SNAPSHOT

9 Key Mathematics Careers

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Introduction

Interested in a career that involves numbers and data? Mathematics applies to many different jobs, some quite high-paying, sometimes in ways that might surprise you. We looked at the highest-paying, most in-demand, and most rewarding jobs and compiled a list of the top careers available to those who graduated with a degree in mathematics or who have high-level math skills.

> "[Math is] the language of the universe, and all those beautiful things about the universe like music, and sunsets, are written in math. You can surely appreciate the universe without knowing math, but only through math can we truly understand it."
>
> *— Mickey Chiu, Physicist at NEXO Collaboration*

Our list of 9 key mathematics careers includes:

1. Accountant
2. Economist
3. Actuary
4. Cryptographer
5. Statistician
6. Mathematician
7. Astronomer
8. Math Professor
9. Physicist

ACCOUNTANT

1

Collect, analyze, and report on financial information; prepare tax returns; use data including costs, revenues, trends, and business operations to project your organization's financial future.

"I use math in my job all the time. I focus on financial statements. Month end close procedures are performed a week after the end of the month. I then analyze the causes for the increases/decreases. Math plays a role in all that because I must keep track of the balances for all the line items on the financials. Math shows you if the company is creating a profit, if the job costs can decrease to increase your profit, how much revenue is forecasted in the short term and long term, and many more things."

— Gabriel Ramirez, Financial Accountant at Gotham Drywall Inc.

2 ECONOMIST

Research and report on economic trends, policies, and relationships; seek solutions to problems related to the production and distribution of goods and services.

"I use math every day to model the effects of political decisions and policies. This modelling, or designing mathematical formulas to understand how variables relate to one another, is used to predict the possible implications of everything from debt borrowing, to housing development, to the impact of state and federal government decision making on the city. The math I primarily use is a combination of algebra, statistics, calculus, and econometrics with each field providing its own unique ability to solve problems. The final step in most of my work is combining the various models into one large systematic model which can adjust for variables and inputs to provide a clearer picture on what the future might hold."

— Eric Mason, Economist, City of Quincy, Massachusetts

3 ACTUARY

Analyze statistical data to determine the rates and implications of life events such as mortality, accidents, illness, disability, and retirement; design insurance and pension plans; calculate insurance premium rates.

"Actuaries use math and statistics to calculate the likelihood and potential costs of different events. They also analyze data and use problem solving skills for real world business problems."

— Ana M. Leyden, FSA, CERA, Actuary at Brighthouse Financial

"As a Group Insurance pricing actuary, I use math every day for many purposes, such as to calculate the appropriate level of reserves to hold for expected future benefit payments. In addition, I use statistical methods to determine the optimal amount of premiums that Group customers should pay."

— Andy Deitch, Director & Actuary at Prudential Insurance Company

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CRYPTOGRAPHER

Code, transmit, and decode encrypted data to help businesses, law enforcement agencies, or government agencies to resolve security concerns; identify and address vulnerabilities in network systems.

"While Computer Science mostly relies on discrete math and linear algebra, with some use of probability, Cryptography also uses statistics and several branches of abstract mathematics, including abstract algebra, number theory, and modal logic. Further, cryptography's need for truly-random numbers leads to the use of time-series analysis, Fourier Analysis, and non-linear dynamics, which in turn requires some knowledge of differential equations, real analysis, and differential geometry.

"Yes, I really have used all this stuff in my work. I wouldn't claim that a cryptography student should master all this math first. But a traditional math specialization in Analysis OR Algebra OR Geometry OR Logic, would be very limiting in Cryptography. Plan to branch out into other areas of math, as you learn more about crypto."

— Don Davis, Cryptographer at Vertica

"Maths is one of the pillars of cryptography. It is used both to build and to break cryptographic systems. Cryptographers leverage hard mathematical problems to build secure communication protocols and computer systems. Mathematics does also provide a set of powerful tools to quantify the security of cryptographic systems (under certain assumptions). This, in turn, makes it possible to compare the security of different cryptographic systems, and to estimate the amount of work needed to crack them."

— Mohamed L., Cryptography & IT Security Researcher

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STATISTICIAN

Gather and interpret numerical data; identify trends and make predictions; help your organization make decisions based on your data analysis.

"Whether it be researching a new product launch or tracking patient outcomes, applying math is essential in making key decisions which impacts whether businesses make money or how many lives improve from a new therapy. In the past 20 years that I worked in this field, I have seen demand in this field skyrocket as technology allows us to access and analyze more and better data. This technological change also is merging the roles of business users with data analysts making applied math skills even more essential."

— David Morley, Statistician, US Government

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MATHEMATICIAN

Conduct mathematical, scientific, or industrial research; analyze mathematical applications and techniques; apply mathematical methods and models to solve problems or draw conclusions.

"In my current role, I build different business models using math that enables business leaders/ users to understand the outcomes of business decisions leading to data driven decision making."

— Tanveer Ahmed, Mathematician, Business Analytics at Dow AgroSciences

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ASTRONOMER

Determine the characteristics of the sun, moon, planets, stars and galaxies; study the history, structure, and extent of the universe; apply astronomical research to practical problems, including air and space navigation and determining exact time.

"The language of the cosmos is mathematics. Without the underpinning of math controlling nature's forces, our understanding of the origin, the structure, and the fate of the universe would lack any concrete meaning. It is the basis of all we know."

— David Eicher, Editor-in-Chief, Astronomy *magazine*

"Since time immemorial, everyone has been inspired by the sky and its contents, its motions, its patterns and beauty. To probe deeper and ask answerable questions is science, and astronomy needs math to get the most out of things far away and very faint.

"I am currently a 'Dark Ranger' with the National Park Service serving at Dinosaur National Monument. Even though this is outreach work and not theoretical at all, I still use math to plan astronomy events, specifically to calculate what is up in the sky at a given time on a given night, telescope performance (magnification, field of view, etc.). A special task I am involved with is the International Dark Sky Park program. Here math is used to determine basic stuff like luminous efficiency and incident light, Pogson's Law for adding magnitudes, et cetera. Finally, since outreach is inherently observational science (showing stuff to people), math involving angles and angular measurement comes up all the time."

— Derek Wallentinsen, Astronomy Interpretive Ranger, National Park Service

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MATH PROFESSOR

Instruct college or university students in mathematical and statistical concepts, techniques, and applications; help students develop an appreciation for mathematics; may conduct research and publish findings.

"Knowing from personal experience how abstract concepts are best internalized by our mind makes it that much easier to introduce such a concept to a student of mathematics so that they can assimilate it with relative ease."

— Nitu Kitchloo, Professor, Mathematics Department, Johns Hopkins University

"I have seen people of all ages, as young as kindergarten, engage in mathematical modeling to understand the world and make good decisions. As a Professor of Mathematics at Harvey Mudd College and Vice President for the Society for Industrial and Applied Mathematics, I help people see how the power and beauty of mathematics connects with the world around them. Through mathematical modeling, everyone can do and appreciate mathematics. Mathematical modeling in the workplace helps us address critical problems such as energy, health, sustainability and safety."

— Rachel Levy, Professor, Mathematics Department, Harvey Mudd College

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9. PHYSICIST

Observe and analyze the physical properties and behaviors of materials; develop theories and laws based on your observations and experiments; apply laws and theories to industry, medicine, or other fields.

"Most of my work was in thin film coatings. The design of these coatings requires the knowledge and use of the mathematical relationship of the physical properties of each dielectric material and how it interacts with light in order to produce high reflection mirrors, anti-reflective films, notch filters, or band pass filters. All of these coatings can be tuned to be quite wavelength specific, depending on layer thickness and how many layers are required in the coating design. Snell's law, the index of refraction of the materials and the superposition of sine waves are basics in the design of these films."

— Daniel Edewaard, Optical & Thin Film Coating Physicist, Optical Metrology Instrumentation Designer & Fabricator

"Math is like a language which is necessary to understand physics (and, for that matter, most sciences)."

— Abdul Rumaiz, Physicist at Brookhaven National Laboratory

"As a physicist responsible for a synchrotron beamline at the National Synchrotron Light Source-II, a unique instrument that delivers intense X-ray light to probe wide range of materials, from living cells to advanced batteries, I use math every minute. I apply trigonometric relations to arrange elaborate combination of X-ray mirror and lenses which deliver the synchrotron beam from the particle accelerator to the sample, apply linear algebra to extract weak signatures of elusive species from the noise and solve complex differential equation to model the data."

— Eli Stavitski, Physicist at National Synchrotron Light Source-II at Brookhaven National Laboratory

CONCLUSION

To assemble our list, we turned to the CareerCast website, and collected data from the U.S. Bureau of Labor Statistics, other government agencies, trade associations, and private survey firms. We also looked to instructors from top math universities around the United States, and spoke to people with the careers on our list to learn how they use mathematics in their day-to-day work.

As you can see, you can apply a mathematics degree or a strong aptitude for numbers to many rewarding career paths. Our list only scratches the surface of all the career choices available.

What math careers did we miss on this list? Join the conversation on Twitter! @CRC_MathStats

REFERENCES

"Best Mathematics Programs | Top Math Schools | US News Best Graduate Schools." U.S. News & World Report. Accessed 02 May 2017. www.usnews.com/best-graduate-schools/top-science-schools/mathematics-rankings.

"Highest Paying Jobs That Involve Math." Highest Paying Jobs That Involve Math - Sokanu. Accessed 02 May 2017. www.sokanu.com/careers/collections/highest-paying-jobs-that-involve-math.

Robinson, Michael. "List of Job Descriptions". CareerPlanner.com. 2017. Accessed 03 May 2017. www.careerplanner.com/JobDescSearchTool.cfm.

"Top Ranked." College Factual. 01 May 2017. Accessed 02 May 2017. www.collegefactual.com/majors/mathematics-and-statistics/mathematics/rankings/top-ranked.

"Top 10 Paying Jobs That Involve Math." DegreeQuery.com. 02 October 2015. Accessed 02 May 2017. www.degreequery.com/top-10-paying-jobs-that-involve-math.

Giang, Vivian. "The 10 Best Jobs for People Who Love Math". Business Insider. 2017. Accessed 02 May 2017. www.businessinsider.com/best-jobs-for-people-who-love-math-2013-12.

Mathematics-Related Professions. Accessed 02 May 2017. www.math.ucdavis.edu/~kouba/MathJobs.html.

Smith, Jacquelyn. "14 high-paying jobs for people who love math." Business Insider. 14 June 2016. Accessed 02 May 2017. www.businessinsider.com/high-paying-jobs-for-people-who-love-math-2016-6/#-14.

INTERVIEWS

Ahmed, T. (05 April 2017). LinkedIn Interview.

Chiu, M. (03 April 2017). LinkedIn Interview.

Davis, D. (31 March 2017). LinkedIn Interview.

Deitch, A. (03 April 2017). LinkedIn Interview.

Edewaard, D. (30 March 2017). LinkedIn Interview.

Eicher, D. (28 March 2017). LinkedIn Interview.

Kitchloo, N. (30 March 2017). Email Interview.

L., M. (03 April 2017). LinkedIn Interview.

Levy, R. (05 April 2017). Email Interview.

Leyden, A. M. (30 March 2017). LinkedIn Interview.

Mason, E. (03 April 2017). LinkedIn Interview.

Morley, D. (03 April 2017). LinkedIn Interview.

Ramirez, G. (03 April 2017). LinkedIn Interview.

Rumaiz, A. (30 March 2017). LinkedIn Interview.

Stavitski, E. (30 March 2017). LinkedIn Interview.

Wallentinsen, D. (31 March 2017). LinkedIn Interview.