Mathematics Enrichment Programs for Gifted Upper Elementary and Middle School Students

Fun Math Club mathematics enrichment programs for gifted students consist of a series of weekly one-hour class meetings. Each meeting offers students engaging and challenging mathematical activities that enrich their mathematics experience. The topics in each program focus on particular domains from the *California Common Core State Standards: Mathematics*. All activities in the program develop skills in the Mathematical Practices[1] put forth in the standards.

A typical class starts with a short lecture about the day's topic followed by time for students to work on problem worksheets and projects. During the hour of class, there may be several points at which a dialogue is held to review progress and discuss solutions to the problems. Students may be given short homework questions to explore outside of the class. The answers to the homework are discussed at the beginning of the next class.

Class size is limited to twenty students. Two grade levels may be combined in a single program. The programs are designed for a series of ten weekly classes but the duration may be changed meet a site's schedule and budget constraints.

The instructor for these programs is Fun Math Club founder Yul Inn. He has offered GATE math enrichment programs to schools and community organizations in the San Jose area since 2003. He has been an instructor in the Johns Hopkins University Center for Talented Youth summer programs and the Stanford University Pre-Collegiate Studies (formerly EPGY) Summer Institutes since 2005. He also has hosted math nights at local schools and led math circles at Stanford and San Jose State.

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Programs

Fun Math Club offers three different programs for gifted students. (Note: lessons listed below are *samples*. Specific program topics are subject to change based on program duration and student progress in the classroom.)

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[1] Common Core Mathematical Practices

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

1. Logic and Problem Solving

Topics presented focus on the Common Core domains of Number and Operations in Base Ten, and Operations and Algebraic Thinking. Sample lessons include:

1. Frog Jumping: solve a puzzle to find some easy and not-so-easy number patterns
2. Cake Cutting: find number patterns by cutting up birthday cakes
3. Dominoes and Seashells: discover Fibonacci numbers and their relation to seashells
4. Numbers and Polygons: learn about triangular, square, and other number patterns
5. Even-Steven Squares: use patterns to solve a two-dimensional puzzle
6. Venn Diagrams: solve problems using Venn diagrams in a group activity
7. Prime Time: explore prime numbers
8. Silly Syllogisms: learn about deductive logic
9. True or False, Valid or Invalid: solve logic problems and learn about logical inference
10. The Candymaster: solve a series of logic problems and create your own

2. Numbers and Geometry

Topics presented focus on the Common Core domains of Operations and Algebraic Thinking, and Geometry. Sample lessons include:

1. Tetromino Puzzles: solve tetromino puzzles and learn about area
2. Pentominoes and Area: explore areas of irregular shapes using pentominoes
3. Cubes: discover many ways one can fold a cube
4. Cubes Squared: solve some cube number puzzles
5. Cubes Cubed: learn how to draw cubes and solve polycube puzzles
6. Cubes to the Fourth: explore symmetries of the cube
7. Triangulum: explore a world where the triangle is the most common polygon
8. Polyhedrons: learn about polyhedrons and number patterns
9. Compasses and Circles: learn about circles and create circle design
10. Flexagons: make magic folding hexagons that can change color

3. Numbers, Data, and Chance

Topics presented focus on the Common Core domains of Operations and Algebraic Thinking, Numbers and operations – Fractions, and Measurement and Data. Sample lessons include:

1. Egyptian Fractions: learn about how ancient Egyptians represented fractions
2. Farey Fractions: discover remarkable properties just by writing fractions in order
3. Magic of 9: learn about divisibility properties and make a magic trick
4. Bars and Pies: graph data about the class
5. The Human Histogram: learn about frequency and histograms
6. Mystery Data: solve of mystery data about unknown populations
7. Numb Numbers: explore some entertaining statistics
8. Roller Derby Dice: find a strategy for a dice game by using a histogram
9. Native American Dice: design a game modeled after a Native American dice game
10. The Monty Hall Dilemma: explore a problem that even perplexed math professors