What Can My Future Hold with a Math Degree?

Careers in Mathematics

University of Nebraska-Lincoln
The University of Nebraska–Lincoln does not discriminate based on gender, age, disability, race, color, religion, marital status, veteran’s status, national or ethnic origin, or sexual orientation.
Mathematician: A versatile career

By Don Kadlec
This is a surprisingly versatile job. Lots of mathematicians end up teaching, which isn’t a bad gig at all when it comes to work/life balance and security. But many go into risk management (where banks, brokerages and more are beefing up their controls), civil engineering (where stimulus-funded construction projects are creating many new openings) and budget analysis (where companies and governments are keeping a sharp eye on the bottom line). This is the top-ranked job on a 2009 report by CareerCast.com. The website notes abundant openings, low stress and a generous salary (median annual pay is $62,804). Mathematicians can also find jobs in industries like video-game development and health care and as statistical analysts for global corporations. They are needed in all sorts of federal agencies and the military. “The number of graduating math majors has been declining for years, and since 9/11, visas for immigrant mathematicians have been harder to get,” says CareerCast.com’s Lee. “So there is a strong demand here for math skills. If you’re a problem solver, this is a great career choice.”


Mathematics majors have a variety of career options. These include diverse choices such as forensic analyst, urban planner, imaging scientist, and actuary. Turn the pages to learn about the many bright futures available to math students.

Math major: A path to further education

An undergraduate degree in mathematics is excellent preparation for a variety of entrance exams that are necessary for further education.

Graduate School
Mathematics majors consistently have some of the highest average GRE scores.

Law School
Math and Physics majors outscore all other majors on the Law School Admission Test, the LSAT.

Business School
Mathematics majors consistently outscore almost every other major on the GMAT, the graduate business school entrance exam.

Medical School
Students who major in mathematics have one of the highest acceptance rates into medical school.

Acceptance rates for mathematics students over the last 4 years have averaged 6% higher than for students who majored in biological sciences and 38% higher than for students who majored in health or exercise sciences (2009 article).

Source: http://weusemath.com
Corporate world offers career options

Many business professionals need a strong mathematical background to succeed at their jobs. Mathematically intensive careers in the corporate world usually focus on one of three areas. First, companies often need models and forecasts for the future so that they can be prepared. Second, the marketing division of companies collect statistics on clients and use this data to find trends. Finally, financial mathematics and the ability to calculate quickly is essential to various types of stockbrokers.

For a company to be successful, a company must be prepared for the future. To help make important business decisions, most companies create models to forecast revenue and sales for the coming years. A variety of careers which make forecasts for businesses include cost estimators, risk analysts, inventory control specialists, budget analysts, operations research analysts, economists, and actuaries.

The marketing division of a company identifies the target audience of a business by discovering the characteristics of the most profitable customers. Market research analysts use their mathematical skills to recognize trends in data, and thus help their company have more successful, profitable marketing campaigns.

Stockbrokers must understand financial mathematics, so they can help their clients make good investment decisions. Financial exchange traders and other types of traders must be able to accurately compute problems involving large sums of money quickly because trading floors are fast-paced environments.

William Hammers, the Chief Financial Officer of Optimal Solutions, told the Mathematical Association of America, “Working in industry provides the opportunity to apply mathematics to real world problems and to actually use the results of analysis to resolve difficulties in building a product or delivering a service.”

Actuaries quantify risk

An actuary is a business professional who deals with the financial impact of risk and uncertainty. Actuaries apply mathematical and statistical theories to solve real business problems. Actuaries assemble and analyze data to estimate the probability and likely cost of an event such as death, sickness, injury, disability, or loss of property. They also address financial questions, including those involving the way a company should invest its resources to maximize its return on investments.

Actuaries are in high demand, and they are often highly paid for the services they render. Financial actuaries are essential to the insurance industry; to other businesses and corporations, including sponsors of pension plans; and to government agencies, such as the Government Actuary’s Department in the UK or the Social Security Administration in the US.

They are paid well for their services with low-end salaries of $41,500 per year, median salaries of $95,980 per year, and high-end salaries of $160,780 per year.

Most actuaries major in either actuarial science or mathematics. Regardless of major, actuaries need a strong foundation in mathematics, statistics, and general business. They generally have a bachelor’s degree and are required to pass a series of exams in order to become a certified actuary.

Janet P. Denbleyker, a consulting actuary for Buck Consultants, told the Mathematical Association of America, “My advice to someone interested in the actuarial profession: talk to many actuaries in different areas of the industry to get a feel for what is right for you...A career as an actuary can be very interesting and rewarding.”

Source: http://wemusemath.com
Operations research analysts do strategic planning

Robin Roundy describes his job as “the application of mathematics to business management.”

Operations research analysts are involved in top-level strategizing, planning, and forecasting. They use advanced techniques from mathematics, science, and engineering to make better decisions and to solve problems. These analysts help to allocate resources, measure performance, design production facilities and systems, manage the supply chain, set prices, coordinate transportation and distribution, and analyze large databases. They also have been used in wartime for various services including searching for enemy submarines.

Operations research analysts receive low-end salaries of $40,000 per year, median salaries of $69,000 per year, and high-end salaries of $118,130 per year.

Robin Roundy, an operations research analyst, wrote, “I deal with the modeling, mathematical theory and algorithmic aspects of inventory control, production planning, production scheduling, forecasting and capacity management.”

Source: http://weusemath.com

Foreign exchange traders calculate quickly

A foreign exchange trader looks at the various factors that influence local economies and rates of exchange, and then takes advantage of any miscalculations of currencies by buying and selling in different foreign exchange markets.

“It’s the wild west of trading,” one trader told the Princeton Review.

Foreign exchange traders receive low-end salaries of $69,173 per year, median salaries of $87,818 per year, and high-end salaries of $139,517 per year.

Mathematics, economics, and statistics majors have a distinct advantage in applying for positions in this field, as do history majors whose coursework included economics. Any experience in a trading environment is valued, as is any work that demonstrates the ability to work hard, make fast and accurate decisions, and manipulate numbers. Many employers appreciate study abroad, international work experience or fluency in a foreign language.

Foreign exchange traders must act fast to exploit valuation differences: “You’ve got seconds to decide how millions of dollars should be spent,” said one trader, “so you have to have confidence.” Confidence ranked second right after “guts” in qualities important in new traders.

Source: http://weusemath.com

Market research analysts identify trends

Market researchers gather information about what people think. They help companies understand what types of products people want and at what price. They also help companies market their products to the people most likely to buy them. Gathering statistical data on competitors and examining prices, sales, and methods of marketing and distribution, they analyze data on past sales to predict future sales.

Market research analysts receive low-end salaries of $33,770 per year, median salaries of $70,410 per year, and high-end salaries of $112,410 per year.

Bob Anastasio, a director of marketing, told the Mathematical Association of America, “If you are interested in this more applied side of mathematics, you should consider taking some business courses (marketing, finance, accounting) in addition to applied mathematical courses like Probability and Statistics, and Operations Research.”

Source: http://weusemath.com

“By applying statistical techniques...I was able to help my employers optimize return on investment in their marketing campaigns.” -Bob Anastasio
Biostatisticians design research studies

Biostatisticians design research studies and analyze data related to human health, animals or plants. The healthcare, biomedical, and pharmaceutical fields employ biostatisticians who are responsible for analyzing genetic data, disease occurrence, and medical imaging data. These biostatisticians develop clinical trials to assess drug treatments. Other academic and government biostatisticians analyze data of populations exposed to environmental chemicals and conditions to understand their risks and effects.

Biostatisticians receive low-end salaries of $46,000 per year, median salaries of $99,571 per year, and high-end salaries of $140,498 per year.

A bachelor's degree is sufficient for entering the field of Biostatistics as an assistant. However, most Biostatisticians have M.S. or Ph.D. degrees in Biostatistics, Statistics, or Applied Mathematics.

Biostatisticians collaborate with researchers as they design studies, helping them find the best approach to data gathering given the question the researchers are trying to answer. These statisticians provide advice on such topics as sample size and data collection (what methods will be used to gather the data).

Once the raw data have been gathered, biostatisticians use statistical software to turn the data into useful information. They use standard statistical procedures and terms to help researchers pinpoint which results were significant and which were inconclusive, warranting further study. Biostatisticians sometimes find themselves cleaning up an imperfect data set to help researchers glean conclusions from it.

Mike Lieber, a biostatistician for Cleveland Clinic Foundation, told the Mathematical Association of America, “I consider myself very fortunate to be doing this kind of work. What I do is interesting, I feel that I’m making a contribution, I enjoy working with doctors doing medical research.”

Source: http://weusemath.com
Climatologists model future weather patterns

Climatologists study climate conditions averaged over a period of time. They use climate models for a variety of purposes, from the study of the dynamics of the weather and climate system to projections of future climate. In contrast to meteorology, which focuses on short term weather systems lasting up to a few weeks, climatology studies the frequency and trends of those systems. Climatology considers the past and can help predict future climate change.

Climatologists receive low-end salaries of $38,990 per year, median salaries of $81,290 per year, and high-end salaries of $127,100 per year.

Climatologists need to have a strong background in mathematics and science. In fact, a bachelor’s degree in mathematics provides excellent preparation for graduate study in climatology. Climatologists often pursue higher education by obtaining a master’s degree and a Ph.D.


Forensics analysts help solve crimes

Forensic analysts use scientific techniques to solve criminal cases. They may use traditional methods such as fingerprinting, assisted by computers, in addition, blood analysis, forensic dentistry, voice and speech spectrograms, and genetic fingerprinting. Chemicals, such as poisons and drugs, are analyzed by chromatography and ESDA (electrostatic document analysis) is a technique used for revealing indentations on paper, which helps determine if documents have been tampered with.

Forensic analysts receive low-end salaries of $30,990 per year, median salaries of $49,286 per year, and high-end salaries of $80,330 per year.

A forensic analyst uses bloodstain pattern analysis in order to tell the story of the crime. It turns out that the location where the blood lands, and the shape of the blood on the landing surface, reveal both the direction in which the blood was moving and how much force was used to wound the victim. Analysts use math principles to figure out the location of the victim when the blood was shed and even the type of weapon or impact that caused the victim’s injury. Math is also used to establish the range of time of death based on the temperature of the body when it was found and to measure other changes in the body occurring at the time of death.

On the department of Forensics Science at the University of Nebraska-Lincoln’s website, it states, “Some of this science is inherently intriguing and is used as the basis for countless television shows, novels, and movies. The analysis of human remains to estimate sex, age, and stature might fall into this category. In contrast, some forensic science would result in very short-lived television programming. This might include determining the number of insect parts in a can of processed food.”

Source: http://weusemath.com

Environmental mathematicians help protect nature

As an environmental mathematician, one works as a member of a team to tackle a specific environmental problem, such as predicting how much gas escapes from storage tanks based on weather conditions. This never-boring job requires both logical and quantitative thinking, and often involves traveling to interesting places.

Kay Strain King, an environmental mathematician with Theta Engineering, Inc, told the Mathematical Association of America, “I find it fun, exciting, and, I hope, a contribution to our Mother Earth to work with others on environmental assignments.”

Source: http://www.bhsu.edu
Math is basis of computer science

Computer scientists work as theorists, researchers, or inventors. They use innovation to solve complex problems and create or apply new technology. The areas of computer science research range from complex theory to hardware design to programming-language design. Some researchers work on projects such as developing and advancing uses of virtual reality, extending human-computer interaction, or designing robots.

Knowledge of mathematics is necessary for any complex work involving computer science.

Various careers are open to those interested in pursuing both their passion for mathematics and computer science. These careers include computer scientist, imaging scientist, software engineer, staff systems analyst, modeling and simulation analysts and system engineer.

Michael Murray, a Java developer, told the Mathematical Association of America, “Without a solid mathematical base, the most talented of programmers can easily get lost when all these numbers start flying around.”

Source: http://weusemath.com

Imaging scientists write programs that edit and display images.

Mathematics is needed to write these complex programs. For example, linear algebra provides tools to flip and rotate graphics in three-dimensional perspective, the basis for countless computer games. Physics and optics opens the door to use the computer as a virtual camera, taking color snapshots of imaginary landscapes and panoramas.

Some areas of work include image-processing, fractal geometry, 3D raytracing, color theory and optics.

Imaging scientists design graphical software

They also do research in trying to build better imaging devices.

Benjamin Weiss, an imaging scientist, told the Mathematical Association of America how he became interested in computer science, “I’ve always been interested in math and science, and in my childhood I was no less fascinated by video games and computer graphics. So it seemed quite natural that I would develop a talent for writing my own computer software, as a sideline of my progression through the world of mathematics.”

Source: http://www.maa.org/careers/

SRC employs imaging scientists to create technology that can take pictures like the one above.

Also, medical imaging software is created by imaging scientists. Mathematicians develop methods for constructing images from information recorded by CAT scans, PET scans, and MRI’s.

WHAT CAN MY FUTURE HOLD WITH A MATH DEGREE?

15 top-earning degrees

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<thead>
<tr>
<th>Rank</th>
<th>Field</th>
<th>Salary</th>
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<tbody>
<tr>
<td>1</td>
<td>Petroleum engineering</td>
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<td>2</td>
<td>Chemical engineering</td>
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<td>3</td>
<td>Mining engineering</td>
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<td>4</td>
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<td>15</td>
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Source: Most Lucrative College Degrees by Julianne Pepitone published on Friday, July 24, 2009 on Yahoo! Finance.
Electrical engineers design, develop, test, and supervise the manufacture of electrical equipment. Some of this equipment includes electric motors; machinery controls, lighting, and wiring in buildings; automobiles; aircraft; radar and navigation systems; and power generation, control, and transmission devices used by electric utilities.

Electrical engineers receive low-end salaries of $56,256 per year, median salaries of $89,268 per year, and high-end salaries of $93,933 per year.

Electrical engineers use laws of nature that are mathematical expressions such as Maxwell’s equations for electromagnetics and Kirchhoff’s Rules for circuit analysis.

Source: http://weusemath.com

Engineering Covers Diverse Fields

Aspiring engineers have diverse options when choosing what type of engineering major they wish to pursue.

For example, the University of Nebraska-Lincoln offers undergraduate majors in architectural engineering, agricultural engineering, biological systems engineering, chemical engineering, civil engineering, computer engineering, construction engineering, electrical engineering, electronics engineering, industrial engineering, and mechanical engineering. There are more options for careers beyond these such as petroleum engineering and applications systems engineering.

For those interested in pursuing a career in engineering, the BYU Mathematics Department lists the following required education, “Engineers typically enter the occupation with a bachelor’s degree in mathematics or an engineering specialty, but some basic research positions may require a graduate degree. Most engineering programs involve a concentration of study in an engineering specialty, along with courses in both mathematics and the physical and life sciences. Engineers offering their services directly to the public must be licensed. Continuing education to keep current with rapidly changing technology is important for engineers.”

“Among the top 10 most sought after college graduates by companies right now are electrical engineers, mechanical engineers, computer engineers and civil engineers.”

-UNL, Department of Engineering

Mechanical engineers create machines

Mechanical engineers research, design, develop, manufacture, and test tools, engines, machines, and other mechanical devices. Mechanical engineering is one of the broadest engineering disciplines. Engineers in this discipline work on power-producing machines such as electric generators, internal combustion engines, and steam and gas turbines. They also work on power-using machines such as refrigeration and air-conditioning equipment, machine tools, material handling systems, elevators and escalators, industrial production equipment, and robots used in manufacturing.

Mechanical engineers receive low-end salaries of $52,456 per year, median salaries of $66,555 per year, and high-end salaries of $87,611 per year.

According to the University of Nebraska-Lincoln’s Department of Engineering’s website, “Mechanical engineers deal with a wide realm of motion, all forms of energy conversion and transmission; the flow of fluids and heat; the development, design and operation of machinery and equipment; material structure and properties; and transportation processes.”

Source: http://weusemath.com
Mathematics is vital to many careers

A major in mathematics prepares students for a wide variety of careers. Besides the wealth of opportunities in business, science, computer science, and engineering, mathematics majors have a diverse group of options.

Possible careers include air traffic controller, animator, architect, attorney, cartographer, cryptanalyst, geographer, national security analyst, political scientist, psychometrician, statistician, technical writer, urban planner, and teacher.

"It's a lot more than just some boring subject that everybody has to take in school. It's the science of problem-solving."

-Jennifer Courter, a research mathematician at mental images Inc., a maker of 3D-visualization software in San Francisco, quoted in the article, Doing the Math to find the Good Jobs, by Sarah Needleman, which appeared in the Wall Street Journal on January 6, 2009. "It's the science of problem-solving."

Air traffic controllers direct pilots

Air traffic controllers coordinate the movement of air traffic to make certain that planes stay a safe distance apart. Their immediate concern is safety, but controllers also must direct planes efficiently to minimize delays. Some regulate airport traffic through designated airspaces; others regulate airport arrivals and departures.

Air traffic controllers receive low-end salaries of $45,020 per year, median salaries of $111,870 per year, and high-end salaries of $161,010 per year.

A degree in mathematics is a great way to start a career as an air traffic controller. To become an air traffic controller, a person must also complete an FAA-approved education program; pass a pre-employment test; receive a school recommendation; meet the basic qualification requirements in accordance with Federal law; and achieve a qualifying score on the FAA-authorized pre-employment test.

Air traffic controller uses math in order to be able to understand distances and measurements at a moment's notice. They also must be able to do mental math quickly and accurately. Part of their job is directing aircraft at what altitude and speed to fly. An error in these directions could be fatal so a strong math background is important. In addition, gaining computer skills is essential in order to work with special computer programs and automated instruments.

Source: http://weusemath.com

Urban planners design cities

Urban planners develop long- and short-term plans for the use of land and the growth of urban, suburban, and rural communities and the region in which they are located. They help local officials by recommending locations for roads, schools, and other infrastructure and suggesting zoning regulations for private property. This work includes forecasting the future needs of the population.

Urban planners receive low-end salaries of $37,960 per year, median salaries of $59,810 per year, and high-end salaries of $91,520 per year.

Urban designers use math as they design the arrangement, appearance, and functionality of towns and cities, and in particular, the shaping and uses of safe public space. Also, urban designers use mathematical models to forecast the future needs of a group of people.

Source: http://weusemath.com
Psychometricians write standardized tests

A psychometrician is a person who practices the science of measurement, or psychometrics. The term psychometrics refers to the measurement of an individual’s psychological attributes, including the knowledge, skills, and abilities a professional might need to work in a particular job or profession. Also, psychometricians write exams such as the MCAT, LSAT, GMAT, SAT, ACT, and Advance Placement test.

Typically, many psychometricians work for testing organizations. They initially determine the abilities, skills and knowledge needed to do the job and create the specifications of the test. They then write test questions and determine the passing score. They may also perform data analyses on the test results as well as conducting validity and reliability studies. College Board, the company that writes the SAT and Advance Placement tests, employ psychometricians.

Psychometricians receive low-end salaries of $50,000 per year, median salaries of $59,440 per year, and high-end salaries of $200,000 per year.

The minimum requirements for the position of a psychometrician are a Master’s degree in educational measurement, industrial/organizational psychology, mathematics, or related area with relevant experience and training. A Ph.D. in a relevant field is highly desirable.

Source: http://weusemath.com

Cryptanalysts develop coding systems

Cryptanalysts design, implement, and analyze algorithms for solving problems. They analyze and decipher secret coding systems and decode messages for military, political, or law enforcement agencies or organizations. They help provide privacy for people and corporations, and keep hackers out of important data systems. They are constantly working on new ways to encrypt information.

Cryptanalysts receive low-end salaries of $38,930 per year, median salaries of $79,470 per year, and high-end salaries of $112,780 per year.

Cryptanalysts use math to perform many tasks including studying and testing ideas and alternative theories, following mathematical theorems, encoding and encrypting systems and databases, performing cryptic computations and applying methods of numerical analysis, devising systems for companies to help keep hackers out and to protect the company and consumer, using computers to make graphs, tables and charts of data, acting as consultant to research staff concerning cryptical and mathematical methods and applications.

Source: http://weusemath.com

Cryptanalysts

“Cryptanalysis is one of the core technical disciplines necessary for the NSA to accomplish its mission and provide critical intelligence to the Nation’s leaders.”

- www.nsa.gov

Technical writers need superior writing skills

A technical writer is a professional writer who designs, writes, creates, maintains, and updates technical documentation—including online help, user guides, white papers, design specifications, system manuals, and other documents.

Technical writers work for book, magazine, or newspaper publishers, or they may be employed in other industries. Technical writers who work for the federal government write the pamphlets that are published by the Government Printing Office. These pamphlets cover many different fields, including the activities of various government agencies and the developments in research in such areas as medicine, education, and agriculture. Some technical writers work for colleges or universities or for the publishers of professional journals. Others work for advertising agencies.

Technical writers receive low-end salaries of $36,500 per year, median salaries of $61,620 per year, and high-end salaries of $97,460 per year.

Source: http://weusemath.com
At the University of Nebraska-Lincoln, you can major in mathematics or in a host of mathematics-related fields. At www.unl.edu, you can explore the different majors available at UNL as well as learn about the specifics of various majors that are offered.

If you are interested in learning more about mathematics-related careers, you should check out the following websites which include information about careers, career profiles, and links for more information.

- BYU Mathematics Department - http://www.weusemath.com

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WUMN helps UNL women bond with others in field

By Amy Been

The University of Nebraska-Lincoln offers undergraduate women in mathematics a unique and fun way to get involved on campus and in their field.

“Women’s Undergraduate Mathematics Network (WUMN) is an organization whose goal is to try and promote math and math-related activities to undergraduate women studying in the STEM fields (science, technology, engineering, and math),” said WUMN President Nicki Gaswick. “We specifically want to help women succeed in math even though it has traditionally been a male-dominated field. I think it’s important for women to have their own math club because they face different problems in the math community than the men do.”

At its monthly meetings, WUMN brings in speakers, has graduate school and research panels, or hosts fun pizza and game nights. WUMN also collaborates with Math Club (men and women) and Pi Mu Epsilon (math fraternity) to strengthen and encourage connections within the math department.

“WUMN has helped me grow academically by showing me what classes I need to take and what things I can do to prepare for graduate school or a career in math,” Gaswick said. “WUMN has also helped me non-academically by helping me to realize my dream career and it has also allowed me to show high school girls how important (and fun!) math can be. My favorite part of WUMN is the building friendships with other girls in math.

“My best piece of advice for high-school-aged girls considering a math degree/career is to go for it! Don’t be intimidated by all the guys in the math field and don’t be afraid if you don’t understand something,” Gaswick added. “Learning math doesn’t usually come instantaneously, but if you keep on going you’ll end up learning valuable skills needed in any career.”

Gaswick reiterates the advantage of a math degree in the work force: “Almost all employers are looking for people with problem solving skills and math helps to give you a leg up on the competition with problem solving skills. Whether you want to be a doctor, a teacher, or an astronaut, math is a great choice to study in college to prepare for your dream job.”