

**The Center for Gifted**  
**2019/20 Fall and Winter Weekday Wonders**  
**Syllabuses for The Great Mathematics Experience**

**For Kindergarten–2<sup>nd</sup> grades - Mathemagicians:** Math is magical! Employ your mathematical powers to make sense of problems, reason abstractly and quantitatively, and construct viable models for a variety of mathematical concepts.

- Becoming a Mathemagician – Finding the power within.
  - Examine oral and written mathematical codes and create your own codes.
  - Explore magic squares and other mathematical shapes using numbers.
  - Solve puzzles such as tangrams, tessellations, Set, 24, and Tenzi that incorporate mathematical concepts like tangrams and pentominoes.
- Math around the World – Geographic and cultural influences in mathematics.
  - Explore mathematical notation of the past in Central America, Egypt, India and Italy to better understand our number system.
  - Use classical depictions of mathematical stories from Africa, China, and India to understand how the mathematics affects our everyday lives.
  - After exploring geometric concepts from Japan, China, Italy, France, and North America, use a variety of materials to create geometric designs and structures.
- The Art of Math – Discover how mathematics is part of our everyday world and of the art around us.
  - Find symmetry in designs and nature using pattern blocks and other materials.
  - Use coordinate graphing to find treasure and create designs.
  - Tessellations: Why shapes tessellate; what shapes tessellate.
- Math on the Move – Explore ways mathematics and science complement each other.
  - Can Hot Wheels and Lego's be used to explore the effects of height and length of an inclined plane on distance travelled?
  - Are spoons levers? How can spoons be used as simple catapults? Can we analyze results of items launched by simple catapults?
  - How can we use bubbles to explore mathematical concepts?
- Geometry 2D and 3D – Measurement, lines, points, angles, and figures.
  - Using the human body for units of measure.
  - How can straight lines make curves?
  - See how nets show the transition from 2D to 3D.
  - Using pentominoes to explain perimeter and area.
- Math and Literature – Exploring books that support various mathematical concepts and activities related to those concepts.
  - *My Little Sister Ate One Hare* – consecutive numbers.
  - *Counting on Frank* – estimation.
  - *Remainder of One* – division.
  - *How Many Feet? How Many Tails?* – problem solving.

**For 3<sup>rd</sup>-5<sup>th</sup> grades - From Algebra to Zero:** Embark on a whirlwind journey through mathematical terms, creating an “illustrated” dictionary inspired by hands-on exploration. Solve problems, and reason abstractly and quantitatively through mathematical modeling.

- **Algebra** – Modeling algebraic concepts and solving problems using algebra.
  - E - expression, equation, equivalent
  - F - formulas, functions
  - I - inverse operations, integers
  - J - joy of math
  - O - order of operations
  - P - properties
  - S - substitution
  - V - variable
  - W - whole numbers
- **Bases** – from ancient history to computer programming how number bases are the underpinning of calculation.
  - B - base, binary numbers
  - D - decimal, digit
  - E - Egyptian hieroglyphs, expanded notation, exponents
  - H - hexadecimal
  - M - Mayan numbers
  - P - place value
  - R - Roman numerals
  - Z - zero

**For 6<sup>th</sup>-8<sup>th</sup> grades - Mysterious Math:** Explore topics that are not normally included in your math textbooks, but that encourage problem solving, thinking outside the box, and using a creative approach to mathematics with hands-on activities.

- **How to Lie with Statistics** – Examine statistics used in advertising and other media. Collect data and create statistical analyses to share with others.
  - Measures of central tendency: Do they represent useful information?
  - How are variables used to collect data? Is the data quantitative or qualitative?
  - Venn diagrams: How are they used to group data in real world situations?
  - How is data organized and displayed? Different types of graphs.
  - Applying statistics to scientific issues.
  - Applying statistics to social problems.
- **Coordinate Graphing** – Use four-quadrant graphs for plotting coordinate points; graph equations, create coordinate designs.
  - Battleship-type activities to model basic concepts:
    - Positive and negative numbers
    - Coordinate pairs
    - X-axis and y-axis
    - Origin
    - Four quadrants
  - Linear equations: What they are and how to graph them; applications in the real world.

- Coordinate designs: Use templates or create your own coordinate designs OR create your own coordinate graphing game or application.
- G is for Geometry — Apply the concepts of points, lines, angles, and two-dimensional and three-dimensional shapes in a variety of applications.
  - Geometry, and art and architecture.
    - Symmetry and tessellations: View examples in the real world; create symmetrical designs; discover which regular polygons tessellate and why.
    - Golden ratio: View examples in art and architecture. Using golden rectangles from the Fibonacci sequence, discover the golden spiral.
    - Mathematical quilts: Use mathematics to design a quilt pattern. Choose from:
      - Golden ratio quilts: Fibonacci rabbits, polygonal numbers, golden rectangle, golden pentagons, Lute of Pythagoras quilt
      - Spiral quilts: Wheel of Theodorus, rational number patterns, spiraling squares and the law of sines
      - Right triangle quilts: right triangle triples, Pythagoras meets Fibonacci, Pythagorean Triangle relationships
      - Tiling Quilts: Polyomino families, Penrose tiles, vertex nets, Escher-like tessellations
- Magic Squares and other Magical Mathematic Concepts — Discover the ways numbers are used to formulate patterns and solve real-world problems.
  - Magic squares: Solve and create a variety of magic squares and examine the numerical properties and patterns. Even Ben Franklin created magic squares.
  - Topology: Moebius strips, African lusons, Flexagons.
  - Parabolic line designs: How can straight lines create curves?
- Math on the Move – Explore the ways math and physics complement each other.
  - Why is data collection important in analyzing physics?
  - Can Hot Wheels and Lego's be used to explore the effects of height and length of an inclined plane on distance travelled?
  - How does friction impact distance travelled?
  - Are spoons levers? How can spoons be used as simple catapults? Can we analyze results of items launched by simple catapults?
  - What is a fulcrum and what does it have to do with levers?
  - Can surface tension, air velocity, and the wave nature of light all be explored using bubbles?

**For 9<sup>th</sup>-12<sup>th</sup> grades - Extreme Math:** Conquer burning questions and investigations into the extreme realm of mathematics theory, and more!

- Magic squares and other numerical patterns – Explore how patterns are the foundation of mathematical exploration.
  - Magic squares
    - Construct simple magic squares and examine the mathematical patterns within
    - Ben Franklin and magic squares he created
    - Learn how to create more complex magic squares

- Math amusements: Cull through sources of mathematical intrigue and choose which you will delve into:
  - Do the Math
  - Mathematical Amusements and Surprises
  - Lewis Carroll's Games and Puzzles
  - The Mathematical Recreations of Lewis Carroll
  - The Weird and Wonderful World of Mathematics
  - Math Perplexors
  - Intrigue: Hands-on Adventures in Critical Thinking
  - Insides, Outsides, Loops, and Lines, and others
- What are the relationships among triangular numbers, Fibonacci sequence, and Pascal's triangle?
- Fractals – Explore the ways that fractals are used in many real-world situations.
  - What are fractals? Create a fractal model.
  - Sierpinski triangle, Sierpinski carpet, Koch snowflake, Menger sponge, Dargon curve, and more.
  - Coastline paradox: Fractal impact on geographical features.
  - Fractals in nature: Trees, cauliflower, glacier river channels, lightning, and more.
  - Fractals in the biological sciences: Chromosomes and DNA.
  - Fractals and complex numbers.
- Mathematical intricacies of games – Why are games fun? What mathematics are employed to make games challenging?
  - Probability: How are the probabilities of rolling two dice built into games?
  - Choose a popular board game and determine how mathematics impact the outcomes of the games.
  - Spot It! How can two cards drawn randomly always have one matching item?
  - Examine games that rely on geometry, such as Gravity Maze, Battleship, or Labyrinth.
  - How do you “learn” strategies that make you a successful player in games such as Dr. Eureka and Mancala?
  - How do you use physics in games such as Suspend or Rock Me Archimedes?
  - Examine games that are complex versions of other games, i.e. Connect Four and Newton, Tic-Tac-Toe and Otrio
- Geometry, Art and Architecture – Explore 2D and 3D designs using a variety of materials. Investigate the work of such innovators as architect Frank Lloyd Wright and artist M. C. Escher. Develop an understanding of geometric principles underlying architectural structure and artistic design.
  - Golden ratio, golden rectangle, golden spiral, golden pentagon: View how these have been incorporated into art and architecture; sketch an idea incorporating these.
  - Parabolic line designs: View how these have been incorporated into art and architecture; explore how changes in angle affect the curve created with straight lines; select a template or idea to create your own parabolic line design.
  - Polyhedral or modular origami: Use origami techniques to create simple and complex 3D geometric models; create a 3D fractal using polyhedral origami.