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MathJam20 Summer Planning Packet

Welcome to Project MEGSSS! This packet will help you plan your summer coursework. Use the course descriptions, schedule, tuition, and financial aid information to assist you with online registration. If you need registration assistance, contact us at (314) 842-5968 or at nomination@megsss.org.

MathJam20 is offered in two-week sessions:

- **Session 1:** June 8-19 at St. John Vianney High School, Kirkwood, 1311 S. Kirkwood Road, Kirkwood from 8:30 a.m. to 3:45 p.m. Half day options are available, from 8:30 a.m. to 11:30 a.m. or 12:30 to 3:45 p.m.
- **Session 2:** July 6-17 at TBD from 8:30 a.m. to 3:45 p.m. Half day options are available, from 8:30 a.m. to 11:30 a.m. or 12:30 to 3:45 p.m.

Additional Summer Programs:

- **Puzzles & Programming:** June 22nd-26th at St. John Vianney High School, Kirkwood, 1311 S. Kirkwood Road, Kirkwood from 8:30 a.m. to 3:45 p.m. Half day options are available, from 8:30 a.m. to 11:30 a.m. or 12:30 to 3:45 p.m.
- **Logic Bootcamp:** July 28th-31st at TBD from 8:30 a.m. to 3:45 p.m. Morning only from 8:30 a.m. to 11:30 a.m.

Before care (beginning at 7:30 a.m.) and after care (ending at 5:30 p.m.) is available for select days or for the whole session.

Which classes should I take?

Project MEGSSS offers courses which are designed for students who are self-motivated and desire math challenge, not students looking for remediation. Classes available for students ages 10 to 14 (by August 1, 2020)

A typical MathJam day for students consists of math enrichment in the morning with courses designed to introduce students to topics not well covered in standard curricula, followed by “After” Math, an afternoon of fun that blends art and literature with math and science inspiration. Some courses have pre-requisites that limit participation to students who tested and qualified for the Elements program. Students who enroll in morning courses receive priority for the After Math afternoon enrichment course, but you are welcome to register for After Math on a stand-alone basis. Some courses have pre-requisites that limit participation to students who tested and qualified for the Elements program.

Please note that students who are 11 or older (by August 1, 2020) also have the option to test for entry into the Elements program (for more information, please contact us at nomination@megsss.org or see the summer registration packet for the Elements program, available online).

Course Descriptions

MORNINGS:

Math Explorers, Sessions 1 & 2 (age 10): Explorers will participate in a hands-on, activity based exploration of geometry, as well as a problem-solving course that introduces students to the Papys mini-computer, the string game, and other interactive experiences designed to develop logic abilities and critical thinking skills. Teacher is IMACS-trained (Institute of Mathematics and Computer Science).

Puzzles and Programming, Sessions 1 & 2 (ages 11-14): Logic puzzles, virtual robotics programming, and more! These IMACS (Institute for Mathematics and Computer Science) courses will be taught by IMACS-trained teachers and are designed to keep kids working on logic skills, while dipping a toe into the world of real programming, using the language, Logo.

Math Contest Preparation, Session 1 (ages 11-14): This class will develop and sharpen students' problem solving skills to the degree needed to be competitive in top math competitions such as MATHCOUNTS and the AMC 8. We'll cover interesting topics - number theory, algebra, sequences and series, probability, geometry, or word problems - with an emphasis on the fundamental principles necessary for efficient problem solving. Students will play math games that explore applied logic, set theory, and number theory concepts. *The first week will feature a math topic in the context of math contest-type problems. The second week will consist of math games. In the first and last class, we will have a simulated math contest and measure our improvement.*

Discrete Math: Lost in the Matrix, Session 1 (ages 11-14): Sport statisticians, economic planners, and environmental biologists are among the diverse groups of people who use the mathematics of matrices to help them manage data and make predictions. This course will look at matrix operations as a tool to manage data and introduce students to graphing calculators. We'll look at several mathematical models and try our hand at predicting the future! There will be a brief introduction

(Discrete Math: Lost in the Matrix (cont'd))

to game theory and strategy. *Class time will be divided into teacher presentations, class discussions, and guided problem sets. Students will have the opportunity to do some independent research on a topic of their choice. There will be a small amount of homework and a final exam*

Discrete Math: Social Choice, Session 2 (ages 11-14): The use of mathematics for modeling real world events and as a tool in decision making is the focus of this introductory course in discrete mathematics. Algorithmic thinking, recursive thinking, and mathematical induction will be used to explore and model applications for areas of social science. The study of election theory will look at group ranking methods and algorithms as well as weighted voting and voting power. Secondly, fair division algorithms will be used to study the discrete cases of estate division and apportionment. While the continuous case of fairly dividing a cake amongst all participants will also be explored. Finally, mathematical induction and recursive thinking will be introduced. Class time will be divided into teacher presentations, class discussions, and guided problem sets with an opportunity to do some independent research on a topic of their choice. *There will be a small amount of homework and a final exam.*

Geometry: Reflecting on Symmetry, Session 2 (ages 11-14): Perhaps the most important theorem in high school mathematics is the Perpendicular Bisector Theorem (PBT). At some deep level, this theorem is about symmetry, the topic of this course. We will examine symmetry through a series of hands-on activities culminating with the PBT and then see what lies beyond. We will develop PBT through constructions, paper folding, and geometric software; we will explore transformations including reflections, rotations, and translations. We will also study symmetry in art, architecture and biology. Coordinate geometry is an important place to apply what we have learned to an analytical setting. *There will be some homework but no final exam.*

Afternoons, Sessions 1 & 2, ages 10 - 14

AfterMath: A Mash-Up of Science, Literature, Art, and Math: Each day, we will explore a different concept, such as motion, leverage, patterns, or size, through several different disciplines. How does an artist convey motion? What is the mathematical interpretation of a lever? What patterns do you see in music? Come spend the afternoon with exciting and creative teachers who will help you jam with ideas from a variety of entirely different perspectives! There will be three levels of After Math programming determined by student age.

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The following courses are designated for students who have qualified for and previously participated in the Elements Summer and/or After-School Program:

Introduction to Probability (EM Book 0-8)

Have you ever wondered how people predict the weather or how you can predict your winnings (or losses) in a game of chance? We will study one-, two-, and multi-stage random experiments such as tossing a coin or die, drawing different colored balls out of boxes, spinning a spinner, games of chance, the product rule, counting subsets, determining whether a toss or drawing is fair, etc. *Students need a good working knowledge of fractions or at least a good knowledge of using a calculator to do arithmetic with fractions. Homework load will be medium to light, and there will be a final.*

Introduction to Number Theory (EM Book 0-9)

Numbers can be fascinating. This course will investigate some of the most intriguing and timeless questions in the field of number theory. We'll learn about prime and composite numbers, factoring, number bases other than ten, and will examine elegant ideas such as the Sieve of Eratosthenes and the Fundamental Theorem of Arithmetic. *Homework load will be medium to light; there will be a final.*

Logic Book 1, Chapter 2

Pre-requisite: Successful completion of first Elements summer (Logic Book 1, Chapter 1). Note that this chapter is covered in the first year afterschool program. Students should bring their Book 1 textbooks to the first class.

(Logic Book 1, Chapter 2, cont'd)

This course continues logic from the introductory summer, Book 1, Introductory Logic. Students learn the rule of inference (modus ponens) upon which all of our formal proofs will be built, along with many subroutines to shorten our proofs. They will continue to use the tautologies explored in Chapter 1. Students will develop an imaginary "machine" to check proofs for accuracy and validity. If time allows, they may learn one or two more sophisticated proof methods: the Deduction Theorem and Indirect Inference. *Homework load will be medium to heavy. This course will complete the necessary pre-requisites for the Digital Logic course so students may take that course in the July session or next summer. There will be homework and a final exam.*

Advanced Digital Logic, 3 Hours

Pre-requisite: Operational Systems (Book 0-1) and at least Chapter 2 of Logic Book 1 Digital circuits are found in watches, calculators, video games, computers, and thousands of other devices. Smart circuits are present in virtually all aspects of our lives, and their presence is increasing rapidly, making digital electronics an important area of study for a prospective career in engineering. Students will study the applications of electronic logic circuits and apply Boolean logic to the solution of problems. They will learn about the basics of digital electronics, number systems, logic gates, Boolean algebra, circuit design, flipflops, counters, & state machines. *There will be homework, but no final exam.*

See Summer Course Schedule on back.

NOTE: We also recommend that MEGSSS students consider the two Discrete Math courses; they cover advanced topics in applied math, exploring new topics not addressed in the Elements curriculum.

2020 MathJam Summer Program Class Schedule

Age by 9/1/2020	Mornings (8:30 to 11:30 AM)	11:30 AM – 12:30 PM	Afternoons (12:30 to 3:45 PM)
10	Math Explorers	<i>Supervised Homework Help (Elements Students), Lunch, Games or Reading Time (Bring Your Own)</i>	After Math
11 -14	Session 1		
	Puzzles & Programming	<i>Supervised Homework Help (Elements Students), Lunch, Games or Reading Time (Bring Your Own)</i>	After Math
	Math Contest Prep & Discrete Math		
	<i>Intro to Elements*</i>		<i>Intro to Elements*</i>
	<i>Intro to Probability & Intro to Number Theory**</i>		
	<i>Book 1 Logic, Chapter 2 & Intro to Number Theory**</i>		
	Session 2		
	Puzzles & Programming	<i>Supervised Homework Help (Elements Students), Lunch, Games or Reading Time (Bring Your Own)</i>	After Math
	Discrete Math & Geometry		<i>Intro to Elements*</i>
	<i>Intro to Elements*</i>		
<i>Intro to Digital Logic***</i>	<i>Intro to Probability & Intro to Number Theory**</i>		

*students must pass the qualification exam offered in the spring

**students must have completed the Introduction to Elements Summer program

*** students must have completed the Introduction to Elements Summer program and Chapter 2 of Book 1 Logic OR the first year of after school Elements Program

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Registration and Payment

When should I register?

Registration must be completed by May 18, 2020. A \$15 late fee will apply after that date.

Unless you have applied for financial aid, your seat can only be held once full payment is received. When applying for financial aid (this does not include students applying through the educator-directed scholarship program), you must pay a refundable \$25 fee to hold your seat. This payment will be refunded if financial accommodations offered are insufficient to meet your needs.

For more information on financial aid, see below. Payment may be made online during online registration. Late registration fees apply after Monday, May 18. Fifty percent of tuition payments are refundable if a withdrawal form is submitted online before April 15, 2020. After that, there are no refunds for summer tuition unless a course is cancelled. If a course is not large enough to justify the class, we will contact you on or before April 29 to reschedule or to arrange a refund.

Payment may be made via PayPal during registration. Late registration fees apply after Monday, May 18. If a session is not large enough to justify a class, we will contact you to reschedule.

Summer 2020 MathJam Tuition

Session 1 or 2, Full Day (8:30 AM – 3:45 PM)	\$610
Half Day	\$355

Additional Items:

- Late registrations, \$15 (after May 18)
- Before Care (7:30 – 8:30 AM), \$80 for 10 days or \$10 per day
- After Care (3:45 – 5:30 PM), \$140 for 10 days or \$15 per day
- Both Before and After Care, \$200 total for 10 days

Financial Aid Options

We offer two financial aid programs, and we encourage applications before the deadline of April 30, 2020. Decisions will be made prior to May 18. All applicants must have registered for courses, or the application will be denied.

1. Families who are eligible for federal lunch programs are eligible for our educator-directed scholarship that streamlines the application process. In 2020, students in districts where all receive federal lunch programs must also meet an income test and provide income verification. Please inquire at nomination@megsss.org
2. For all others, financial aid applications are accepted online. Submission of the most recent federal tax return is required for this process.

Discounts (choose one; does not apply to financial aid recipients):

Early Registration discount, \$30 on full day registration—before March 31.