



FREE

# SPEAKERS BUREAU

CATALOG OF INTERACTIVE STEM ENRICHMENT TALKS FOR GRADES K-12.



**NATIONAL SECURITY AGENCY STEM OUTREACH**  
AVAILABLE TO NON-PROFIT EDUCATIONAL INSTITUTIONS





**PLEASE SAVE THIS CATALOG FOR FUTURE REFERENCE!**

The catalog is also available online at:

<https://www.nsa.gov/educators/stem-education-partnership>





## MEPP SPEAKERS BUREAU

The continuing development of science, technology, engineering, and mathematics (STEM) professionals is not only important for the success of the National Security Agency (NSA), but is also good for the Nation. To ensure a bright future in the STEM professions, NSA initiated several programs to support the education of students at the local, state, and national levels. One of these programs, the MEPP Speakers Bureau, enables NSA professionals to provide STEM enrichment talks to local schools.

The MEPP Speakers Bureau offers a wide variety of fun and fascinating STEM-related talks to elementary, middle, and high school students. Many talks include interactive activities to engage the students during the visit. NSA hopes that the speakers' knowledge of and excitement about STEM topics will inspire students to be more enthusiastic about their future encounters with these subject areas.

This program is available at NSA in the Baltimore-Washington area and NSA's cryptologic centers in Georgia, Colorado, Texas, and Hawaii. Please contact [mepp@nsa.gov](mailto:mepp@nsa.gov) for a catalog of offerings at a specific cryptologic center.



**NATIONAL SECURITY AGENCY**  
AMERICA'S CODE BREAKERS & CODE MAKERS









































































## TABLE OF CONTENTS




























MEPP SPEAKERS BUREAU TALKS AT-A-GLANCE . . . .	6
HOW TO REQUEST A SPEAKER . . . . .	8
REQUEST FORM . . . . .	9
SPEAKER FEEDBACK . . . . .	10
FEEDBACK FORM . . . . .	11
TALK DESCRIPTIONS . . . . .	12
ADDITIONAL MEPP SERVICES AND INFORMATION . .	22
EDUCATION PARTNERSHIP AGREEMENTS . . . . .	22
CYBERSECURITY AND ONLINE SAFETY . . . . .	24
ADDITIONAL RESOURCES FOR TEACHERS AND STUDENTS . . . . .	25







## MEPP SPEAKERS BUREAU TALKS AT-A-GLANCE

	 INTERACTIVE TALKS	 DISCUSSION TALKS	PAGE
 Adventures in Countable County	K 1 2 3 4 5 6 7 8 9 10 11 12	 K-2  45	12
 Bubble Sorting	K 1 2 3 4 5 6 7 8 9 10 11 12	 K-2  30	12
 Buried Treasure	K 1 2 3 4 5 6 7 8 9 10 11 12	 3-5  45	12
 But Who's Counting?	K 1 2 3 4 5 6 7 8 9 10 11 12	 2-5  45	13
 Careers at NSA	K 1 2 3 4 5 6 7 8 9 10 11 12	 1-12  30	13
 Coding Theory in Your Mailbox	K 1 2 3 4 5 6 7 8 9 10 11 12	 6-12  45	13
 Cryptanalysis 101	K 1 2 3 4 5 6 7 8 9 10 11 12	 4-10  45	13
 Cryptoball	K 1 2 3 4 5 6 7 8 9 10 11 12	 6-10  60	13
 Cryptography and Cryptanalysis	K 1 2 3 4 5 6 7 8 9 10 11 12	 8-12  60	14
 Cryptology Past and Present	K 1 2 3 4 5 6 7 8 9 10 11 12	 9-12  45	14
 CryptoWheel 101	K 1 2 3 4 5 6 7 8 9 10 11 12	 K-5  30	14
 Cyber Ethics	K 1 2 3 4 5 6 7 8 9 10 11 12	 6-12  45	14
 Cyber Safety 101	K 1 2 3 4 5 6 7 8 9 10 11 12	 6-12  45	14
 Cybersecurity: Defending our Nation in Cyberspace	K 1 2 3 4 5 6 7 8 9 10 11 12	 8-12  45	15
 Cybersecurity: Public Key Cryptography & Public Key Infrastructure	K 1 2 3 4 5 6 7 8 9 10 11 12	 11-12  50	15
 Error-Correcting Codes and Impartial Games	K 1 2 3 4 5 6 7 8 9 10 11 12	 9-12  45	15
 Exclamation Explanation!	K 1 2 3 4 5 6 7 8 9 10 11 12	 4-6  45	15
 Experimenting with Chance	K 1 2 3 4 5 6 7 8 9 10 11 12	 4-8  45	16
 Fermat's Last Theorem	K 1 2 3 4 5 6 7 8 9 10 11 12	 8-12  60	16
 Fractals: The Art of Math	K 1 2 3 4 5 6 7 8 9 10 11 12	 4-12  60	16
 Fun with Geometry	K 1 2 3 4 5 6 7 8 9 10 11 12	 4-6  45	16
 Gold Bug	K 1 2 3 4 5 6 7 8 9 10 11 12	 5-8  60	16



	 RECOMMENDED GRADES	 MINIMUM TIME PER LESSON	PAGE
 <b>How to Lie with Statistics</b>	K 1 2 3 4 5 6 7 8 9 10 11 12	 6-12  45	17
 <b>How to Talk Like a Computer</b>	K 1 2 3 4 5 6 7 8 9 10 11 12	 6-8  30	17
 <b>Kakuro (Where Math Meets Crosswords)</b>	K 1 2 3 4 5 6 7 8 9 10 11 12	 5-8  50	17
 <b>Magic of Error-Correcting Codes</b>	K 1 2 3 4 5 6 7 8 9 10 11 12	 8-12  50	17
 <b>Marshmallow Tower Challenge</b>	K 1 2 3 4 5 6 7 8 9 10 11 12	 2-12  55	18
 <b>M-A-T-H...It's Not Just Another Four-Letter Word</b>	K 1 2 3 4 5 6 7 8 9 10 11 12	 4-6  45	18
 <b>Mathematical Ways of Thinking</b>	K 1 2 3 4 5 6 7 8 9 10 11 12	 3-8  45	18
 <b>Mission Possible</b>	K 1 2 3 4 5 6 7 8 9 10 11 12	 5-8  60	18
 <b>One Dollar Shirt</b>	K 1 2 3 4 5 6 7 8 9 10 11 12	 3-4  45	18
 <b>Operations Research: Decision Making Using Multiple Criteria</b>	K 1 2 3 4 5 6 7 8 9 10 11 12	 9-12  50	18
 <b>Pascal's Triangle</b>	K 1 2 3 4 5 6 7 8 9 10 11 12	 4-8  50	19
 <b>Patterns and Number Sequences</b>	K 1 2 3 4 5 6 7 8 9 10 11 12	 4-8  60	19
 <b>Science Fair Projects—A Judge's Perspective</b>	K 1 2 3 4 5 6 7 8 9 10 11 12	 3-8  45	19
 <b>Sir Cumference Math Adventures</b>	K 1 2 3 4 5 6 7 8 9 10 11 12	 K-2  30	19
 <b>Skittles® Guessing Game</b>	K 1 2 3 4 5 6 7 8 9 10 11 12	 1-4  50	20
 <b>Solving Sudoku</b>	K 1 2 3 4 5 6 7 8 9 10 11 12	 4  60	20
 <b>Strega Nona</b>	K 1 2 3 4 5 6 7 8 9 10 11 12	 K-3  45	20
 <b>Taking Polls and Making Faces</b>	K 1 2 3 4 5 6 7 8 9 10 11 12	 K-1  30	20
 <b>Tessellations</b>	K 1 2 3 4 5 6 7 8 9 10 11 12	 5-8  45	21
 <b>Total Integer Workout</b>	K 1 2 3 4 5 6 7 8 9 10 11 12	 3-4  45	21
 <b>Winning Games: Luck or Logic?</b>	K 1 2 3 4 5 6 7 8 9 10 11 12	 6-10  45	21

## HOW TO REQUEST A SPEAKER

Many of the talks are interactive (denoted with  in the Talk Description section) and work best with a smaller group (25–30 students or less.) Other talks are discussion-based (denoted with ). The appropriate grade levels , and the minimum time  needed are specified for each talk. Please use this information to guide you during talk selection and scheduling.

If you are interested in requesting a speaker, please complete the form on the next page.

A digital version of this catalog and a copy of the speaker request form are available on our website: <https://www.nsa.gov/resources/educators/stem-education-partnership/>.

If you have any questions, email [mepp@nsa.gov](mailto:mepp@nsa.gov) or call, 301-688-6214.

## PROGRAM EXPECTATIONS

- The talk must be scheduled during a time that the regular teacher, and not a substitute, will be present in the classroom.
- The teacher must remain in the classroom for the entire presentation.
- NSA speakers are not to be left alone with students.
- NSA speakers are not responsible for classroom discipline and cannot accept liability for the students.

## SPEAKER AVAILABILITY

Our speakers are NSA professionals who present at the schools in addition to their normal duties. Once a speaker has been identified, that speaker will contact you to arrange a date and time to visit your classroom. To assist in this process, please include all requested contact information when submitting your request. The more flexible you are, the better we can serve your needs. We will honor requests as our resources permit.

**ALL MEPP SERVICES ARE OFFERED FREE OF CHARGE.**







## NSA MEPP SPEAKERS BUREAU REQUEST FORM

Talks must be scheduled during a time that the regular teacher, and not a substitute, will be present in the classroom and the teacher must remain in the classroom during the entire presentation.

Please email, fax, or mail the below information to request a talk. **Please print.**

**Email:** We cannot accept email attachments, so please include all of the below information within the body of an email addressed to [mepp@nsa.gov](mailto:mepp@nsa.gov), with a subject line of "<your school name>: MEPP Speakers Bureau Request."

**Fax:** 443-479-1193

**Mail:** National Security Agency, MEPP/Suite 6637, 9800 Savage Rd., Ft. Meade, MD 20755-6637

Today's Date:

### SCHOOL INFORMATION

### TEACHER INFORMATION

Name:

Name:

Address:

Please check your preferred communication method:

City:

Work phone:

State:

E-mail:

Zip:

Work Fax:

County:

Other:

Check here if your school has special requirements for volunteers.  
Details:

### REQUESTED TALK

Please list title from catalog of topics. In the area below each choice write the intended **grade**, number of **classes**, and approximate **number of students per class**.

*1<sup>st</sup> Choice:*

*Grade:*

*Classes:*

*# of students per class:*

*2<sup>nd</sup> Choice:*

*Grade:*

*Classes:*

*# of students per class:*

*3<sup>rd</sup> Choice:*

*Grade:*

*Classes:*

*# of students per class:*



### **SPEAKER FEEDBACK**

We need your feedback! Following a speaker's visit to your school, please take a moment to complete and return the feedback form. Your speaker should provide a copy of the form when they visit. It is also available at the back of this catalog and online:

<https://www.nsa.gov/resources/educators/stem-education-partnership/>.

Feedback about the presenter, the talk, and the materials will help us to improve future offerings and identify new topics of interest.

### **CONTACT US**

For further information on any of the MEPP services, please contact the MEPP office via email at [mepp@nsa.gov](mailto:mepp@nsa.gov) or by phone at 301-688-6214.

MEPP participants are NSA professionals who participate with local schools in addition to their normal duties. We will honor requests as our resources permit.



## NSA MEPP SPEAKERS BUREAU FEEDBACK FORM

PLEASE HELP US TO IMPROVE WITH YOUR FEEDBACK!

Your feedback is essential to ensure the quality of our talks as well as assist us in an on-going review of our presentations to keep them informative and interesting.

Please complete this form and email to [mepp@nsa.gov](mailto:mepp@nsa.gov), fax to 443-479-1193, or mail to: National Security Agency, MEPP/Suite 6637, 9800 Savage Rd., Ft. Meade, MD 20755-6637.

Teacher's Name:

School:

Grade:

Speaker's Name:

Talk Title/Topic:

Date of Presentation:

1. DID YOU FIND THE SUBJECT INTERESTING?

Very       Somewhat       Average       Not very       Boring

2. FOR THE STUDENTS, THE LEVEL WAS:

Too difficult       Somewhat difficult       About right       Somewhat easy       Easy

3. WERE THE HANDOUTS AND VISUALS GOOD?

Extremely       Somewhat       Not at all       Does not apply

4. DO YOU THINK YOUR STUDENTS LEARNED ANYTHING FROM THE TALK?

Quite a bit       Some       Not much

5. WAS THE SPEAKER ORGANIZED?

Yes       No

6. FOR THE STUDENTS, THE PACE OF THE NSA SPEAKER WAS:

Too fast       A little fast       About right       A little slow       Too slow

7. DID THE SPEAKER MAKE DIFFICULT IDEAS UNDERSTANDABLE?

Yes       No

8. DID THE SPEAKER INTERACT WELL WITH THE STUDENTS?

Yes       No

9. OVERALL RATING OF THE SPEAKER:

Excellent       Good       Fair       Poor





10. OVERALL RATING OF THE PRESENTATION:

Excellent       Good       Fair       Poor

11. PLEASE FEEL FREE TO SHARE ANY OTHER FEEDBACK.



## TALK DESCRIPTIONS

-  Interactive Talk: engaging students in a problem-solving activity
-  Discussions Talk: engaging students in a thoughtful consideration of the topic
-  Recommended grade level
-  Minimum time needed per lesson

### ADVENTURES IN COUNTABLE COUNTY

 K-2  45

This adventure is geared toward familiarizing students with mathematical terminology, fostering logical thinking, and demonstrating the usefulness of mathematics. This includes working with basic geometric shapes, telling time, counting, and measuring.

### BUBBLE SORTING

 K-2  30

Students simulate a simple sorting algorithm by acting as components of a computer. They will each be assigned a computer's tasks to learn concepts such as computer architecture, algorithm, order, bubble sort, address, pointer, compare, fetch, store, and swap. Additional topics that could be discussed are other sorting algorithms, sort fields, complexity, efficiency, ties, or time/memory trade-off.

### BURIED TREASURE

 3-5  45

This is a wonderful introduction to cryptography! Students are challenged to help Grandpa decode a secret message to find where a buried treasure is located. Students are introduced to the logic and math behind code breaking.



### BUT WHO'S COUNTING?

2-5 45

Students play a game to create numbers based on a spin of the wheel! This is a very versatile talk which may be used to reinforce a number of mathematic concepts such as place value and probability. Students spin a wheel which has digits between 0 and 9, and are challenged to create specific numbers, such as the lowest, five-digit number. Other variations of this game include building a number that satisfies a speaker-defined math condition such as largest odd number or constructing addition or multiplication problems whose answer satisfies that math condition.



### CAREERS AT NSA

1-12 30

Is your school having a career day? Students are introduced to the diverse careers available at NSA, emphasizing the technical skills of the workforce. Students are invited to consider activities they like to do now and how these may fit into a future career. Alternatively, some talks may be adapted to fit into a condensed time frame. When requesting a speaker for a career day, please identify whether the Careers at NSA talk is preferred or request additional information about possible adapted talks. Material is tailored to the appropriate grade level.



### CODING THEORY IN YOUR MAILBOX

6-12 45

Do you ever wonder what those lines are on the bottom of business postcards and envelopes? This talk helps students explore this question in a hands-on manner. Time permitting, other applications of “check digits” in the modern world are examined. In more advanced classes, students can investigate questions such as, “What types of errors will such checking catch?” Material is tailored to the appropriate grade level.



### CRYPTANALYSIS 101

4-10 45

This presentation defines the basic terminology used in code breaking and introduces a variety of elementary ciphers. Students are led through the deciphering of several messages using substitution and transposition ciphers. The mathematics behind cryptanalysis is introduced by examining frequency counts and the letter frequencies in the English language. Material is tailored to the appropriate grade level.



### CRYPTOBALL

6-10 60

Students are introduced to substitution and transposition encryption methods by encoding and decoding select messages. The students then play an indoor football-like game in which the offensive team creates a secret code to designate which player will receive the pass. The defense tries to break the code to intercept the ball.



## CRYPTOGRAPHY AND CRYPTANALYSIS

8-12 60

This talk introduces students to the art of making codes (cryptography) and breaking codes/ ciphers (cryptanalysis). For the cryptography portion of the talk, several topics are explored: symmetric vs. asymmetric (traditional vs. public key) cryptography; keys; basic security services (confidentiality, integrity, authentication, non-repudiation, and availability); and applications and use of cryptography in the public and private sectors. For the cryptanalysis portion of the talk, students are introduced to transposition and substitution ciphers. Students work through brief examples and are ultimately challenged to decipher an unknown cryptogram.



## CRYPTOLOGY: PAST AND PRESENT

9-12 45

Students are led through the evolution and use of cryptology from a historical perspective. The two foundational cryptologic techniques, substitution and transposition ciphers, are introduced and their usage explained. Specific topics include: monoalphabetic ciphers (Caesar cipher, Revolutionary War, Civil War, World War I); polyalphabetic ciphers (Vigenère Square); codebooks; the Enigma (World War II German cipher device); Data Encryption Standard; and public key cryptography.



## CRYPTOWHEEL 101

K-5 30

This talk introduces younger students to the basics of substitution cryptography. Using a cipher wheel, students match separate alphabets to determine the ‘slide’ of the alphabet. Students are then challenged to solve a simple substitution cipher to put their new skills to the test.



## CYBER ETHICS

6-12 45

Cyber ethics is a code of safe and responsible behavior for the internet community. Practicing good cyber ethics involves understanding the risks of harmful and illegal online behavior. The information presented helps students understand the ethical issues as related to computer usage. Terms are introduced and scenarios are presented to help students understand the material. Topics include: (1) Computers and Privacy; (2) Crime, Abuse, and Hacker Ethics; (3) Responsibility; and (4) Social Implications and Consequences. The students receive simple guidelines on how to make an ethical decision.



## CYBER SAFETY 101

6-12 45

Smartphones, computers, tablets, the internet, social media, email—these and other communication devices and methods are ever-present and ever-changing. One common thread is the need for the user to be aware of the possible threats in the cyber realm. This talk introduces cybersecurity principles to increase students’ knowledge about safely navigating the internet, including email and social media. Topics covered include viruses, worms, Trojan horses, identity theft, phishing, and social engineering.



## CYBERSECURITY: DEFENDING OUR NATION IN CYBERSPACE



8-12



45

How are you protecting yourself from threats in cyberspace? How are we protecting our country from threats in cyberspace? Combining protection and defense defines cybersecurity. This unique presentation provides a view of cybersecurity and its threats, such as infected websites, infected emails, phishing attacks, and social engineering from a national-level down to the home user, and presents how it takes a team to make cyberspace more secure. The talk provides “homework” on how to secure your home computer via a variety of recommended tasks.



## CYBERSECURITY: PUBLIC KEY CRYPTOGRAPHY & PUBLIC KEY INFRASTRUCTURE



11-12



50

Public key cryptography and public key infrastructure (PKI) provide one solution for addressing issues with integrity, confidentiality, authentication, and non-repudiation. This talk introduces students to the use of public key cryptography and PKI to enable users of an unsecured public network to securely and privately exchange data and conduct financial transactions. The difference between public key cryptography and symmetric cryptography are explained. Students are introduced to the key management problem and learn why public key cryptography is often used to solve this problem. The students learn why there is more to securing communications than applying cryptography—the need for and the elements of a good public key infrastructure. This talk is ideal for students studying discrete mathematics.



## ERROR-CORRECTING CODES AND IMPARTIAL GAMES



9-12



45

Error-correcting codes are a vital component in modern day digital communications. Whenever devices communicate using bits, noise in the environment can cause zeros and ones to be flipped. To enable the communications to be accurately received, redundant bits are added to the message. Error-correcting codes appear in everything from cell phones to routers to digital music. Advances in the last 20 years have made smartphones and wireless internet possible. One surprising application of these codes is the ability to identify the winning positions in a class of games known as “impartial heap games.” This talk provides an introduction to the concept of error-correcting codes and gives students the opportunity to apply them to the game “Nim.”



## EXCLAMATION EXPLANATION!



4-6



45

Students develop and understand the mathematical concept of factorials by recognizing patterns, extending their thinking, and just having some fun. This talk is best for students who have never seen factorial numbers before.



## EXPERIMENTING WITH CHANCE

4-8 45

This talk introduces students to the concept of probability by exploring the scientific method. The ideas of testing hypotheses, collecting data by simulation, and empirical probability will be emphasized. Pairs of students will perform statistical experiments to test their hypotheses regarding the results of: (1) tossing a coin; (2) rolling a single die; (3) rolling a pair of dice and taking the sum of the two faces; or (4) rolling a 10-sided die.



## FERMAT'S LAST THEOREM

8-12 60

Fermat's Last Theorem is a discussion of the differences among a conjecture, a proof, and a theorem. Pierre de Fermat was a 17<sup>th</sup> century French attorney, Member of Parliament, and amateur mathematician. In number theory, Fermat's Conjecture stated that no three positive integers  $a$ ,  $b$ , and  $c$  can satisfy the equation  $a^n + b^n = c^n$  for any integer value of  $n$  greater than two. He wrote in the margin of his copy of *Arithmetica, Book III* by Diophantus that he had a proof, but there was insufficient room in the margins of the book to write it down. Two potential solutions (proven incorrect) are offered from an unusual source, demonstrating the rigor a proof must meet. Intended for high school students and gifted/talented middle school students. Familiarity with raising to a power is necessary.



## FRACTALS: THE ART OF MATH

4-12 60

Students are introduced to fractals—geometric objects created by endlessly repeating patterns. Fractals are found almost everywhere in nature and have become a popular art form in the past decade. This talk targets students whose interests lie more in the arts than in math as it connects art and nature to math without focusing upon numbers and equations. Students draw their own fractals and learn where fractals can be found in everyday life. Material is tailored to the appropriate grade level.



## FUN WITH GEOMETRY

4-6 45

Students learn to construct triangles, squares, hexagons, and octagons within a circle using only a compass and a straight edge. Using this knowledge, students create geometric 'art' by exploring how repeated shapes create patterns. If time permits, the exercise can be extended to dividing a circle into twelve parts and drawing chords inside it with colored pencils, thus creating a kaleidoscopic effect.



## GOLD BUG

5-8 60

Edgar Allen Poe's "The Gold Bug" is a fascinating story of pirates and buried treasure. Poe tells about a slightly eccentric man who deciphers a secret message to find Captain Kidd's hidden treasure. The students hear a summary of "The Gold Bug" story and learn the problem-solving skills needed to break the code. By working together and with the instructor, the students solve this puzzle with a logical, step-by-step attack using simple statistics.





## HOW TO LIE WITH STATISTICS



6-12



45

The study of statistics is mathematically rigorous, but the statistics themselves can be used, often incorrectly, in non-mathematical ways. Advertisers do not usually falsify statistics as they can be sued or fined for that; however, they still may mislead us through a variety of methods. Advertisers may present statistics that are taken out of context; that are based on too small a sample size or on a biased sample; or that are based on biased questions or words with no generally agreed-upon meaning. For example, a prominent aspirin manufacturer asked 100 doctors, if they were stranded on a desert island, would they rather have aspirin or acetaminophen? More doctors chose aspirin. But the advertisement does not tell you why. Aspirin is also an anti-inflammatory drug. This does not mean that aspirin would be their drug of choice for a headache. The statistic may be true but the question on which it is based is misleading. Consumers should be aware of how statistics can be misused to sway consumer opinions. The talk builds this awareness and is not a rigorous examination of statistics.



## HOW TO TALK LIKE A COMPUTER



6-8



30

Computers and other devices talk to each other constantly. But how do they communicate? What language is used? This talk introduces the underlying character encoding—binary, also known as the base-2 number system—essential to computer communications. Students explore how to count and interpret binary numbers and are challenged to ‘use’ the language.



## KAKURO—WHERE MATH MEETS CROSSWORDS



5-8



50

Kakuro is a different form of a logic puzzle! Based on the completion of a grid, like the more commonly known Sudoku puzzles, the Kakuro puzzle uses the concept of unique sums in order to complete the appropriate row or column of numbers. The secret to solving Kakuro puzzles is learning how to use a unique sum—those special situations where only a single combination of numbers can fit into a sum of a given length. Whenever Kakuro solvers spot a unique sum, they immediately know which numbers are going to be used in that sum; all they have to worry about is the order of the numbers. This talk provides an introduction to the challenging puzzle.



## MAGIC OF ERROR-CORRECTING CODES



8-12



50

Error-correcting codes are programmed into many technologies that we use every day, including CDs, DVDs, and smart phone QR images. The mathematical foundation of error-correcting codes is explained and demonstrated in a fun and unique way. Students, our volunteers from the audience, will help execute number ‘magic tricks.’ The secret behind each trick is then revealed and explained. Mathematical principles demonstrated include: binary number system, ternary number system, Hamming code, double error-correcting code, Reed-Solomon code, and product codes. The use of error-correcting codes used in QR images may also be examined. Material is tailored to the appropriate grade level.

-  **MARSHMALLOW TOWER CHALLENGE**  2-12  55  
Bring the Marshmallow Tower Challenge to your class. Ignite your students' engineering and leadership skills while exploring teamwork, engineering design, prototyping, success, and failure. Working in small groups, students are challenged to use the materials provided to create a stand-alone structure—how high will each team's tower reach?
-  **M-A-T-H...IT'S NOT JUST ANOTHER FOUR-LETTER WORD!**  4-6  45  
Do your students believe math is not fun? Students are challenged to use logic, problem-solving, and decision-making skills to solve a mystery.
-  **MATHEMATICAL WAYS OF THINKING**  3-8  45  
Students are challenged to think outside the box. The differences between deductive and inductive reasoning are examined. Students apply logic and reasoning to a variety of games, brainteasers, and puzzles to explore these concepts. Material is tailored to the appropriate grade level.
-  **MISSION POSSIBLE**  5-8  60  
Your mission, should you choose to accept it, is to recover the secret code which opens a briefcase. The class will join “the Agency,” an elite group of cryptanalysts and problem solvers. They will be trained on two basic topics of cryptography and the elementary statistical properties demonstrated by each. Students work in teams to diagnose and decipher a unique encrypted message. The success of “the Agency” depends upon all teams solving their messages and then working together on one final problem to recover the secret code to the briefcase.
-  **ONE DOLLAR SHIRT**  3-4  45  
This activity provides a general review of geometric shapes: point, line, rectangle, triangle, circle, and oval. A fun exercise is presented to show how these shapes can be used in paper folding (Origami) using a dollar bill to create a small shirt. The students can bring in their own crisp one dollar bill or play money will be provided.
-  **OPERATIONS RESEARCH:  
DECISION MAKING USING MULTIPLE CRITERIA**  9-12  50  
Multiple criteria decision making is a structured Operations Research methodology designed to handle the trade-offs inherent in making a decision that involves multiple criteria. It's a systematic approach for quantifying preferences. In this talk, students look at how a future college student uses multiple criteria decision making to compare unrelated factors, such as the colleges' academics, location, costs, and social life to select the best college to attend.



### PASCAL'S TRIANGLE



4-8



50

Blaise Pascal was a renowned 17<sup>th</sup> Century French scientist and mathematician. One of his most important discoveries was a collection of integers arranged in a triangular fashion which can easily be computed using only simple addition. Today, we call this construction Pascal's Triangle. The speaker guides the students through the generation of Pascal's Triangle and investigates some of the marvelous mathematical properties of Pascal's Triangle. Applications covered vary according to the level and ability of the class and include: elementary probability, binary arithmetic, sequences, and patterns.



### PATTERNS AND NUMBER SEQUENCES



4-8



60

Students are introduced to patterns by examining various arithmetic sequences. The students determine the rule for generating each sequence. Non-arithmetic sequences are also used. Students learn about properties of the English language, such as expected letter frequencies, and combine this knowledge with their pattern-identifying skills to decrypt a secret message. Material is tailored to the appropriate grade level.



### SCIENCE FAIR PROJECTS FROM A JUDGE'S PERSPECTIVE



3-8



45

For many years, NSA has provided science fair judges to local schools. These events have ranged from noncompetitive elementary school science fairs to highly competitive regional high school science fairs. This talk is a compilation of our observations and is intended for students and teachers. It covers the scientific method and focuses on experiment versus demonstration, repeated trials/stratified testing, presentation, and the interview.



### SIR CUMFERENCE MATH ADVENTURES



K-2



30

These interactive presentations are based on the illustrated children's books by the same names, written by Cindy Neuschwander and illustrated by Wayne Geehan. They are designed to be fun while reinforcing mathematical ideas such as geometry, measurement, angles, shapes, solids, problem solving, and mathematical reasoning. Available stories, as described by the author, are:

#### ***SIR CUMFERENCE AND THE FIRST ROUND TABLE***

"King Arthur has a problem! He needs the perfect table to accommodate him and his knights. Assisted by his knight, Sir Cumference, and using ideas offered by the knight's wife Lady Di of Ameter and son Radius, they discover the perfect shape for the king's table."

#### ***SIR CUMFERENCE AND THE DRAGON OF PI***

"Sir Cumference, Lady Di of Ameter, and Radius are back in their second Math Adventure! This time, a potion has accidentally changed Sir Cumference into a fire-breathing dragon. Can Radius change him back in time? Join Radius on his quest through the castle to solve a riddle that will reveal the cure. It lies in discovering the magic number that is the same for all circles."

### **SIR CUMFERENCE AND THE GREAT KNIGHT OF ANGLELAND**

“An adventure by degrees!! Radius, son of Sir Cumference and Lady Di of Ameter, wants to be a knight more than anything. To earn his knighthood, he needs to venture alone on a heroic quest. With only an ancient family medallion (a protractor) for luck, Radius dodges dangers and dragons to find their neighbor, King Lell, who has disappeared. The ultimate challenge lies in a mysterious castle with a maze of many angles.”

### **SIR CUMFERENCE AND THE SWORD IN THE CONE**


“King Arthur has hidden his sword, Edgecalibur. The knight who finds it will be the next king. Sir Cumference and Lady Di try to help point Vertex in the right direction. Vertex enlists the aid of the carpenters Geo and Sym of Metry in creating three-dimensional shapes from two-dimensional outlines. Will Vertex’s sharp thinking give him the edge?”

### **SKITTLES® GUESSING GAME**

 1-4  50

This talk introduces students to the important concept of estimation by exploring the scientific method. Every student is given a fun-size bag of Skittles® candies (data) and asked to predict: (1) the total number of candies in the bag; (2) the most commonly occurring color in the bag; and (3) the numbers of each of the six colors occurring in the bag. After each student has made their predictions, the real fun begins. Every student will open their bag of candy to analyze the data and form conclusions. (*Skittles® is a registered trademark of Mars, Inc.*)

### **SOLVING SUDOKU**

 4  60

Sudoku is a Japanese word meaning “single digits only” and today is used to identify a form of logic puzzle using nine elements. Puzzle creators use numbers, symbols, letters, shapes, colors, or any combination of these to differentiate between the elements. In this talk, the students are introduced to the types of logic/problem-solving skills needed to complete the series of beginner level Sudoku puzzles provided.

### **STREGA NONA**

 K-3  45

*The patterns activity is appropriate for grades K–1. The time and money activities are appropriate for grades 2–3.*

*Strega Nona*, a children’s book written and illustrated by Tomie de Paola, tells the story of Strega Nona, or “grandmother witch,” and Big Anthony, her hired hand. When Big Anthony doesn’t pay attention and interferes with Strega Nona’s magic pasta pot, he learns a very big lesson. Three mathematical activities are available: patterns, time, or money. When selecting this talk, please indicate your preferred activity (patterns, time, or money).

### **TAKING POLLS AND MAKING FACES**

 K-1  30

Students draw a face using geometric shapes to represent their answers to age-appropriate questions. By comparing their ‘faces’ students discover how much they have in common.

## TESSELLATIONS

 5-8  45

From architecture to textiles, tessellations are all around us. In this fun geometry talk, students discover how repeating patterns are found in multiple cultures throughout history. There's plenty of room for creativity as students learn the basic features of pattern design and create their own tessellations.

## TOTAL INTEGER WORKOUT

 3-4  45

This presentation reinforces addition, subtraction, multiplication, and division skills. Associative and commutative properties are reviewed while encouraging independent, creative problem solving. Given a set of numbers between 1 and 9, the students are asked to build another specified number between 1 and 9 using basic arithmetic operations.

## WINNING GAMES: LUCK OR LOGIC?

 6-10  45

Students are introduced to the basic concepts of game theory. They play familiar games such as tic-tac-toe and rock-paper-scissors and examine the strategies required to win. Students are also introduced to variations on these games and must extend their analysis to determine how to adapt winning strategies.





## **ADDITIONAL MEPP SERVICES AND INFORMATION**

### **EDUCATION PARTNERSHIP AGREEMENTS**

An Education Partnership Agreement (EPA) is established between NSA and the non-profit educational institution (school) receiving MEPP services. The EPA outlines the responsibilities of the school and NSA and is valid for 3 years. This administrative requirement must be completed prior to a MEPP speaker visiting the school. Our office will work with your school to establish an EPA if one does not exist.

### **SCHOOL PARTNERSHIPS**

MEPP partners develop continuing relationships with schools, spending part of their work week to provide support to academic and enrichment activities in science, technology, engineering, and mathematics. Past activities have included tutoring in a variety of STEM subjects; coaching CyberPatriot teams, robotics clubs, math competition teams; and classroom assistance in STEM subjects.

To request a partnership, email [mepp@nsa.gov](mailto:mepp@nsa.gov) with the subject line of “<your school name>: MEPP Partnership Request.” The request should provide the school name, contact information, and partnership details to include the activity, days, times and frequency of meetings/help sought, and other relevant information. We will then determine if a MEPP participant may be available to assist.



### SCIENCE/STEM FAIR JUDGES

NSA provides judges to local K–12 math, science, and STEM fairs and competitions.

To request science/STEM fair judges, email [mepp@nsa.gov](mailto:mepp@nsa.gov) with the subject line of “<your school name>: MEPP Science Fair Judges Request.” The request should provide the school name, contact information, and the event date and time. Additional information such as the grades involved in the science fair, expected number of projects, and other relevant information is appreciated. We will then determine if a MEPP participant may be available to assist.

### IN-SERVICE TALKS

MEPP will be happy to send a representative to your teacher in-service day to explain our educational services. This includes previewing talks from our MEPP Speakers Catalog by presenting them as part of the in-service day activities. Contact the MEPP team via email or phone for further information.



## CYBERSECURITY AND ONLINE SAFETY

The National Initiative for Cybersecurity Education (NICE) is a national effort to energize and promote “a robust network and an ecosystem of cybersecurity education, training, and workforce development.” A multi-pronged approach in cybersecurity education addresses cybersecurity, cyber safety, and cyber ethics. A variety of talks within the MEPP Speakers Bureau are available which address computers and the different facets of cyber education:

**BUBBLE SORTING** *(elementary school)*

**CODING THEORY IN YOUR MAILBOX** *(middle/high school)*

**CYBER ETHICS** *(middle/high school)*

**CYBER SAFETY 101** *(middle/high school)*

**CYBERSECURITY: DEFENDING OUR NATION  
IN CYBERSPACE** *(middle/high school)*

**ERROR-CORRECTING CODES AND IMPARTIAL GAMES** *(high school)*

**HOW TO TALK LIKE A COMPUTER** *(middle school)*

**MAGIC OF ERROR-CORRECTING CODES** *(advanced middle/high school)*

## FURTHER INFORMATION ON CYBERSECURITY AWARENESS IS AVAILABLE AT:

<https://www.OnGuardOnLine.gov> Sponsored by the Federal Trade Commission.

<https://www.StaySafeOnline.org> Sponsored by the National Cyber Security Alliance, public/private sponsorship including the Department of Homeland Security.

<https://www.nist.gov/itl/applied-cybersecurity/nice> Sponsored by the National Institute of Standards and Technology (NIST).





### **ADDITIONAL RESOURCES FOR TEACHERS AND STUDENTS**

In addition to the MEPP program, additional educational resources are available to teachers and students through online lesson plans, the NSA Day of Cyber, and the STARTALK and GenCyber summer camps.

#### **K–12 STEM LESSON PLANS**

Through the MEPP grant program, NSA has sponsored many workshops designed to encourage the learning of mathematics, the adoption of advanced teaching techniques, and the use of technology in the classroom. From 1995 through 2011, teachers who participated in the **Summer Institutes for Mathematics Teachers (SIMT)** and the **Summer Institutes for Elementary School Teachers (SIEST)** created concept development units (multi-day lesson plans) for classroom use which were designed in accordance with the **National Council of Teachers of Mathematics (NCTM) Standards**.

After the adoption of the Common Core State Standards for Mathematics, teachers who attended these workshops created rich mathematical tasks designed to promote the Common Core Mathematical Practices.

Concept development units and rich mathematical tasks are available on the NSA website (<https://www.nsa.gov/resources/educators>) as a free resource for teachers.

## NSA DAY OF CYBER

The NSA Day of Cyber is a free online, interactive education tool. Its purpose is to enhance awareness about cyber-related career fields and inspire the next generation of cyber professionals. The tool allows participants to experience a day-in-the-life of an NSA cyber professional and take a virtual career field trip in some of our hardest-to-recruit STEM work roles.

Teachers are able to create an account for their students to participate in this interactive cyber career exploration experience.

It also gives the student the opportunity to create a “cyber resume” that compares their interests and education to that of NSA cyber professionals and identifies educational areas that the student can pursue to further their goals in becoming a cyber professional.

**For more information about this program, please visit the NSA Day of Cyber website:**

<https://www.nsadayofcyber.com>

## GENCYBER CAMPS

Inspiring the Next Generation of Cyber Stars



The GenCyber program provides summer cybersecurity camp experiences for students and teachers at the K–12 level. The goals of the program are to help all students understand correct and safe online behavior, increase diversity and interest in cybersecurity and careers in the cybersecurity workforce of the nation, and improve teaching methods for delivering cybersecurity content in the K–12 computer science curricula.

Our vision is for the GenCyber program to be part of the solution to the nation’s shortage of skilled cybersecurity professionals. Ensuring that enough young people are inspired to direct their talents in this area is critical to the future of our country’s national and economic security as we become even more reliant on cyber-based technology in every aspect of our daily lives.

GenCyber camps are open to all student and teacher participants at no cost. Funding is provided jointly by the National Security Agency and the National Science Foundation.

**For more information about this program, please visit the GenCyber website:**

<https://www.gen-cyber.com>

## STARTALK

STARTALK's mission is to increase the number of U.S. citizens learning, speaking, and teaching critical need foreign languages. STARTALK offers students (K–16) and teachers of these languages creative and engaging summer experiences that strive to exemplify best practices in language education and in language teacher development.



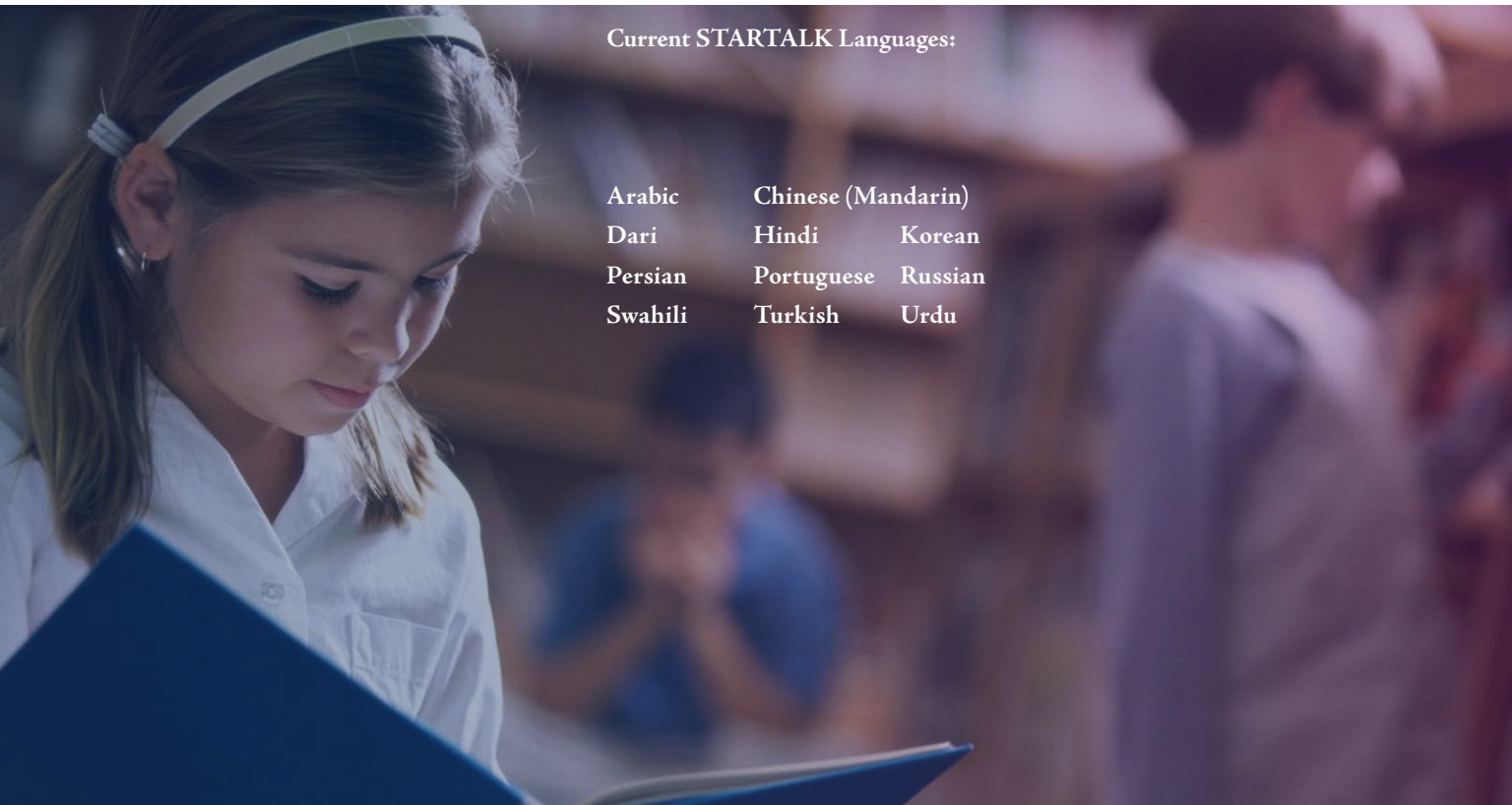
STARTALK also provides programs for current and potential K–16 teachers designed to increase teaching knowledge and skills, presented with a blend of theory, research, and practice. Programs exemplify best practices in language teacher development, strive to form extensive communities of practice, and create credentialing pathways for teachers of STARTALK languages.

Additionally, STARTALK sponsors projects to build resources that support language learning and teaching to create a lasting infrastructure for the world language community.

**For more information on the STARTALK program, please view the STARTALK website:**  
<https://startalk.umd.edu/pub>

### Current STARTALK Languages:

Arabic	Chinese (Mandarin)	
Dari	Hindi	Korean
Persian	Portuguese	Russian
Swahili	Turkish	Urdu



National Security Agency  
MEPP Speakers Bureau  
ATTN: MEPP/Suite 6637  
Ft. Meade, MD 20755-6637

First Class Mail  
Postage and Fees Paid  
National Security Agency  
Permit No. G-712

Official Business  
Penalty for Private Use. \$300