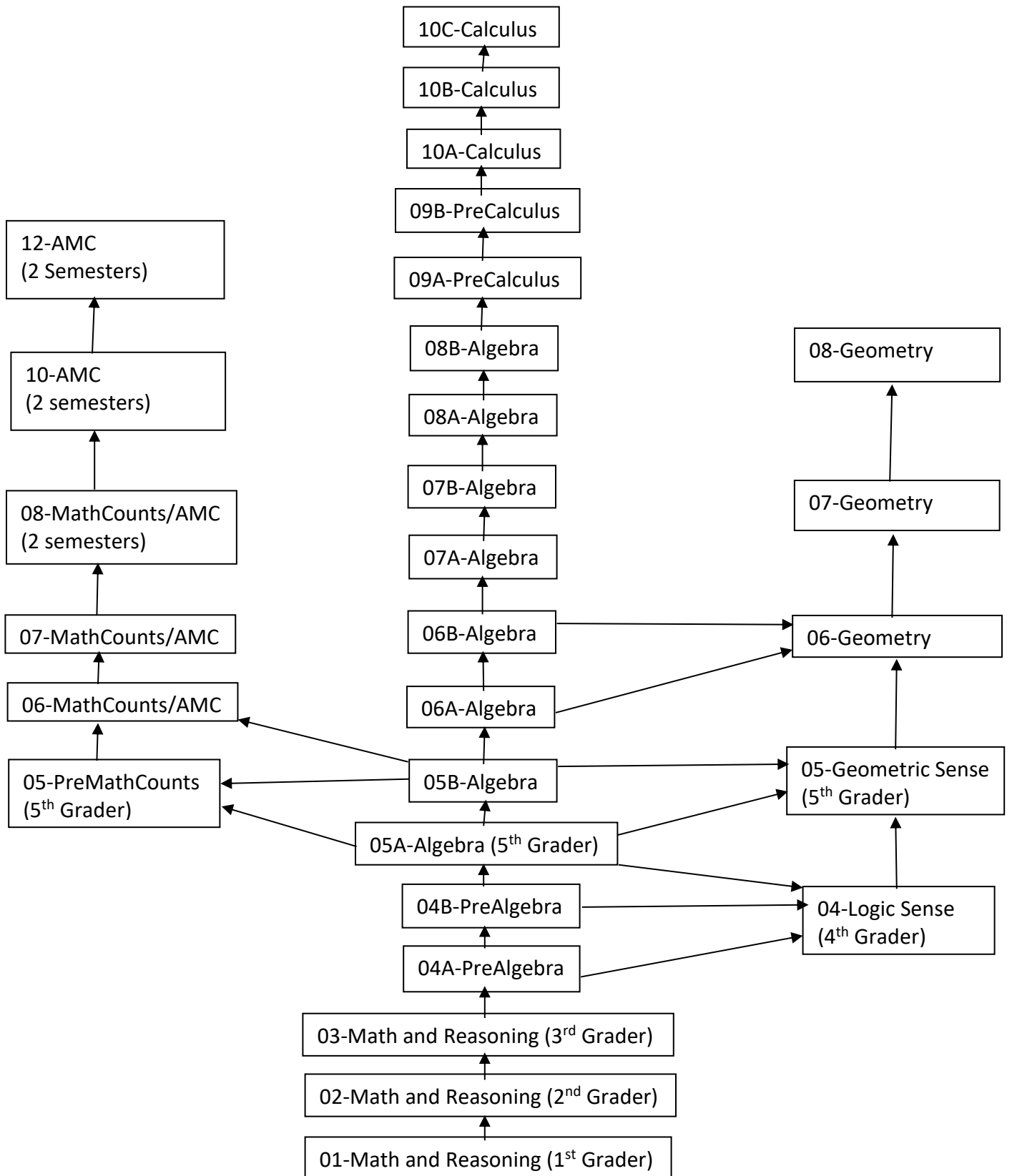Dr. Qiang Zhao (07A-Algebra, 07B-Algebra, 09B-PreCalculus) – Mathematics Professor at Texas State University
Ms. Chen Li (04A-PreAlgebra, 04B-PreAlgebra, 06A-Algebra, 06B-Algebra) **--** 17 years of teaching experience, "Teacher of the Year" Award (2021) at a public middle school in Austin.
Dr. Hungzen Liao (02-Math and Reasoning, 08B-Algebra) – 10 years of teaching experience at a private middle school in Austin
Ms. Zhen Wang (03-Math and Reasoning) – 11 years of teaching experience
Dr. Fang Xu (01-Math and Reasoning) – 5 years of teaching experience

DSM Mathematics Course Sequence

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10C-Calculus

10B-Calculus

10A-Calculus

09B-PreCalculus

09A-PreCalculus

08B-Algebra                                    08-Geometry

08A-Algebra

07B-Algebra

07A-Algebra                                    07-Geometry

06B-Algebra ──────────────► 06-Geometry

06A-Algebra ──────────────►

                                               05-Geometric Sense
                                               (5th Grader)

05B-Algebra

05A-Algebra (5th Grader)

04B-PreAlgebra ──────────► 04-Logic Sense
                                               (4th Grader)
04A-PreAlgebra ──────────►

03-Math and Reasoning (3rd Grader)

02-Math and Reasoning (2nd Grader)

01-Math and Reasoning (1st Grader)
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12-AMC
(2 Semesters)

10-AMC
(2 semesters)

08-MathCounts/AMC
(2 semesters)

07-MathCounts/AMC

06-MathCounts/AMC

05-PreMathCounts
(5th Grader)

01-Math and Reasoning
This is a one-year enhancement course recommended for students in 1st grade. Topics will be selected from Beast Academy (Grade 2), Singapore Math (Grade 1), and a few other sources.

02- Math and Reasoning
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 and Reasoning
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. Shen.

04-PreAlgebra (1st Semester: 04A-PreAlgebra, 2nd Semester: 04B-PreAlgebra)
This is a one-year enhancement course recommended for students in 4th 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. Shen.

05-Algebra (1st Semester: 05A-Algebra, 2nd Semester: 05B-Algebra)
This is a one-year enhancement course recommended for students in 5th grade. The course will cover many topics taught in Texas middle schools. Topics (two semesters) include number sense, fraction, operations of fractions, equation with fractions, rounding decimals, equation with decimals, number relations, linear equation, linear inequality, mean median and mode, radical, exponent, divisibility properties, greatest common divisor, least common multiple, factorization of integers, change, percent, ratio, direct proportion, inverse proportion, markup, discount, simple interest, US customary system of measurement, metric system of measurement, scale drawing, speed-distance problems, rectangular coordinate system, point, line segment, square root of whole numbers, Pythagorean theorem, area of triangle, parallelogram, distance formula, mid-point formula, 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 in practicing mental mathematics skills. Prerequisite: 04-PreAlgebra or approved by Dr. Shen.

06-Algebra (1st Semester: 06A-Algebra, 2nd Semester: 06B-Algebra)
This is a one-year enhancement course recommended for students in 6th grade. Topics (two semesters) include distance formula, mid-point 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. Shen.

07-Algebra (1st Semester: 07A-Algebra, 2nd Semester: 07B-Algebra)
This is a one-year enhancement course recommended for Students in 7th grade. Topics (two semesters) include solving complicate 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. Shen.

08-Algebra (1st Semester: 08A-Algebra, 2nd Semester: 08B-Algebra)
This is a one-year enhancement course recommended for Students in 8th grade. Topics (two semesters) include complex number, operations of complex numbers (+,-,X,/), 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. Shen.

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. Shen. This course is recommended for students in 6th, 7th, 8th 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. Shen. This course is recommended for students in 6th, 7th 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. Shen. This course is recommended for students in 7th, 8th 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. Shen. This course is recommended for students in 8th, 9th, 10th grades. Topics for the 2020-2021 year (Fall and Spring semesters) include 4-step research procedure (pattern -> guess -> conjecture -> 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 (1st Semester: 09A-PreCalculus, 2nd 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 (1st Semester: 10A-Calculus, 2nd 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.