Mathematics Today at the National Security Agency

The role of mathematicians at NSA is continually evolving in response to the ever changing world of communications technology. In recent years the changes have been dramatic. While it is not possible to describe on one page what mathematics is at NSA today, we can at least highlight some characteristics.

• **NSA mathematicians solve problems.**
  The primary responsibility of mathematicians at NSA is to solve problems associated with signals intelligence (the interception, collection and analysis of foreign signals) and information security (the protection of all classified information that is stored in, or sent through, U.S. government equipment). In addition to the traditional area of cryptology, mathematicians at NSA now work on problems in areas such as signal analysis, speech processing, coding theory, data compression, analysis of communication networks and computer security. NSA is unique in its ability to offer the opportunity to work in such diverse areas of applied mathematics. To solve the problems generated by NSA’s mission, mathematicians draw from a wide body of mathematical knowledge, ranging over number theory, finite field theory, Fourier analysis, probability, statistics and more. However, many times, the essential ingredient to the solution of a problem is not mathematical knowledge per se, but the keen analytic ability that a mathematician possesses through training and talent.

• **The ingenuity of NSA’s mathematicians and the computer are a powerful team.**
  NSA mathematicians use computers to test ideas and implement solutions to a diverse set of problems. While there is no requirement for any previous computer work, a mathematician at NSA must learn to use the computer effectively. It is the combination of a mathematician’s ingenuity and the power of modern computers that has made the mathematics community at NSA successful.

• **NSA mathematicians take pride in being part of a mathematics community.**
  At NSA, teamwork is a tool that contributes to problem solving. Interaction among mathematicians varies from working together on small teams to participating in workshops. Mathematicians routinely share their results and ideas through papers, seminars and conferences. NSA’s learned societies provide opportunities for both intellectual and social interaction among mathematicians. While mathematicians take pride in being part of a vibrant and cohesive mathematics community here at NSA, ties to the wider mathematics community outside NSA are also maintained. Besides attending external conferences sponsored by mathematics organizations, NSA mathematicians have sponsored a series of Invitational Math Meetings at NSA. One of these was attended by minority mathematicians from academic institutions throughout the country. At another, prominent women in mathematics from academia were invited to NSA to learn more about us. Out of the latter meeting grew an NSA organization which continues NSA’s outreach to women in mathematics in academia, both students and faculty, as well as fosters career opportunities for women in mathematics within NSA.

• **The future will offer NSA mathematicians more opportunities than ever before.**
  In the future, mathematicians will find themselves in pioneering roles where perhaps even the mathematical formulation of a problem is not clear. More and more, mathematicians will work with people in other disciplines like computer science and electrical engineering, and there will be greater opportunities for mathematicians to learn and experiment in areas far from their original academic training. No description of mathematics at NSA can ever be final and complete. As new communication technologies emerge, so will new challenges for mathematicians at NSA.
Fact Sheet: Hiring Process for Mathematicians at the National Security Agency

The mathematics hiring process at the NSA involves a visit consisting of three to four hour-long interviews, an opportunity to present a seminar to an audience of mathematicians and an evaluation by NSA mathematicians, in addition to the processing required for a security clearance. Please note that:

- United States citizenship is required.

- A polygraph exam and background investigation are required in order to obtain a security clearance.

The process of granting a clearance may take three to six months from the date of the polygraph, but this period varies. Applicants with immediate family members who are not United States citizens may experience delays.

Typical starting salaries are $49,685 for an applicant with a Bachelors degree, $59,811 for a Masters and $83,720 for a Ph.D.

To apply, visit the NSA website (www.nsa.gov) to submit an on-line application and send (1) a cover letter stating interest in a position as a mathematician, (2) a standard résumé or Curriculum Vitae (CV) with postal address, phone number, e-mail address and all degrees earned or expected, with granting institutions, and (3) original copies of all undergraduate and graduate transcripts to:

National Security Agency
9800 Savage Road
Suite 6515
Fort Meade, MD 20755-6515
ATTN: Mathematics Hiring Manager

For additional information, please contact Deanna Egelston, Mathematics Hiring Manager, at (301) 688-0944 or dmegels@nsa.gov.
Technical Skills

The National Security Agency (NSA) conducts a number of the country’s most important and sensitive intelligence activities. This is an enormous responsibility that NSA achieves in two ways. Our Signals Intelligence (SIGINT) mission is to collect, decipher, analyze, and report on intercepted foreign electronic signals. Our Information Assurance (IA) mission is to protect our Nation’s government information systems against the same. At NSA, you can apply your technical skills to the top SIGINT and IA challenges facing our country in this ever-evolving information age.

COMPUTER SCIENCE

NSA’s systems environment is a haven for Computer Scientists with technology years away from commercial release and vast networks able to manipulate and analyze huge volumes of data at mind-boggling speeds. At NSA, you’ll use today’s most advanced computers, supercomputers, and custom-built machinery to solve problems, test approaches, and research solutions. As a Computer Scientist, you can either create new intelligence gathering tools or devise ways to safeguard our computer networks against espionage.

MATHEMATICS

Excellent opportunities exist for Mathematicians who wish to bring the power of Mathematics to bear on important technical problems relevant to NSA’s mission. NSA Mathematicians apply a variety of mathematical disciplines, including Abstract Algebra, Linear Algebra, Number Theory, Fourier Theory, Combinatorics, Probability and Statistics, and Signals Analysis, to solve problems in many areas. No description of Mathematics at NSA can ever be final and complete because as new communication technologies emerge, so will new challenges for Mathematicians at NSA.

COMPUTER/ELECTRICAL ENGINEERING

NSA offers some of the world’s most demanding and exhilarating high-tech engineering challenges. Already featuring cutting-edge, state-of-the-art facilities, NSA needs Computer/Electrical Engineers to push the envelope even further. You’ll develop advanced communication security and foreign intelligence collection and processing systems with the most sophisticated hardware and software available. Opportunities range from fundamental research through advanced development, small to large system design and prototype development, developmental test and evaluation, field installation, and operational support.
Technical Skills

**SIGNALS ANALYSIS**

Signals Analysis is a cutting-edge technical discipline that seeks to recover, understand, and derive intelligence from foreign signals. Our adversaries often communicate using advanced techniques that require the most sophisticated means to analyze, understand, and exploit. With today's rapidly evolving technology, NSA's Signals Analysts are seeking to unravel the internal structures of these complex signals to recover information content and related data. In addition, Signals Analysts derive intelligence data on weapons, and from radars and satellites. Signals Analysts must use their background in Engineering, Mathematics, and Computer Science to meet their mission.

**CRYPTANALYSIS**

As one of the core technical disciplines at NSA, Cryptanalysis is the analytic investigation of an information system with the goal of illuminating hidden aspects of that system. It encompasses any systematic analysis aimed at discovering features in, understanding aspects of, or recovering hidden parameters from an information system. Cryptanalysts use Mathematics, Computer Programming, Engineering, and Foreign Language skills, as well as new technologies and creativity, to systematically analyze basic elements in a cipher code to find a solution.

**COLLECTION**

Collection is where it all starts. In order for codes to be cracked and intelligence passed on to key decision-makers, the information must first be collected. Collection is the process of acquiring data from any number of sources and passing the data to the next stage in the process. NSA is looking for people who understand the modern telecommunications system and can use that knowledge to help acquire the information needed by our stakeholders. The challenge for Collection Specialists is how to leverage systems to acquire data from the increasingly complex telecommunications environment.

For more information about NSA's Technical Skills positions, and how to apply, visit www.NSA.gov/Careers.

U.S. citizenship is required for all applicants. NSA is an equal opportunity employer and abides by applicable employment laws and regulations. All applicants for employment are considered without regard to race, color, religion, sex, national origin, age, marital status, handicap, sexual orientation, or status as a parent.