Ohio Mathematics Initiative

FAST FACTS

All Ohio public colleges and universities will offer pathways in mathematics that help students succeed, increase the percentage of students completing degree programs and promote the effective transfer of credits for students moving from one institution to another.

Mathematics opens the doors to many promising career paths

FACT: *If you like to crunch numbers and love mathematics, you're in luck. According to CareerCast, mathematician is the third best job in the nation for 2015, based on working environment, compensation, job prospects and stress. And actuary, which demands strong quantitative skills, ranks first.*(1)

FACT: *A study by PayScale shows that the top 15 highest-earning college degrees have a common element: mathematics. Not only do many professions and majors require courses in mathematics, but the analytical and problem-solving skills students learn in mathematics can apply to all disciplines.*(2)

This is great news for students who say, "I love mathematics, but I don't want to be a teacher." To be sure, there continues to be a great demand for high-quality teachers in the fields of mathematics and statistics, but teaching is not the only option for students who choose majors in the quantitative sciences. In fact, job opportunities for graduates with degrees in mathematics have never been better, as the world is being viewed through increasingly quantitative eyes.

Outside of academia, mathematical careers rarely are built around such job titles as "mathematician". Instead, jobs are most often associated with other fields of study and carry titles such as analyst, data scientist, engineer and biostatistician.

Preparation for a successful career should include a solid foundation in mathematical and computational knowledge; strong skills in differential equations, probability, combinatorics, applied algebra and matrices; and advanced computing and programming skills. And students must be prepared to apply these skills to real-life problems and to achieving practical results.

Today, mathematicians have their choice of career opportunities, in large part because mathematics plays a major role in the bottom line of so many organizations – scientific, engineering, manufacturing, construction and technology. Very simply, mathematics has evolved and is often coupled with a wide variety of organizations that perform better in data-driven marketplaces.

(1) http://www.careercast.com/jobs-rated/best-jobs-2015

(2) http://www.payscale.com/

10 notable Americans who chose to study mathematics

Tammy Baldwin, member of the U.S. House of Representatives, majored in mathematics and government at Smith College.

Harry Blackmun, Associate Justice of the U.S. Supreme Court, was a summa cum laude graduate in mathematics at Harvard.

Sergey Brin, co-founder of Google, earned a degree in mathematics and computer science from the University of Maryland.

Art Garfunkel, folk-rock singer, received a MA in mathematics from Columbia; he then entered the university's Ph.D. program, but chose to pursue his musical career instead.

Reed Hastings, founder of Netflix, graduated from Bowdoin College with a major in mathematics.

Jeff Immelt, CEO, General Electric, earned a B.A. degree in applied mathematics from Dartmouth College.

Danica McKellar starred as 12-year old Winnie Cooper on *The Wonder Years,* then earned a mathematics degree from UCLA and now writes children's books on mathematics.

Mollie Orshansky earned degrees in mathematics, economics and statistics from Hunter College and American University, and later set the federal government's poverty thresholds for household income.

David Robinson, NBA basketball star, earned a BS degree in mathematics from the U.S. Naval Academy.

Matt Stone, co-creator of South Park, majored in film and mathematics at the University of Colorado.

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Problems that mathematicians might work on

While they may differ widely by discipline and job title, all mathematicians are engaged in problem solving. For example:

- How can an automobile's operating systems be made more efficient to reduce emissions as required by federal policy?
- How can automotive and aircraft companies test performance, safety and ergonomics, while also reducing the cost of production and testing?
- How can mathematical models be used to support practical, low-cost simulations in computer chip design and manufacture?
- Is ethanol a viable solution for our dependence on fossil fuels, and can biofuel production be optimized to combat the negative implications for the world's economy and environment?
- How can mathematical modeling be used to predict the spread of a forest fire depending on weather, ground cover and type of trees?
- How do you design a robotic hand to grip a coin and drop it in a slot?
- How can genome sequencing analysis help in making clinical decisions based on a personalized approach to the practice of medicine?
- How might disease spread in populated areas in the event of a bioterrorism incident, and how could it be contained?
- A chemical company cannot test potential new products by releasing them into the atmosphere, so how can it develop models of atmospheric chemistry that simulate the complex chemical reactions in the atmosphere?

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What can a college graduate do with a mathematics degree?

Actually, just about anything because mathematically-trained people are known for their excellent problem-solving and critical thinking skills. Here are some career opportunities open to a math major:

Actuarial Mathematics – the application of mathematics, particularly probability and statistics, to insurance company products and policies.

Computer Science – offers several mathematics-intensive specialties such as graphics and animation, cryptography and network security.

Statistics – the study of methods for collecting, classifying, analyzing and making inferences from data. There are lots of jobs here, including Internet companies built on data (e.g., Google, Facebook and LinkedIn), traditional companies with extensive customer data, and government organizations with public "open data" missions.

Sports Analytics – the use of statistics and data to guide decision making has revolutionized professional sports. Every major professional sports team currently has an analytics department or an analytics expert on staff to crunch numbers that scouts and general managers use to help determine which players they think fit their club best.

Applied Mathematics – working on problems in physics, chemistry, geology and engineering from a mathematical perspective (e.g., a climate analyst models long-term changes in global weather, a forensic analyst investigates data collected at crime scenes, and a population ecologist works to protect endangered species).

Data Mining and Data Privacy – the discovery of patterns and previously unknown information in large data sets, with emerging career opportunities in such fields as security, e-commerce, astrophysics, and chemical and electrical engineering.

Financial Mathematics (also known as Quantitative Finance) – mathematics used on Wall Street for stock market analysis, mortgage banking and financial derivatives.

Biomathematics – the application of mathematics in the health sciences (e.g., mapping and understanding the human genome relies on the use of sophisticated mathematical and computational tools).

Biostatistics – the application of statistics in the health sciences.

Operations Research – the application of mathematics to problems of optimization and decision-making, especially for large-scale or complex business problems.

Materials Science – the study of the properties, processing and production of existing and new materials (including metallic alloys, composite liquid crystals and thin films) depends on mathematical models and computational tools.

For examples of career paths and advice from professionals in many of the above fields, see Mathematical Association of America's (MMA) Career Profiles at http://www.maa.org/careers/career-profiles.

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