



Careers in Mathematics

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Abstract : Mathematics provide an effective way of building mental discipline and encourages logical reasoning. Mathematics plays a crucial role in understanding other subjects such as science, social studies and even music and art. Teaching is the only possible career in Mathematics this impression is held by majority of us. In this paper author wishes to give the details of career options available for a student learning Mathematics at undergraduate and post graduate level.

Index Terms – Mathematics, Actuary, Finance, Technology.

I. INTRODUCTION

There are many skills that we gain throughout our educational journey. Studying mathematics prepares one for nearly and reasonably any career imaginable. In general, companies believe that studying mathematics develops analytical skills and the ability to work in a problem-solving environment. These are the skills and experience that are essential assets to one's success in the work place. Precisely, mathematics is often the quintessential element to fluently communicate with people of various backgrounds. It is the ability to efficiently process a manifold of information and deliver the technical details to a general audience that makes mathematicians valuable. Having a mathematics background not only helps people broadening their pool of career options, it also helps to land you the best jobs known to people.

A student can enroll in a number of program to obtain degree in mathematics. Various bodies like MTTs (Mathematics training and talent search), NCM (National center for Math), summer and winter schools are available to promote, train and extract mathematical talent at higher education level. In this paper we begin by discussing about the details of some curriculum and institutes where an aspirant can enroll. In Section 3 we will describe about some growing career options in finance and information technology. In the last section we will provide details of some government and private services 1 which a student can join after completing education in mathematics. Some exams like Kishor Vigyan Prothasahan Yojana (KVPY), Council of scientific and industrial research(CSIR), Indian institute of technology (IIT), Indian institute of Science (IISc), National eligibility test(NET), National board of higher mathematics(NBHM), etc will be frequently used.

II Courses after 10+2 leading to major in Mathematics

2.1 B.Sc.(Regular): This is a three year program where students are admitted through merit in 10+2 or equivalent with Science subjects and mathematics as one of the subject. Popular combination in the first year of this program are: Physics-Chemistry-Math, Physics-Math-Computer Science, Physics-Math-Statistics, Math-Statistics-Economics. This program is available in majority of colleges across the country but subject combination is college dependent.

2.2 B.A.(Regular): This is a three year program like B.Sc.(Regular) but the difference is that science subjects at 10 + 2 level are not compulsory. Beside mathematics other subject in the combination at the first year of the program consist of subjects from humanities. This program is available in many colleges across country.

2.3 B.Sc.(Hons)/B.A.(Hons): This is a three year program where a 2 rigorous exposure of mathematics is given. All papers in this course consists of mathematics or related areas. This program proves the best for the students who have clear goal of making a career in academics and research.

III Courses after Completing bachelor degree in Mathematics

3.1 M.Sc.(Pure): After completing bachelor degree with mathematics major a student can continue a masters programme in the same university/institution on the basis of merit or can join another university. Some universities conduct entrance exam and shortlist the student on that basis.

3.2 M.Sc.(Applied): A student can enroll in programs like M.Sc.in industrial math, M.Sc. in engineering mathematics, M.Sc. in mathematical statistics. Some institute providing these courses are: Institute of chemical technology(ICT), Mumbai; for M.Sc.(Eng.) and admits student through entrance test, Veer Narmad South Gujarat University for M.Sc.(Industrial Math).

IV Higher education in interdisciplinary area

4.1 B.Ed.: This is a two year bachelor program in education. Majority of universities conduct entrance test for admission in B.Ed. After completing this course a student can join teaching profession.

4.2 M.Sc. (Geology, Geophysics or Earth Science): A student with 50 percentage aggregate or equivalent in B.Sc. can enroll in M.Sc. or M.Sc.-PH.D program in geology, geophysics, or earth science. These courses are available at Aligarh Muslim University, Andhra University, Amravati University, Annamalai University, Banaras Hindu University.

4.3 M.Sc. (Meteorology): This is a two year program where students are admitted through entrance test. The main focus of this course is to combine fundamental principles of forecasting weather, understand soil condition and related study. Students holding B.Sc.(Math) and aggregate 50 percent or equivalent are eligible for this course. Some institute with provide this course are: Government institute of science, Maharashtra; CUSAT, Kochi; Andhra University, Indian institute of tropical meteorology, Pune, etc.

4.4 M.Sc. (Information Technology): This program is available in many universities and is admission is on the basis of merit. However, some universities may follow a different admission criterion for a student not having a background in this area.

4.5 M.C.A. (Master of Computer Applications): This is a three year course and students are admitted through entrance exams conducted by university where a student desires to take admission. It is available in many universities across the country.

4.6 Ph.D.(Mathematics): A student can either join M.Sc.-Ph.D. dual degree program or can enroll in Ph.D. after completing masters. Admission in majority of institutes and university is through entrance test followed by interview. Some entrance test for these program are: CSIR-NET(JRF), GATE, NBHM, Ph.D. entrance test(PET), CMI entrance test, TIFR entrance test, ISI entrance test, etc.

4.7 Ph.D.(Physics): A student with M.Sc.(Math) is eligible for appearing JEST (Joint entrance screening test) and make his applications for PH.D(Physics) at premier institute of India like IIT, IUCA, IIA(Indian institute of astrophysics), etc.

V Career options for Math Major: Although it is seemingly impossible to categorize different branches of mathematics due to its extensive uses in every operation of the society, I have made a crude attempt to provide a list of career options available for someone who studies under some common branches of mathematics, particularly, the areas of Actuarial Mathematics, Financial Mathematics and other emerging fields.

5.1 Actuary

Actuaries are the math professionals who work with numbers and statistics, primarily in the financial and insurance industries and occasionally for professional and technical companies or even the government. They analyze economic data to help businesses make the right financial decisions.

These finance graduates with strong mathematical skills help organizations to calculate the likelihood of various events. They also allow an organization to assess the impact of economic effects on those outcomes.

5.2 Statistician

In this job, you will collect and analyze data to solve practical and real-world problems, whether in agriculture, business, or another field. Some entry level job positions are also available for students with a bachelor's degree in this mathematical job field.

5.3 Mathematician

Mathematician is certainly one of the most obvious career choices for anyone with a good understanding and education in math. This job brings responsibilities that include developing mathematical rules, deciding what data is required for specific questions, and applying various mathematical theories to different areas such as science and engineering.

5.4 Economist

Economists evaluate economic issues related to the production and distribution of raw materials, goods, and services. They analyze and show their findings to government agencies, corporations, and academic research organizations.

Economists' job is to help public and private groups to forecast important aspects of their operations like job availability in specific sectors, labor shortages, the impact of the pandemic, natural resource scarcity, etc.

5.5 Operations Research Analyst

In this job role, you will use your advanced mathematical and analytical skills to organize, investigate issues, identify and solve problems, and make the right and better decisions.

You will also identify problems, create mathematical equations to solve them and use the information to inform policymakers and business leaders. You will help firms evaluate records, data, customer reviews, and management insights.

5.6 Data Scientist

Data Scientists are among the most in-demand mathematical professionals today. Many organizations invest heavily in big data, which is important to create consumer-centric solutions and enhance product/service performance. Moreover, many companies hire data scientists to make more data-driven business decisions.

5.7 Accountant

An accountant professional is responsible for checking and ensuring an individual or company's tax information, whether it is accurate and done properly or not. Accountants are busy during the tax filing season. Accountants sometimes need to work like mathematicians. It is one of the best careers for math lovers, which demands lots of calculations.

5.8 Math Professor

A University or College professor is one of the best careers for math majors. These professionals teach students calculus, statistics, number theories, and differential equations. They also write a syllabus, present lectures, design tests, assignments and assess student learning through exams.

Apart from teaching in classes, math professors often research their specialties. Math professors also supervise graduate and undergraduate students, serve on academic committees, and attend professional universities and colleges.

5.9 Financial Analyst

Financial analysts' job is to look after company finances, poring over data, and supporting financial management decisions. Their job also involves evaluating possible outcomes of business and investment recommendations.

Generally, they are hired in junior and senior positions in banks, insurance companies, and other financial institutions. Apart from the basic financial literacy and accounting skills, these professionals should also have critical thinking and communication skills.

5.10 Market Research Analyst

A market research analyst job requires performing market analysis with the help of advanced methods and mathematics. They also monitor the market, forecast sales, analyze trends, and help you measure the effectiveness of marketing programs.

This math degree job demands a bachelor's degree in most cases. On-the-job training or previous experience is rarely a requirement for advanced roles. In this decade, we are most likely to see career job growth of 23%, which means it's one of the best jobs for math majors.

5.11 Cryptographer

A cryptographer is a professional who uses math and computer science to encrypt and decrypt data. They are most likely to work in financial and government agencies to protect sensitive information. Since hackers are constantly finding new methods and techniques to breach data security, cryptographers must think on their feet and develop new ways to protect the data.

5.12 Physicist

A physicist is a highly advanced and educated professional studying how the universe works, including how matter and energy interact with each other. From the nature of time to the behavior of electrons, these job professionals use complex mathematics to design and test different theories.

To become a physicist, you should have doctorate-level education for this career. This job career offers one of the best salaries for people who have great math skills.

5.13 Cost Estimator

Cost estimators calculate how much a potential project will cost, how long it will take to finish, and what resources will be required to complete the project.

In this job profile, you need to study blueprints or talk with architects, engineers, and other contractors that help you to gather the production data you need for your estimates. You might also be expected to recommend finding out ways to keep costs down.

5.14 Budget Analyst

Budget analysts help public and private institutions like government agencies and universities organize their finances. Budget analysts are also responsible for ensuring that budget proposals are accurate and compliant with laws and regulations.

However, this job role is technical and business, which makes the work engaging, and it also means your skills will be in demand.

5.15 Programmer Analyst

Programmer analysts write and test code, computer applications, and software program codes. These IT professionals update and expand existing programs, check programs for errors, and help you fix errors from code lines. They are also well-versed in various computer languages, including C++, Java, and Python. This job requires a background in various math topics.

5.16 Investment Analyst

An investment analyst is a professional who needs to research investment opportunities and past market data. This professional also develops financial models, creates reports on insights, and recommends stocks, bonds, or other investment opportunities to clients, organizations, or corporations.

Investment analysts are specialized in producing research that improves a sales pitch for certain investment options. Moreover, they research and recommend opportunities to their employer's financial team to buy or sell investments when opportune.

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