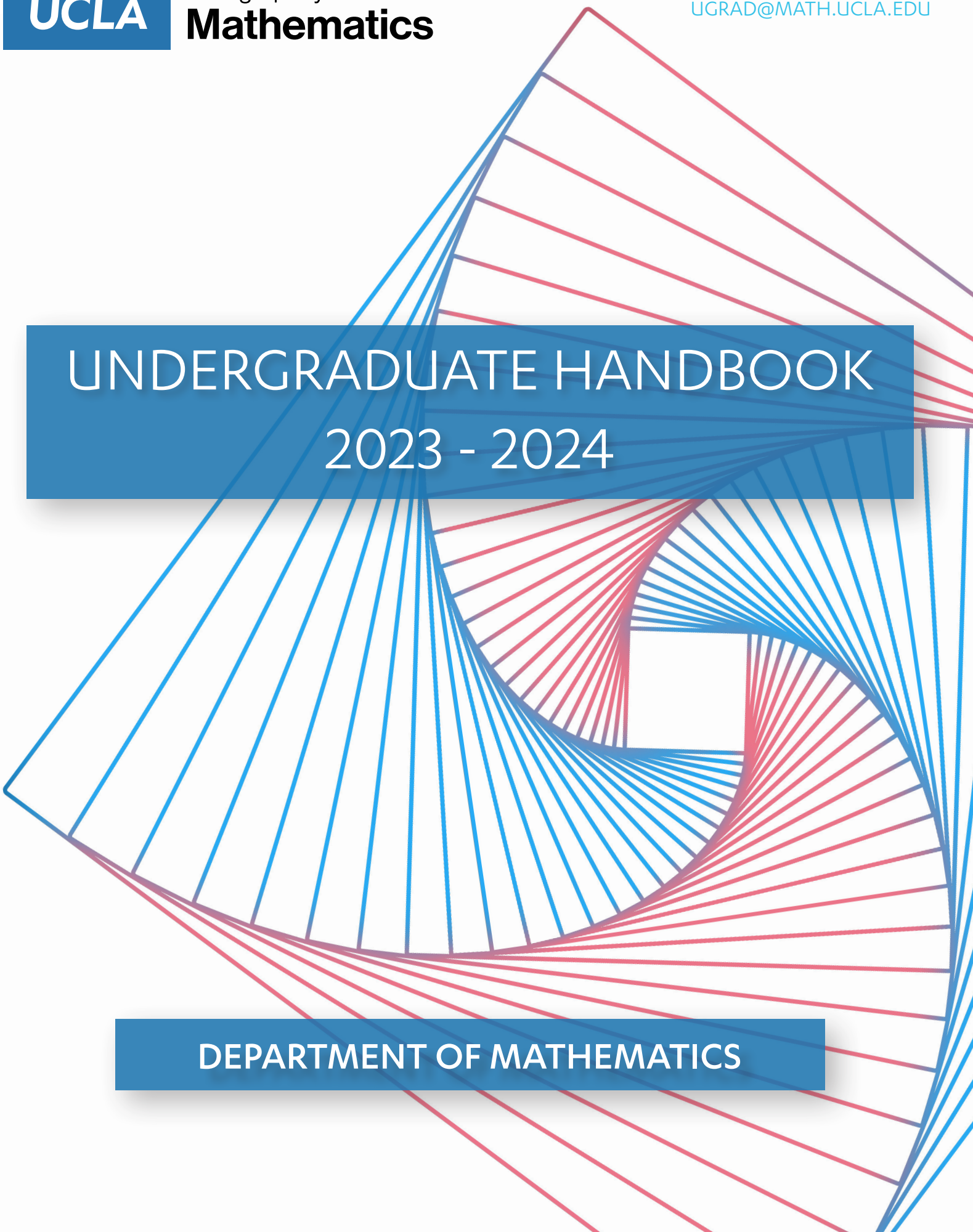
UCLA College | Physical Sciences
Mathematics

6356 MATH SCIENCES
UGRAD@MATH.UCLA.EDU



# UNDERGRADUATE HANDBOOK 2023 - 2024

## DEPARTMENT OF MATHEMATICS

UCLA College | Physical Sciences Mathematics

The Department of Mathematics is the home for Mathematics and Programming in Computing

## UNDERGRADUATE STUDENT SERVICES

**LOCATION**
Student Services Office
Math Sciences 6356

**HOURS OF OPERATION**
Monday – Friday
7:30 am – 11:50 am
1 pm – 4:30 pm

**EMAIL**
ugrad@math.ucla.edu

**PHONE**
(310) 206-1286

**VIRTUAL ADVISING HOURS**
No Appointment Needed
Hours are subject to change depending on the time of the year. See website for the Zoom link and up-to-date hours.

**IN-PERSON ADVISING HOURS**
No Appointment Needed
9 am – 11 am & 1 pm – 4 pm
Summer hours vary. See website.

**WEBSITE**
ww3.math.ucla.edu/undergraduate-program

**ACADEMIC ADVISORS**
Carla Ramos
Trisha Tran
TBD

**MAILING ADDRESS**

UCLA Department of Mathematics
520 Portola Plaza
Box #951555
Los Angeles, CA 90095-1555

**MESSAGE CENTER**
Accessible through MyUCLA
my.ucla.edu

The Student Services Office is available for physical and virtual on specific days & times each week with no appointments needed. Enrollment issues are prioritized during weeks 0–2.

Advisors can answer questions regarding:

- Academic Difficulty
- Course Planning
- Career Planning
- Course Transfers
- Departmental Programs
- Enrollment Concerns
- Majors, Minors, and Specializations
- Student Organization

## PROGRAMMING IN COMPUTING: PIC LAB

**LOCATION**
Math Sciences 2000

**PHONE**
(310) 825-7276

**WEBSITE**
pic.ucla.edu

**HOURS: FALL, WINTER, SPRING**
Monday – Friday: 9 am – 5 pm
Saturday: CLOSED
Sunday: 1 pm – 5 pm

**HOURS: SUMMER SESSIONS**
Monday – Friday: 9 am – 5 pm
Saturday & Sunday: CLOSED

The PIC Lab supports both PIC students learning programming and math students who wish to use analytical software. The lab is reserved for PIC and math students only.

Student accounts have 1 GB of disk space on the network drive and may print 200 pages per class per quarter at no charge. No additional printing is allowed.

Accounts are automatically created for all eligible students each quarter or can be requested at the Student Services Office.

Hours may vary each quarter. Visit the PIC Lab website for the current schedule. Reduced hours during finals week.

**RESOURCES**

Visual Studio Community: visualstudio.microsoft.com/vs/community

Matlab (available to UCLA students): softwarecentral.ucla.edu/matlab-getmatlab

Python: python.org/downloads

Adobe Creative Cloud: ucla.service-now.com/support?id=kb_article&sys_id=KB0013458

# FREQUENTLY ASKED QUESTIONS

**1. Who should I go to regarding my GE or university requirements?**

Questions regarding university or college requirements should be directed to the student's designated college counseling office: College of Letters and Science, Honors, AAP or Athletics. For more information, refer to their website.

registrar.ucla.edu/Academics/Academic-Counseling

**2. Where can I obtain information about courses offered through other departments (non-Math/Programming In Computing courses)?**

For questions regarding non-Math/PIC course syllabi, prerequisites, enrollment restrictions, transferability, etc., students should check with the department that offers the course. The Mathematics Department does not manage enrollment for courses outside of math and PIC.

**3. Do I need to take the Math Diagnostic Test?**

All students wishing to enroll in MATH 1, 3A, 31AL or 31A are required to take the math diagnostic test. The UCLA Mathematics Department requires students to use ALEKS PPL, a web-based learning system that uses adaptive technology, to quickly and accurately assess readiness for certain mathematics courses. Each student who takes the diagnostic test through ALEKS PPL will be charged a $20 non-refundable fee upon logging in, which covers six (6) months of access to the Prep and Learning Module.

Please contact the Student Services Office if you are not sure whether you need to take the exam.

ww3.math.ucla.edu/math-diagnostic-test

**4. Can I retake the Math Diagnostic Test?**

Yes. Students are allowed three (3) attempts on the diagnostic exam. The first attempt establishes a baseline score to assess a student's knowledge of the topics. Students are allowed to retake the test two (2) times after establishing a baseline score. The most recent score, for better or worse, will be placed into the student's record. Students can register for a new ALEKS assessment each quarter prior to enrollment.

If you are satisfied with your placement based on the baseline score, you do not need to take the test again. If you did not receive a baseline score that places you in your desired class, you can attempt to retake the test after a 48-hour cooling period and after doing a minimum of three (3) hours of self-review in the learning modules.

Even if you are satisfied with the initial score, you are highly encouraged to review the learning modules and achieve up to 80% mastery in each topic to help you prepare for the course.

**5. If I took an AP Calculus exam, what math course should I enroll in at UCLA?**

Only students that receive a score of 3, 4 or 5 on the AP Calculus AB or BC exams will receive college credit. Credit may vary depending on your major and the college to which you belong. Math majors will receive the credit as indicated in the following chart:

| Score | AB Exam | BC Exam |
|---|---|---|
| 5 | Credit for MATH 31A<br>Enroll in MATH 31B/3B | Credit for MATH 31A, 31B<br>Enroll in MATH 32A/3C |
| 4 | Credit for 4 units of calculus | Credit for MATH 31A and 4 units of calculus<br>Enroll in MATH 31B/3B |
| 3 | Credit for 4 units of calculus | Credit for 8 units of calculus |
| 2 | No college credit | No college credit |
| 1 | No college credit | No college credit |

**6. What credit will I receive with my International Baccalaureate (IB) Higher Level Exam?**

UCLA awards college credit for higher level (HL) exams only. Credit awarded by UCLA as a result of IB exams is subject to change without notice. IB examinations, AP examinations, and college courses taken prior to or after enrolling at UCLA may be duplicative. In these cases, students will be awarded credit for only one course.

To receive credit for math equivalences, the IB exams must be passed with a score of 6 or 7. Students may petition for more advanced credit if they will be taking more advanced math at UCLA (MATH 31B and further).

admission.ucla.edu/admitted-students/ib-credit-the-college

admission.ucla.edu

ibo.org/programmes/diploma-programme/curriculum/mathematics

**POSSIBLE UCLA COURSE CREDIT FOR IB EXAMS**

| IB EXAM | SCORE | CREDIT |
|---|---|---|
| Mathematics | 5 | Math 1 and 4.0 units |
| | 5 | Math Unassigned and 4.0 units |
| | 6 | Math 31A and 4.0 units |
| | 6 | Math Unassigned and 4.0 units |
| Mathematics, Applications & Approaches HL | 5 | Math Unassigned and 8.0 units |
| | 6 - 7 | Math 31A |
| | 6 - 7 | Math Unassigned and 4.0 units |
| Mathematics, Further | 5 - 7 | Math Further and 8.0 units |

*UC does not award credit for Mathematics: Applications & Interpretations HL

# FREQUENTLY ASKED QUESTIONS

**7. Does my Advanced Level General Certificate of Education, commonly referred to as an A-Level exam, count for anything?**

Credit awarded by UCLA as a result of A-Level exams is subject to change without notice. In order to receive credit for math equivalences, the A-Level exams must be passed with "C" grades or better. Math majors will receive the credit as indicated in the following chart:

**POSSIBLE UCLA COURSE CREDIT**

| CIE A- LEVEL EXAMS | A | B | C |
|---|---|---|---|
| Pure Mathematics 1 (P1) + Pure Mathematics 3 (P3) + Mechanics 1 (M1) + Probability and Statistics 1 (S1) | MATH 1, MATH 31A | MATH 1, MATH 31A | MATH 1 |
| Pure Mathematics 1 (P1) + Pure Mathematics 3 (P3) + Mechanics 1 (M1) + Mechanics 2 (M2) | MATH 1, MATH 31A | MATH 1, MATH 31A | MATH 1 |
| **SINGAPORE A-LEVEL EXAMS** | **A** | **B** | **C** |
| Higher 2 Mathematics: (P1) + (P2) | MATH 1, MATH 31A | MATH 1, MATH 31A | MATH 1 |
| **EDEXCEL A-LEVEL EXAMS** | **A** | **B** | **C** |
| GCE Mathematics (9371): C1, C2, C3, C4 | MATH 1, MATH 31A | MATH 1, MATH 31A | MATH 1 |
| GCE Further Mathematics (9372): FP1 and FP2 | 12.0 title units | 12.0 title units | 12.0 title units |
| GCE Further Mathematics (9372): FP1 and FP3 | 12.0 title units | 12.0 title units | 12.0 title units |
| GCE Pure Mathematics (9373): C1, C2, C3, C4, FP1 | MATH 1, MATH 31A | MATH 1, MATH 31A | MATH 1 |
| **OXFORD CAMBRIDGE AND RSA EXAM** | **A** | **B** | **C** |
| Mathematics B (MEI) H640 | MATH 1, MATH 31A | MATH 1, MATH 31A | MATH 1 |

CIE A-Level Mathematics (9709) — cambridgeinternational.org/programmes-and-qualifications/cambridge-international-as-and-a-level-mathematics-9709

CIE A-Level Mathematics - Further (9231) — cambridgeinternational.org/programmes-and-qualifications/cambridge-international-as-and-a-level-mathematics-further-9231/

Singapore A-Level — seab.gov.sg/home/examinations/gce-a-level

Edexcel A-Level — qualifications.pearson.com/en/qualifications/edexcel-a-levels/advanced-extension-award-mathematics-2018.html

Oxford A-Level — ocr.org.uk/qualifications/as-and-a-level/mathematics-b-mei-h630-h640-from-2017

Credit may vary depending on your major and the college to which you belong. Consult with the Undergraduate Admission Office for more information.

admission.ucla.edu

**8. What is a typical course load for math students?**

All math majors should be taking at least one math class per quarter for the first two years. By their junior year, students should be taking two to three major courses per quarter. These are just recommendations. Schedules and course load will vary depending on students' interests and level.

**9. How big are the math classes?**

Lower division classes usually have a capacity of 210 students per lecture (35 students per discussion). Upper division classes usually have a capacity of 40 students in each lecture.

**10. What if a math course I planned to take is full during my enrollment appointment?**

If there are open sections of that course offered at a different time, it is best to try rearranging your schedule and enroll in the open section. Otherwise, you should add yourself to the wait list. If the wait list is full, you can continue to monitor the enrollment number on the Schedule of Classes and try to add yourself to the wait list if space becomes available.

sa.ucla.edu/ro/public/soc

Upper division math courses are limited to math majors and minors during first pass. Pre-math majors cannot enroll in upper division math courses during first pass. Enrollment into most upper division courses is open to all students in second pass. Restrictions may still apply to a few specialized courses.

ww3.math.ucla.edu/enrollment-into-math-and-programming-in-computing-pic-courses

For upper division math courses only, you can place your name on the unofficial wait list, which opens in Week 1 of each quarter. Signing up for the unofficial wait list does not guarantee that you will be enrolled in the class. The Mathematics Department reviews all unofficial wait list requests. If enrollment in a class falls below capacity, math advisors will enroll students from the unofficial wait list based on priority and/or graduation date.

If you are not enrolled in the class by the first day of instruction, you can email ugrad@math.ucla.edu for more information or visit our Enrollment Updates page. It is always a good idea to have a back-up plan. Enrollment in any course is not guaranteed and you may have to take the course the next time it is offered.

math.ucla.edu/ugrad/unofficial-waitlist

**11. Can I take a "Preparation for the Major" or "Major" course pass/no pass?**

No. All courses for the major, minor, or specialization must be at least 4.0 units and taken for a letter grade.

**12. If I received a "C-" or lower in my math class, may I repeat it?**

Lower division mathematics courses: Students may not take or repeat a course for credit if it is a requisite of a more advanced lower division course for which they already have credit. This applies in particular to the repetition of courses (e.g., if students wish to repeat MATH 31B, they must do so before completing MATH 32B).

Upper division mathematics courses: Students may not take or repeat a lower sequence course for credit if it is part of a sequence for which they already have credit. This applies in particular to the repetition of courses (e.g., if students wish to repeat MATH 131A, they must do so before completing MATH 131B or 131BH).

Students may not receive credit for both a course and the honors version of that course (e.g., they may not receive credit for both MATH 131A and 131AH).

Refer to the College of Letters and Science website for more policy information about repeating courses.

caac.ucla.edu/policies/grading-repeats

# FREQUENTLY ASKED QUESTIONS

**13. How and when can I drop a course?**

Refer to the drop deadline chart for deadlines and fees.

If you are on financial aid and plan to drop a course, you should also speak with the Financial Aid Office to learn more about how dropping courses impacts your financial aid.

financialaid.ucla.edu

International students should visit the Dashew Center before dropping below 12.0 units.

internationalcenter.ucla.edu

**UNDERGRADUATE DROP DEADLINES AND FEES**

COLLEGE OF LETTERS AND SCIENCE

| DROP PERIOD | DROP TYPE | METHOD | APPROVED FEE | TRANSCRIPT NOTATION |
|---|---|---|---|---|
| Weeks 1-2 All Courses | Drop | MyUCLA | None | No |
| Weeks 3-4 Non-impacted Courses | Drop | MyUCLA | None | No |
| Weeks 3-10 Impacted Courses | Late Drop | Petition* | $20.00 | Yes |
| Weeks 5-7 Non-impacted Courses | Late Drop | MyUCLA | None | Yes |
| Weeks 8-10 Non-impacted Courses | Restricted Drop (maximum 3) | Petition* | $35.00 | Yes |
| After week 10 | Retroactive Drop | Petition* | $50.00 | Yes |

*Petitions are available in Murphy Hall A-316

Students outside of the College of Letters & Sciences follow different deadlines: registrar.ucla.edu/fees-residence/course-and-study-list-fees/undergraduate-study-list-deadlines-and-fees

**14. How can I find a tutor?**

The Student Math Center in MS 3974 offers individual and group homework assistance for lower division math courses.

ww3.math.ucla.edu/student-math-center

The Academic Advancement Program (AAP) in Campbell Hall 1232 offers free tutoring for lower division math and sciences courses to students whose academic profiles and personal backgrounds may impact their university experience, their retention and graduation from UCLA.

aap.ucla.edu

Engineering and Mathematical Sciences Library (EMS) in Boelter Hall 8270 offers various academic resources to current UCLA students.

library.ucla.edu/sel

Private (fee based) tutoring is available from graduate students in the Mathematics Department. Refer to our website for a list of available tutors. For rates, please contact the tutors directly.

ww3.math.ucla.edu/tutoring

More tutoring resources can be viewed on UCLA's website:

caac.ucla.edu/wp-content/uploads/2021/03/Tutoring-Resources-Handout-2020_10-27.pdf

**15. Can I take courses for my major at another institution?**

Yes. If you would like to complete some "Preparation for the Major" or "Major" courses during the summer at a community college, four-year university, or at another UC campus, you must verify course equivalences with an undergraduate math advisor prior to completing the course. **All pre-major and major courses MUST be taken for letter grades!** Also, check with your college counselor regarding residency requirements and other regulations for taking courses at another school.

Upon completion of the course(s), send an official transcript to UCLA Undergraduate Admission. You must also fill out a Transfer Credit Evaluation Request form in order to have the course evaluated and credited to your record.

admission.ucla.edu/apply/transferring-credits

**16. Will the grade for a course taken at another institution transfer to UCLA?**

While credit for courses taken at other schools may be used for satisfying pre-major and major requirements, the grades themselves are transferred to your UCLA transcript only if the course is taken at another UC campus or through Education Abroad Program (EAP). However, grades taken at UC Extension programs do not transfer, except for those earned in concurrent enrollment (XLC) classes at UCLA Extension.

**17. If I want to study abroad, how can I find out if the math courses I plan to take will count towards my major?**

Students should consult with the undergraduate math advisor only after they have met with EAP and know which math courses they are considering. Bring program information, course descriptions and outlines when you meet with the undergraduate math advisor.

ieo.ucla.edu/uceap

**18. What if one of my transferred courses is processed by UCLA Admission as title credit?**

If your transferred course appears as title credit (Math T##) with a math course number that does not match any class at UCLA, you can submit a Course Equivalency Petition to our email. Submit a detailed syllabus that has each week broken down by specific topics. We will evaluate your course for equivalency.

**19. Can I double major?**

The university requires students who want to double major to complete all preparation for the major courses of both majors and two upper division courses in each major before applying. Please consult with a math advisor about double majoring. Students pursuing the Data Theory major cannot double major with any math or stats major. Students pursuing the Mathematics/Economics major cannot double major with any math or econ major.

**20. Can I declare more than one math major?**

No. Additionally, students cannot declare both math major and math minor.

# FREQUENTLY ASKED QUESTIONS

**21. How do I add the Specialization in Computing?**

If you are in any math major (except Data Theory and Mathematics of Computation), you can submit a petition to our email upon the completion of PIC 10A and PIC 10B with a grade of "C-" or better.

**22. Who do I talk to about my statistics course major requirements for Data Theory?**

Students who are in the pre-major should consult with a math advisor. Once officially declared into the major, students will be advised by a stats advisor.

**23. What is the difference between a Mathematics/ Economics and an Economics or Business Economics major?**

Mathematics/Economics students receive a Bachelor of Science degree and are advised under the Mathematics Department. Over half of the required major courses for the Mathematics/Economics degree are in mathematics and about half are in economics. The program is designed to give students a solid foundation in both mathematics and economics, stressing those areas of mathematics that are most relevant to economics and the parts of economics that emphasize the use of advanced mathematics.

**24. Where and when can I petition to change or declare my major?**

Visit our Petitions page for directions on where to submit your petition and what form(s) you should include in the petition.

ww3.math.ucla.edu/petitions

Students can apply for any of the pre-majors as long as they are in good academic standing, will not go over their unit max, and can graduate on time.

Students can petition to be in a math major if they meet the following minimum requirements to enter the major:

- See Pages 8 - 29 for specific course and pre-GPA requirements for each major
- Have not exceeded 160.0 units (not including AP units)
- Complete one 12.0-unit term during a regular academic quarter at UCLA
- Are currently in good academic standing
- Are enrolled at UCLA during a regular academic session
- Have GPA of 2.0 or above in upper division courses taken for the major as well as cumulatively at UCLA

Please refer to the department's or registrar's website for more information on requirements.

ww3.math.ucla.edu/majors-minors-specializations

catalog.registrar.ucla.edu

ww3.math.ucla.edu/petitions

**25. How long will my petition(s) take to process?**

Once you submit your petition to us through email, it will take about 2-3 weeks.

**26. What other major or minor options are available if I decide to not be a math major?**

There is one interdepartmental program with the mathematics department that is run by another department:

- **Computational and Systems Biology**

  Life Sciences Division - casb.ucla.edu

There are two minors in the Mathematics Department:

- **Minor in Mathematics**
- **Minor in Mathematics for Teaching**

**27. Are classes online or in-person?**

A majority of UCLA courses are being offered in-person, while a select few courses are being offered online. Students should monitor UCLA's Schedule of Classes for the most up-to-date status of our courses. If a room is listed, then the lecture is being offered in-person.

sa.ucla.edu/ro/public/soc

**28. Are lectures going to be recorded?**

The department does not require instructors to record lectures. The decision to record lectures is up to each instructor. To find out more information, please contact the instructor and ask them directly.

**29. How can I talk to an advisor?**

Our Student Services Office offers both in-person and virtual advising with no appointments needed. Students are encouraged to visit us virtually. For more information on our hours and Zoom meeting information, please visit our math website:

ww3.math.ucla.edu/undergraduate-program

# CREDIT LIMITATIONS

**Credit is given for only one course in each of the following groups:**

- MATH 3A, 31A, 31AL
- MATH 3B, 31B
- MATH #, #H
- MATH 110A, 117
- Math 118, 164
- MATH 170A, 170E

You may not take a mathematics course for credit if you have credit for a more advanced course that lists the first course as a prerequisite. This applies in particular to the repetition of courses.

For example, if you wish to repeat MATH 31B, you must do so before completing MATH 32B. However, you are allowed to repeat MATH 31B after completing MATH 32A, since MATH 31B is not a prerequisite for MATH 32A.

You may not receive credit for both a course and for the honors version of the course (e.g., you may not receive credit for both MATH 131A and 131AH). MATH 110A, 110B and MATH 110AH, 110BH (Honors) are a special case. Please see an undergraduate advisor in the Mathematics Department if you find that you have stopped in the middle of one of the algebra sequences and want to finish with the other the following year.

## USING NON-MATH COURSES TO FULFILL MATH MAJOR REQUIREMENTS

Unless there are course credit restrictions stated, students are welcome to take the related courses offered by other departments. This includes, but is not limited to: Algorithms, Data Analysis/Mining, Financial Mathematics, Game Theory, Machine Learning, Networks, and Probability/Statistics.

Although the topics may be similar, the material in the course offered by the other department will be taught with different approaches and through the lens of that discipline. However, the Mathematics Department will limit students to applying only one unique topic to their major requirements.

For example, a student can take both MATH 167 and ECON 106G for credit, but only one game theory course can be used to complete the major requirement. Credit for non-math courses will not be automatically applied towards the mathematics major requirements. Students must petition with the Mathematics Department to receive credit by sending an email to ugrad@math.ucla.edu.

The Mathematics Department is not endorsing enrollment in non-math courses to fulfill major requirements. If you are interested in taking a course offered by a different department, you may be held to the enrollment restrictions enforced by the department that offers the course.

| You may not receive credit for: | If you have already taken: |
|---|---|
| MATH 32T: Essential Calculus for Mathematical Biologists | Any MATH 30's course |
| MATH 132: Complex Analysis for Applications | PHYSICS 132: Mathematical Methods of Physics |
| MATH 151A: Applied Numerical Methods | EC ENGR 133A: Applied Numerical Computing |
| MATH 156: Machine Learning | EC ENGR M146: Introduction to Machine Learning |
| MATH 167: Mathematical Game Theory | ECON 106G: Introduction to Game Theory |
| MATH 170A: Probability Theory<br>or MATH 170E: Introduction to Probability and Statistics 1: Probability | STATS 100A: Introduction to Probability Theory<br>or EC ENGR 131A: Probability and Statistics |
| MATH 170S: Introduction to Probability and Statistics 2: Statistics | STATS 100B: Introduction to Mathematical Statistics |
| MATH 174E: Mathematics of Finance | ECON 141: Topics in Microeconomics: Mathematical Finance<br>or STATS C183/C283: Statistical Models in Finance |
| MATH 180: Graph Theory | EC ENGR 134: Graph Theory in Engineering |
| MATH 182: Algorithms | COM SCI 180: Introduction to Algorithms and Complexity |
| PIC 10A: Introduction to Programming | COM SCI 31: Introduction to Computer Science I |

UCLA College | Physical Sciences Mathematics

# MAJORS IN MATHEMATICS

## MATHEMATICS
Pure Mathematics

Designed for students who are interested in the theory of mathematics. Pure mathematicians often pursue a master and doctorate degree in mathematics in order to prepare for a career in research or university level teaching.

## APPLIED MATHEMATICS

Designed for students who are interested in the classical relationships between the physical sciences and engineering. They often seek employment in the industry utilizing their skills to solve engineering and computer related problems.

## DATA THEORY

Trains students, through theory and practice, in the mathematical, statistical, and computational principles of data science. Top graduates will be prepared for graduate studies in a field related to data science or an initial technical position in the field with leadership potential. In collaboration with Statistics, it is a capstone major with a data-based project in the senior year.

## FINANCIAL ACTUARIAL MATHEMATICS

Designed for students interested in financial mathematics and its applications. Graduates typically go on to MFE/MBA programs, the actuarial field, banking and/or business.

## MATHEMATICS OF COMPUTATION

Designed for individuals who are interested in the mathematical theory and the applications of computing. These students often seek employment in areas similar to the applied mathematicians.

## MATHEMATICS FOR TEACHING

Designed for students who have a substantial interest in teaching mathematics at the secondary level. Visit the Curtis Center website for more information about other undergraduate teacher preparation programs such as the Joint Mathematics Education Program and the Subject Matter Preparation Program — curtiscenter.math.ucla.edu.

## MATHEMATICS/APPLIED SCIENCE
3 Available Plans

**History of Science** — For students intending to go to professional school, law or business, while pursuing their interest in mathematics.

**Medical and Life Sciences** — Prepares students for a career in the medical field while pursuing their interest in mathematics. Several courses overlap with the pre-med requirements.

**Individual** — Allows students to combine upper division math with upper division courses from other science areas (i.e., physics, chemistry, physiology, etc.). This major requires departmental approval and is rarely granted because the Department already offers a wide range of majors.

## MATHEMATICS/ ECONOMICS

Designed to give students a solid foundation in both mathematics and economics, stressing those areas of mathematics and statistics that are most relevant to economics and the parts of economics that emphasize the use of mathematics and statistics. It is ideal for students who may wish to complete a higher degree in economics.

# MINORS AND SPECIALIZATIONS

## MINOR IN MATHEMATICS

Designed to provide students who are non-math major the opportunity to widen their background and general comprehension of the role of mathematics in various disciplines.

## MINOR IN MATHEMATICS FOR TEACHING

Designed for students majoring in fields other than mathematics who plan to teach secondary mathematics after graduation.

## SPECIALIZATION IN COMPUTING

A specialization requires a sequence of supplemental courses that enhance work in a specific major. Different from a minor, it provides extensive education in programming and its applications in the field of mathematics. The Department of Mathematics offers a Specialization in Computing, which can be added to all of the math majors with the exception of Data Theory and Mathematics of Computation.

# INTERDEPARTMENTAL MAJORS

## COMPUTATIONAL AND SYSTEMS BIOLOGY

Visit the Computational and Systems Biology (CaSB) office or website for more information — Hershey Hall 102 • casb.ucla.edu

# MATHEMATICS B.S.

## PRE-MAJOR: 10 COURSES

**Students can declare the pre-major at any time while in good academic standing.**

| | Quarter | Grade |
|---|---|---|
| MATH 31A* | | |
| MATH 31B* | | |
| MATH 32A* | | |
| MATH 32B* | | |
| MATH 33A* | | |
| MATH 33B* | | |
| PIC 10A | | |
| PHYSICS 1A | | |

**Two** courses from the following:

| | Quarter | Grade |
|---|---|---|
| ECON 11 | | |
| CHEM 20A | | |
| CHEM 20B | | |
| LIFESCI 7A | | |
| PHYSICS 1B **or** 5B | | |
| PHYSICS 1C **or** 5C | | |
| PHILOS 31 | | |
| PHILOS 132 | | |

*The mathematics sequenced courses are calculated separately from the other preparation for the major courses and must be completed with a minimum overall 2.5 grade-point average and a grade of "C" or better in each course. Repetition of more than two mathematics sequenced courses, or of any mathematics sequenced course more than once, results in automatic dismissal from the major.

## THE MAJOR: 12 COURSES

**Students must declare the major before reaching 160 units (not including AP units).**

| | Quarter | Grade |
|---|---|---|
| MATH 115A[+†] | | |
| MATH 131A[+] | | |
| MATH 110A | | |
| MATH 110B | | |
| MATH 120A | | |
| MATH 131B | | |
| MATH 132 | | |

**Five** upper division mathematics courses chosen from: MATH 106–199, STATS 100A–102C

| | | Quarter | Grade |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |

[+]Students must pass this course with a "C-" or better. It is strongly recommended that students take MATH 115A as one of their first upper division courses before MATH 131A.

All required courses for the major must be at least 4.0 units and taken for a letter grade, unless the class is a supplement to a larger course (e.g. a required lab).

catalog.registrar.ucla.edu

# MATHEMATICS B.S.

## PRE-MAJOR: 11 COURSES

**Students can declare the pre-major at any time while in good academic standing.**

| | Quarter | Grade |
|---|---|---|
| MATH 31A* | | |
| MATH 31B* | | |
| MATH 32A* | | |
| MATH 32B* | | |
| MATH 33A* | | |
| MATH 33B* | | |
| MATH 11 **or** 61* | | |
| PIC 10A | | |
| PHYSICS 1A | | |

**Two** courses from the following:

| | Quarter | Grade |
|---|---|---|
| ECON 11 | | |
| CHEM 20A | | |
| CHEM 20B | | |
| LIFESCI 7A | | |
| PHYSICS 1B **or** 5B | | |
| PHYSICS 1C **or** 5C | | |
| PHILOS 31 | | |
| PHILOS 132 | | |

*The mathematics sequenced courses are calculated separately from the other preparation for the major courses and must be completed with a minimum overall 2.5 grade-point average and a grade of "C" or better in each course. Repetition of more than two mathematics sequenced courses, or of any mathematics sequenced course more than once, results in automatic dismissal from the major.

## THE MAJOR: 12 COURSES

**Students must declare the major before reaching 160 units (not including AP units).**

| | Quarter | Grade |
|---|---|---|
| MATH 115A+ | | |
| MATH 131A+ | | |
| MATH 110A | | |
| MATH 110B | | |
| MATH 120A | | |
| MATH 131B | | |
| MATH 132 | | |

**Five** upper division mathematics courses chosen from: MATH 106–199, STATS 100A–102C

| | Quarter | Grade |
|---|---|---|
| 1. | | |
| 2. | | |
| 3. | | |
| 4. | | |
| 5. | | |

+Students must pass this course with a "C-" or better. It is strongly recommended that students take MATH 115A as one of their first upper division courses before MATH 131A.

All required courses for the major must be at least 4.0 units and taken for a letter grade, unless the class is a supplement to a larger course (e.g. a required lab).

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COMING SOON

# APPLIED MATHEMATICS B.S.

## PRE-MAJOR: 10 COURSES

**Students can declare the pre-major at any time while in good academic standing.**

| | Quarter | Grade |
|---|---|---|
| MATH 31A* | | |
| MATH 31B* | | |
| MATH 32A* | | |
| MATH 32B* | | |
| MATH 33A* | | |
| MATH 33B* | | |
| PIC 10A | | |
| PHYSICS 1A | | |
| PHYSICS 1B | | |

**One** course from the following:

| | Quarter | Grade |
|---|---|---|
| CHEM 20A | | |
| CHEM 20B | | |
| PHYSICS 1C | | |

*The mathematics sequenced courses are calculated separately from the other preparation for the major courses and must be completed with a minimum overall 2.5 grade-point average and a grade of "C" or better in each course. Repetition of more than two mathematics sequenced courses, or of any mathematics sequenced course more than once, results in automatic dismissal from the major.

## THE MAJOR: 12 COURSES

**Students must declare the major before reaching 160 units (not including AP units).**

| | Quarter | Grade |
|---|---|---|
| MATH 115A+ | | |
| MATH 131A+ | | |
| MATH 131B **or** MATH 132 | | |
| MATH 142 | | |

**Four** upper division mathematics courses chosen from: MATH 106–199, STATS 100A–102C

| | | | |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |

**Two** 2-quarter sequences chosen from three different categories:

| | Quarter | Grade |
|---|---|---|
| **A. Differential Equations** | | |
| MATH 134 | | |
| MATH 135 | | |
| **B. Applied Numerical Methods** | | |
| MATH 151A | | |
| MATH 151B | | |
| **C. Probability and Statistics** | | |
| MATH 170E | | |
| MATH 170S | | |
| **or** | | |
| STATS 100A | | |
| STATS 100B | | |
| **or** | | |
| MATH 170A | | |
| MATH 170B | | |

+Students must pass this course with a "C-" or better. It is strongly recommended that students take MATH 115A as one of their first upper division courses before MATH 131A.

All required courses for the major must be at least 4.0 units and taken for a letter grade, unless the class is a supplement to a larger course (e.g. a required lab).

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# APPLIED MATHEMATICS B.S.

## PRE-MAJOR: 11 COURSES

**Students can declare the pre-major at any time while in good academic standing.**

| | Quarter | Grade |
|---|---|---|
| MATH 31A* | | |
| MATH 31B* | | |
| MATH 32A* | | |
| MATH 32B* | | |
| MATH 33A* | | |
| MATH 33B* | | |
| MATH 11 **or** 61* | | |
| PIC 10A | | |
| PHYSICS 1A | | |
| PHYSICS 1B | | |

**One** course from the following:

| | Quarter | Grade |
|---|---|---|
| CHEM 20A | | |
| CHEM 20B | | |
| PHYSICS 1C | | |

*The mathematics sequenced courses are calculated separately from the other preparation for the major courses and must be completed with a minimum overall 2.5 grade-point-average and a grade of "C" or better in each course. Repetition of more than two mathematics sequenced courses, or of any mathematics sequenced course more than once, results in automatic dismissal from the major.

## THE MAJOR: 12 COURSES

**Students must declare the major before reaching 160 units (not including AP units).**

| | Quarter | Grade |
|---|---|---|
| MATH 115A+ | | |
| MATH 131A+ | | |
| MATH 131B **or** MATH 132 | | |
| MATH 142 | | |

**Four** upper division mathematics courses chosen from: MATH 106–199, STATS 100A–102C

| | | | |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |

**Two** 2-quarter sequences chosen from three different categories:

| | Quarter | Grade |
|---|---|---|
| **A. Differential Equations** | | |
| MATH 134 | | |
| MATH 135 | | |
| **B. Applied Numerical Methods** | | |
| MATH 151A | | |
| MATH 151B | | |
| **C. Probability and Statistics** | | |
| MATH 170E | | |
| MATH 170S | | |
| **or** | | |
| STATS 100A | | |
| STATS 100B | | |
| **or** | | |
| MATH 170A | | |
| MATH 170B | | |

+Students must pass this course with a "C-" or better. It is strongly recommended that students take MATH 115A as one of their first upper division courses before MATH 131A.

All required courses for the major must be at least 4.0 units and taken for a letter grade, unless the class is a supplement to a larger course (e.g. a required lab).

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COMING SOON

# DATA THEORY B.S.

## PRE-MAJOR: 11 COURSES

**Students can declare the pre-major at any time while in good academic standing.**

| | Quarter | Grade |
|---|---|---|
| MATH 31A* | | |
| MATH 31B* | | |
| MATH 32A* | | |
| MATH 32B* | | |
| MATH 33A* | | |
| MATH 42* | | |
| MATH 115A* | | |

| | Quarter | Grade |
|---|---|---|
| **One** course from the following*: STATS 10-15 | | |
| 1. | | |
| STATS 20* | | |
| STATS 21* | | |
| PIC 10A* | | |

*All preparation courses must be completed with a minimum overall **3.3** grade-point average and a grade of "C" or better in each course. Admitted freshmen must complete pre-major courses by the **end of fall quarter of their third year (7th quarter at UCLA)**. Admitted transfers must complete pre-major courses by the **end of spring quarter (third quarter at UCLA)**. Repetition of more than two courses, or of any course more than once, results in automatic dismissal from the major.

## THE MAJOR: 16 COURSES

**Students must declare the major before reaching 160 units (not including AP units).**
***Other restrictions apply, please see the General Catalog for more information.***

| | Quarter | Grade |
|---|---|---|
| MATH 131A+ | | |
| MATH 118 | | |
| MATH 156 | | |

| | Quarter | Grade |
|---|---|---|
| STATS 101A | | |
| STATS 101C | | |
| STATS 102A | | |
| STATS 102B | | |
| STATS 147 | | |
| STATS 184 | | |

**One** 2-quarter sequence of Probability and Statistics

**A. Intro to Probability and Statistics**

| | | |
|---|---|---|
| MATH 170E | | |
| MATH 170S | | |

**or**

**B. Intro to Probability and Mathematical Statistics**

| | | |
|---|---|---|
| STATS 100A | | |
| STATS 100B | | |

**One** statistics elective from STATS 100C, 101B, 102C, C151-199:

1. _____ _____ _____

**One** mathematics elective from: MATH 151A, 151B, 164, 168, 171, 174E, 178A, 178B, 178C, 179, 182:

1. _____ _____ _____

**Two** additional electives from the mathematics and/or statistics electives listed before:

1. _____ _____ _____
2. _____ _____ _____

**One** capstone course: MATH M148 **or** STATS M148 (to be taken in the final year):

1. _____ _____ _____

Students must pass this course with a "C-" or better. It is strongly recommended that students take MATH 115A as one of their first upper division courses before MATH 131A.

All required courses for the major must be at least 4.0 units and taken for a letter grade, unless the class is a supplement to a larger course (e.g. a required lab).

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# FINANCIAL ACTUARIAL MATHEMATICS B.S.

## PRE-MAJOR: 13 COURSES

**Students can declare the pre-major at any time while in good academic standing.**

| | Quarter | Grade | | Quarter | Grade |
|---|---|---|---|---|---|
| MATH 31A* | | | ECON 1** | | |
| MATH 31B* | | | ECON 2** | | |
| MATH 32A* | | | ECON 11** | | |
| MATH 32B* | | | MGMT 1A** | | |
| MATH 33A* | | | | | |
| MATH 33B* | | | | | |
| PIC 10A* | | | | | |
| PIC 10B **or** PIC 16A* | | | | | |

**One** course from the following*: MATH 11N, 42, 61, or 70

1. _____ _____ _____

*Mathematics sequenced courses, ** Economics preparation courses: Each are calculated separately and must be completed with a minimum overall 2.5 grade-point average and a grade of "C" or better in each course. Repetition of more than two mathematics sequenced courses, or of any mathematics sequenced course more than once, results in automatic dismissal from the major. Repetition of more than one economics preparation course, or of any economics preparation course more than once, results in automatic dismissal from the major.

## THE MAJOR: 12 COURSES

**Students must declare the major before reaching 160 units (not including AP units).**

| | Quarter | Grade | | Quarter | Grade |
|---|---|---|---|---|---|
| MATH 115A+ | | | MATH 178A | | |
| MATH 131A+ | | | MATH 178B | | |
| MATH 177 | | | MATH 178C | | |
| MATH 174E | | | MATH 179 | | |

(ECON 141 **or** STATS C183/C283 is also accepted)

| | | |
|---|---|---|
| MATH 170E | | |
| MATH 170S | | |

**Two** upper division economics, mathematics, or statistics courses:
MATH 106-199, ECON 101–199, STATS 100C

1. _____ _____ _____
2. _____ _____ _____

+Students must pass this course with a "C-" or better. It is strongly recommended that students take MATH 115A as one of their first upper division courses before MATH 131A.

All required courses for the major must be at least 4.0 units and taken for a letter grade, unless the class is a supplement to a larger course (e.g. a required lab).

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# MATHEMATICS OF COMPUTATION B.S.

## PRE-MAJOR: 13 COURSES

**Students can declare the pre-major at any time while in good academic standing.**

| | Quarter | Grade |
|---|---|---|
| MATH 31A* | | |
| MATH 31B* | | |
| MATH 32A* | | |
| MATH 32B* | | |
| MATH 33A* | | |
| MATH 33B* | | |
| MATH 61 | | |
| PHYSICS 1A | | |
| PHYSICS 1B | | |
| PIC 10A | | |
| PIC 10B | | |
| PIC 10C | | |

**One** course from the following:

| | Quarter | Grade |
|---|---|---|
| CHEM 20A | | |
| CHEM 20B | | |
| PHYSICS 1C | | |

*The mathematics sequenced courses are calculated separately from the other preparation for the major courses and must be completed with a minimum overall 2.5 grade-point average and a grade of "C" or better in each course. Repetition of more than two mathematics sequenced courses, or of any mathematics sequenced course more than once, results in automatic dismissal from the major.

Acceptable substitutions for pre-major requirements:
CS 31 for PIC 10A, CS 32 for PIC 10B, CS 33 or 35L for PIC 10C

Completing PIC 10ABC will meet the requisite for some CS courses that require CS 32. Additional classes might have to be taken to meet other requisites. Please note: a majority of CS upper division courses may require CS 33 & 35L. For more information and help with enrollment in CS courses, contact Engineering.

## THE MAJOR: 14 COURSES

**Students must declare the major before reaching 160 units (not including AP units).**

| | Quarter | Grade |
|---|---|---|
| MATH 115A+ | | |
| MATH 131A+ | | |
| MATH 131B **or** MATH 132 | | |
| MATH 151A | | |
| MATH 151B | | |

**Six** upper division mathematics courses chosen from:
MATH 106–199, STATS 100A–102C

| | Quarter | Grade |
|---|---|---|
| 1. | | |
| 2. | | |
| 3. | | |
| 4. | | |
| 5. | | |
| 6. | | |

**Three** upper division computer science courses:

| | | |
|---|---|---|
| 1. | | |
| 2. | | |
| 3. | | |

+Students must pass this course with a "C-" or better. It is strongly recommended that students take MATH 115A as one of their first upper division courses before MATH 131A.

All required courses for the major must be at least 4.0 units and taken for a letter grade, unless the class is a supplement to a larger course (e.g. a required lab).

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# MATHEMATICS OF COMPUTATION B.S.

## PRE-MAJOR: 13 COURSES

**Students can declare the pre-major at any time while in good academic standing.**

| | Quarter | Grade |
|---|---|---|
| MATH 31A* | | |
| MATH 31B* | | |
| MATH 32A* | | |
| MATH 32B* | | |
| MATH 33A* | | |
| MATH 33B* | | |
| MATH 61* | | |
| PHYSICS 1A | | |
| PHYSICS 1B | | |
| PIC 10A | | |
| PIC 10B | | |
| PIC 10C | | |

**One** course from the following:

| | Quarter | Grade |
|---|---|---|
| CHEM 20A | | |
| CHEM 20B | | |
| PHYSICS 1C | | |

*The mathematics sequenced courses are calculated separately from the other preparation for the major courses and must be completed with a minimum overall 2.5 grade-point average and a grade of "C" or better in each course. Repetition of more than two mathematics sequenced courses, or of any mathematics sequenced course more than once, results in automatic dismissal from the major.

Acceptable substitutions for pre-major requirements:
CS 31 for PIC 10A, CS 32 for PIC 10B, CS 33 or 35L for PIC 10C

Completing PIC 10ABC will meet the requisite for some CS courses that require CS 32. Additional classes might have to be taken to meet other requisites. Please note: a majority of CS upper division courses may require CS 33 & 35L. For more information and help with enrollment in CS courses, contact Engineering.

COMING SOON

## THE MAJOR: 14 COURSES

**Students must declare the major before reaching 160 units (not including AP units).**

| | Quarter | Grade |
|---|---|---|
| MATH 115A+ | | |
| MATH 131A+ | | |
| MATH 131B **or** MATH 132 | | |
| MATH 151A | | |
| MATH 151B | | |

**Six** upper division mathematics courses chosen from:
MATH 106–199, STATS 100A–102C

| | Quarter | Grade |
|---|---|---|
| 1. | | |
| 2. | | |
| 3. | | |
| 4. | | |
| 5. | | |
| 6. | | |

**Three** upper division computer science courses:

| | Quarter | Grade |
|---|---|---|
| 1. | | |
| 2. | | |
| 3. | | |

+Students must pass this course with a "C-" or better. It is strongly recommended that students take MATH 115A as one of their first upper division courses before MATH 131A.

All required courses for the major must be at least 4.0 units and taken for a letter grade, unless the class is a supplement to a larger course (e.g. a required lab).

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# MATHEMATICS/APPLIED SCIENCE B.S.
# HISTORY OF SCIENCE PLAN

## PRE-MAJOR: 10 COURSES

**Students can declare the pre-major at any time while in good academic standing.**

| | Quarter | Grade |
|---|---|---|
| MATH 31A* | | |
| MATH 31B* | | |
| MATH 32A* | | |
| MATH 32B* | | |
| MATH 33A* | | |
| MATH 33B* | | |
| PIC 10A | | |

**Three** courses from the following:

| | Quarter | Grade |
|---|---|---|
| HISTORY 2B | | |
| HISTORY 2C | | |
| HISTORY 3A | | |
| HISTORY 3B | | |
| HISTORY 3C | | |
| HISTORY 3D | | |

*The mathematics sequenced courses are calculated separately from the other preparation for the major courses and must be completed with a minimum overall 2.5 grade-point average and a grade of "C" or better in each course. Repetition of more than two mathematics sequenced courses, or of any mathematics sequenced course more than once, results in automatic dismissal from the major.

## THE MAJOR: 14 COURSES

**Students must declare the major before reaching 160 units (not including AP units).**

| | Quarter | Grade |
|---|---|---|
| 1. MATH 115A+ | | |
| 2. MATH 131A+ | | |
| 3. MATH 106 | | |
| 4. MATH 134 | | |
| 5. MATH 170E | | |

**Three** upper division mathematics courses chosen from: MATH 110A–199

| | Quarter | Grade |
|---|---|---|
| 1. | | |
| 2. | | |
| 3. | | |

**Six** upper division courses from history, philosophy, or physical science, including five courses from the following[1]:

| | Quarter | Grade |
|---|---|---|
| 1. HISTORY 179A | | |
| 2. HISTORY 179B | | |
| 3. HISTORY 180A | | |
| 4. HISTORY M180B | | |
| 5. HISTORY 180C | | |
| 6. PHILOS 124 | | |
| 7. NEURBIO M169 | | |

**One** Honors Collegium course with "history of science or medicine" content[1]:

| | Quarter | Grade |
|---|---|---|
| 1. | | |

+Students must pass this course with a "C-" or better. It is strongly recommended that students take MATH 115A as one of their first upper division courses before MATH 131A.

[1]Students can petition with the Mathematics Department for other courses not on this list to fulfill the major requirements.

All required courses for the major must be at least 4.0 units and taken for a letter grade, unless the class is a supplement to a larger course (e.g. a required lab).

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# MATHEMATICS/APPLIED SCIENCE B.S.
# HISTORY OF SCIENCE PLAN

## PRE-MAJOR: 11 COURSES

**Students can declare the pre-major at any time while in good academic standing.**

| | Quarter | Grade |
|---|---|---|
| MATH 31A* | | |
| MATH 31B* | | |
| MATH 32A* | | |
| MATH 32B* | | |
| MATH 33A* | | |
| MATH 33B* | | |
| MATH 11 **or** 61* | | |
| PIC 10A | | |

**Three** courses from the following:

| | Quarter | Grade |
|---|---|---|
| HISTORY 2B | | |
| HISTORY 2C | | |
| HISTORY 3A | | |
| HISTORY 3B | | |
| HISTORY 3C | | |
| HISTORY 3D | | |

*The mathematics sequenced courses are calculated separately from the other preparation for the major courses and must be completed with a minimum overall 2.5 grade-point average and a grade of "C" or better in each course. Repetition of more than two mathematics sequenced courses, or of any mathematics sequenced course more than once, results in automatic dismissal from the major.

## THE MAJOR: 14 COURSES

**Students must declare the major before reaching 160 units (not including AP units).**

| | Quarter | Grade |
|---|---|---|
| 1. MATH 115A+ | | |
| 2. MATH 131A+ | | |
| 3. MATH 106 | | |
| 4. MATH 134 | | |
| 5. MATH 170E | | |

**Three** upper division mathematics courses chosen from: MATH 110A–199

| | Quarter | Grade |
|---|---|---|
| 1. | | |
| 2. | | |
| 3. | | |

**Six** upper division courses from history, philosophy, or physical science, including five courses from the following[1]:

| | Quarter | Grade |
|---|---|---|
| 1. HISTORY 179A | | |
| 2. HISTORY 179B | | |
| 3. HISTORY 180A | | |
| 4. HISTORY M180B | | |
| 5. HISTORY 180C | | |
| 6. PHILOS 124 | | |
| 7. NEURBIO M169 | | |

**One** Honors Collegium course with "history of science or medicine" content[1]:

| | Quarter | Grade |
|---|---|---|
| 1. | | |

+Students must pass this course with a "C-" or better. It is strongly recommended that students take MATH 115A as one of their first upper division courses before MATH 131A.

[1]Students can petition with the Mathematics Department for other courses not on this list to fulfill the major requirements.

All required courses for the major must be at least 4.0 units and taken for a letter grade, unless the class is a supplement to a larger course (e.g. a required lab).

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# MATHEMATICS/APPLIED SCIENCE B.S.
# MEDICAL AND LIFE SCIENCE PLAN

## PRE-MAJOR: 18 COURSES

**Students can declare the pre-major at any time while in good academic standing.**

| | Quarter | Grade | | Quarter | Grade |
|---|---|---|---|---|---|
| MATH 31A* | | | CHEM 20A | | |
| MATH 31B* | | | CHEM 20B | | |
| MATH 32A* | | | CHEM 20L | | |
| MATH 32B* | | | CHEM 30A | | |
| MATH 33A* | | | CHEM 30AL | | |
| MATH 33B* | | | LIFESCI 7A | | |
| PIC 10A | | | LIFESCI 7B | | |
| PHYSICS 1A | | | LIFESCI 7C | | |
| PHYSICS 1B | | | LIFESCI 23L | | |

*The mathematics sequenced courses are calculated separately from the other preparation for the major courses and must be completed with a minimum overall 2.5 grade-point average and a grade of "C" or better in each course. Repetition of more than two mathematics sequenced courses, or of any mathematics sequenced course more than once, results in automatic dismissal from the major.

## THE MAJOR: 13 COURSES

**Students must declare the major before reaching 160 units (not including AP units).**

| | Quarter | Grade |
|---|---|---|
| MATH 115A+ | | |
| MATH 131A+ | | |
| MATH 134 | | |
| MATH 151A | | |
| MATH 170E **or** MATH 170A | | |
| MATH 170S **or** MATH 170B | | |

**One** upper division mathematics course chosen from: MATH 110A–199, STATS 100B–101C

1. _____ _____ _____

+Students must pass this course with a "C-" or better. It is strongly recommended that students take MATH 115A as one of their first upper division courses before MATH 131A.

[1]Students should work closely with math advisors to make plans for non-math courses that have enrollment restrictions at least **one quarter in advance**. Students can also petition with the Mathematics Department for other courses not on this list to fulfill major requirements.

All required courses for the major must be at least 4.0 units and taken for a letter grade, unless the class is a supplement to a larger course (e.g. a required lab).

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**Three** upper division outside science courses[1]:

| | Quarter | Grade |
|---|---|---|
| PHYSCI M180A | | |
| PHYSCI M180B | | |
| PHYSCI M180C | | |

Same as MCDB M175A-M175B-M175C, NEURSCI M101A-M101B-M101C, and PSYCH M117A-M117B-M117C

**Three** upper division courses from the following[1]:

| | | |
|---|---|---|
| BIOMATH 160 | | |
| BIOSTAT 100A | | |
| CHEM CM160A | | |
| COM SCI CM186 | | |
| EEB C119A | | |
| EEB 133 | | |
| EEB C135 | | |
| LIFESCI 107 | | |
| PHYSCI 100 | | |
| PHYSCI 135 | | |

# MATHEMATICS/APPLIED SCIENCE B.S.
# MEDICAL AND LIFE SCIENCE PLAN

## PRE-MAJOR: 19 COURSES

**Students can declare the pre-major at any time while in good academic standing.**

| | Quarter | Grade |
|---|---|---|
| MATH 31A* | | |
| MATH 31B* | | |
| MATH 32A* | | |
| MATH 32B* | | |
| MATH 33A* | | |
| MATH 33B* | | |
| MATH 11 **or** 61* | | |
| PIC 10A | | |
| PHYSICS 1A | | |
| PHYSICS 1B | | |

| | Quarter | Grade |
|---|---|---|
| CHEM 20A | | |
| CHEM 20B | | |
| CHEM 20L | | |
| CHEM 30A | | |
| CHEM 30AL | | |
| LIFESCI 7A | | |
| LIFESCI 7B | | |
| LIFESCI 7C | | |
| LIFESCI 23L | | |

*The mathematics sequenced courses are calculated separately from the other preparation for the major courses and must be completed with a minimum overall 2.5 grade-point average and a grade of "C" or better in each course. Repetition of more than two mathematics sequenced courses, or of any mathematics sequenced course more than once, results in automatic dismissal from the major.

## THE MAJOR: 13 COURSES

**Students must declare the major before reaching 160 units (not including AP units).**

| | Quarter | Grade |
|---|---|---|
| MATH 115A+ | | |
| MATH 131A+ | | |
| MATH 134 | | |
| MATH 151A | | |
| MATH 170E **or** MATH 170A | | |
| MATH 170S **or** MATH 170B | | |

**One** upper division mathematics course chosen from: MATH 110A–199, STATS 100B–101C

| | Quarter | Grade |
|---|---|---|
| 1. | | |

**Three** upper division outside science courses[1]:

| | Quarter | Grade |
|---|---|---|
| PHYSCI M180A | | |
| PHYSCI M180B | | |
| PHYSCI M180C | | |

Same as MCDB M175A-M175B-M175C, NEURSCI M101A-M101B-M101C, and PSYCH M117A-M117B-M117C

**Three** upper division courses from the following[1]:

| | | |
|---|---|---|
| BIOMATH 160 | | |
| BIOSTAT 100A | | |
| CHEM CM160A | | |
| COM SCI CM186 | | |
| EEB C119A | | |
| EEB 133 | | |
| EEB C135 | | |
| LIFESCI 107 | | |
| PHYSCI 100 | | |
| PHYSCI 135 | | |

+Students must pass this course with a "C-" or better. It is strongly recommended that students take MATH 115A as one of their first upper division courses before MATH 131A.

[1]Students should work closely with math advisors to make plans for non-math courses that have enrollment restrictions at least **one quarter in advance**. Students can also petition with the Mathematics Department for other courses not on this list to fulfill major requirements.

All required courses for the major must be at least 4.0 units and taken for a letter grade, unless the class is a supplement to a larger course (e.g. a required lab).

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COMING SOON

# MATHEMATICS/APPLIED SCIENCE B.S.
# INDIVIDUAL PLAN

## PRE-MAJOR: 7 COURSES

**Students can declare the pre-major at any time while in good academic standing.**

| | Quarter | Grade |
|---|---|---|
| MATH 31A* | | |
| MATH 31B* | | |
| MATH 32A* | | |
| MATH 32B* | | |
| MATH 33A* | | |
| MATH 33B* | | |
| PIC 10A | | |

*The mathematics sequenced courses are calculated separately from the other preparation for the major courses and must be completed with a minimum overall 2.5 grade-point average and a grade of "C" or better in each course. Repetition of more than two mathematics sequenced courses, or of any mathematics sequenced course more than once, results in automatic dismissal from the major.

## THE MAJOR: 14 COURSES

**Students must declare the major before reaching 160 units (not including AP units).**

**Seven** upper division mathematics courses chosen from: MATH 106–199:

| | | Quarter | Grade |
|---|---|---|---|
| 1. | MATH 115A+ | | |
| 2. | MATH 131A+ | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |

**One** 2-quarter mathematics sequence:

| | | | |
|---|---|---|---|
| 6. | | | |
| 7. | | | |

**Seven** upper division courses chosen from 1-2 related fields:

| | | Quarter | Grade |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |

+Students must pass this course with a "C-" or better. It is strongly recommended that students take MATH 115A as one of their first upper division courses before MATH 131A.

All required courses for the major must be at least 4.0 units and taken for a letter grade, unless the class is a supplement to a larger course (e.g. a required lab).

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I understand that if I wish to make any changes to my Individual plan, I must first obtain written approval from the Student Services Office in MS 6356.

Student's Signature _____ Date _____

Undergraduate Vice-Chair's Signature _____ Date _____

# MATHEMATICS/APPLIED SCIENCE B.S.
# INDIVIDUAL PLAN

## PRE-MAJOR: 8 COURSES

**Students can declare the pre-major at any time while in good academic standing.**

| | Quarter | Grade |
|---|---|---|
| MATH 31A* | | |
| MATH 31B* | | |
| MATH 32A* | | |
| MATH 32B* | | |
| MATH 33A* | | |
| MATH 33B* | | |
| MATH 11 **or** 61* | | |
| PIC 10A* | | |

*The mathematics sequenced courses are calculated separately from the other preparation for the major courses and must be completed with a minimum overall 2.5 grade-point average and a grade of "C" or better in each course. Repetition of more than two mathematics sequenced courses, or of any mathematics sequenced course more than once, results in automatic dismissal from the major.

## THE MAJOR: 14 COURSES

**Students must declare the major before reaching 160 units (not including AP units).**

**Seven** upper division mathematics courses chosen from: MATH 106–199:

| | | Quarter | Grade |
|---|---|---|---|
| 1. | MATH 115A+ | | |
| 2. | MATH 131A+ | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |

**One** 2-quarter mathematics sequence:

| | | | |
|---|---|---|---|
| 6. | | | |
| 7. | | | |

**Seven** upper division courses chosen from 1-2 related fields:

| | | Quarter | Grade |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |

COMING SOON

+Students must pass this course with a "C-" or better. It is strongly recommended that students take MATH 115A as one of their first upper division courses before MATH 131A.

All required courses for the major must be at least 4.0 units and taken for a letter grade, unless the class is a supplement to a larger course (e.g. a required lab).

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I understand that if I wish to make any changes to my Individual plan, I must first obtain written approval from the Student Services Office in MS 6356.

Student's Signature _____ Date _____

Undergraduate Vice-Chair's Signature _____ Date _____

# MATHEMATICS FOR TEACHING B.S.

## PRE-MAJOR: 11 COURSES

**Students can declare the pre-major at any time while in good academic standing.**

| | Quarter | Grade |
|---|---|---|
| MATH 31A* | | |
| MATH 31B* | | |
| MATH 32A* | | |
| MATH 32B* | | |
| MATH 33A* | | |
| MATH 33B* | | |
| MATH 61 | | |
| PHYSICS 1A **or** 5A | | |
| PIC 10A | | |

**Two** courses from the following:

| | Quarter | Grade |
|---|---|---|
| CHEM 20A | | |
| CHEM 20B | | |
| PHYSICS 1B **or** 5B | | |
| PHYSICS 1C **or** 5C | | |
| PIC 10B–97 | | |

*The mathematics sequenced courses are calculated separately from the other preparation for the major courses and must be completed with a minimum overall 2.5 grade-point average and a grade of "C" or better in each course. Repetition of more than two mathematics sequenced courses, or of any mathematics sequenced course more than once, results in automatic dismissal from the major.

## THE MAJOR: 13 COURSES

**Students must declare the major before reaching 160 units (not including AP units).**

| | Quarter | Grade |
|---|---|---|
| MATH 115A+ | | |
| MATH 131A+ | | |
| MATH 105A | | |
| MATH 105B | | |
| MATH 105C | | |
| MATH 106 | | |
| MATH 117 **or** MATH 110A | | |
| MATH 123 **or** MATH 120A | | |
| MATH 170E **or** STATS 100A **or** MATH 170A | | |
| MATH 170S **or** STATS 100B | | |

**Mathematics Analysis**
**One** course chosen from MATH 131B–136

| | Quarter | Grade |
|---|---|---|
| 1. | | |

**Applied Mathematics**
**One** course chosen from MATH 142–168

| | Quarter | Grade |
|---|---|---|
| 1. | | |

**Upper Division Mathematics**
**One** course chosen from MATH 110B–191 or STATS 100C

| | Quarter | Grade |
|---|---|---|
| 1. | | |

In order to receive a 100% CSET waiver from UCLA, students must have "C-" or better in the following courses and an upper division GPA of 2.0 or higher: MATH 117 or MATH 110A, MATH 123 or MATH 120A, MATH 131A, MATH 105A, MATH 105B, and MATH 105C.

curtiscenter.math.ucla.edu/students/undergraduates

+Students must pass this course with a "C-" or better. It is strongly recommended that students take MATH 115A as one of their first upper division courses before MATH 131A.

All required courses for the major must be at least 4.0 units and taken for a letter grade, unless the class is a supplement to a larger course (e.g. a required lab).

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# MATHEMATICS FOR TEACHING B.S.

## PRE-MAJOR: 11 COURSES

**Students can declare the pre-major at any time while in good academic standing.**

| | Quarter | Grade |
|---|---|---|
| MATH 31A* | | |
| MATH 31B* | | |
| MATH 32A* | | |
| MATH 32B* | | |
| MATH 33A* | | |
| MATH 33B* | | |
| MATH 61* | | |
| PHYSICS 1A **or** 5A | | |
| PIC 10A | | |

**Two** courses from the following:

| | Quarter | Grade |
|---|---|---|
| CHEM 20A | | |
| CHEM 20B | | |
| PHYSICS 1B **or** 5B | | |
| PHYSICS 1C **or** 5C | | |
| PIC 10B–97 | | |

*The mathematics sequenced courses are calculated separately from the other preparation for the major courses and must be completed with a minimum overall 2.5 grade-point average and a grade of "C" or better in each course. Repetition of more than two mathematics sequenced courses, or of any mathematics sequenced course more than once, results in automatic dismissal from the major.

## THE MAJOR: 13 COURSES

**Students must declare the major before reaching 160 units (not including AP units).**

| | Quarter | Grade |
|---|---|---|
| MATH 115A+ | | |
| MATH 131A+ | | |
| MATH 105A | | |
| MATH 105B | | |
| MATH 105C | | |
| MATH 106 | | |
| MATH 117 **or** MATH 110A | | |
| MATH 123 **or** MATH 120A | | |
| MATH 170E **or** STATS 100A **or** MATH 170A | | |
| MATH 170S or STATS 100B | | |

**Mathematics Analysis**
**One** course chosen from MATH 131B–136

| | Quarter | Grade |
|---|---|---|
| 1. | | |

**Applied Mathematics**
**One** course chosen from MATH 142–168

| | Quarter | Grade |
|---|---|---|
| 1. | | |

**Upper Division Mathematics**
**One** course chosen from MATH 110B–191 or STATS 100C

| | Quarter | Grade |
|---|---|---|
| 1. | | |

In order to receive a 100% CSET waiver from UCLA, students must have "C-" or better in the following courses and an upper division GPA of 2.0 or higher: MATH 117 or MATH 110A, MATH 123 or MATH 120A, MATH 131A, MATH 105A, MATH 105B, and MATH 105C.

curtiscenter.math.ucla.edu/students/undergraduates

+Students must pass this course with a "C-" or better. It is strongly recommended that students take MATH 115A as one of their first upper division courses before MATH 131A.

All required courses for the major must be at least 4.0 units and taken for a letter grade, unless the class is a supplement to a larger course (e.g. a required lab).

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COMING SOON

# MATHEMATICS/ECONOMICS B.S.

## PRE-MAJOR: 11 COURSES

**Students can declare the pre-major at any time while in good academic standing.**

| | Quarter | Grade |
|---|---|---|
| MATH 31A* | | |
| MATH 31B* | | |
| MATH 32A* | | |
| MATH 32B* | | |
| MATH 33A* | | |
| MATH 33B* | | |
| MATH 61* | | |
| PIC 10A* | | |

| | Quarter | Grade |
|---|---|---|
| ECON 1** | | |
| ECON 2** | | |
| ECON 11** | | |

*Mathematics sequenced courses, ** Economics preparation courses: Each are calculated separately and must be completed with a minimum overall **2.7** grade-point average and a grade of "C" or better in each course. Repetition of more than two mathematics sequenced courses, or of any mathematics sequenced course more than once, results in automatic dismissal from the major. Repetition of more than one economics preparation course, or of any economics preparation course more than once, results in automatic dismissal from the major.

## THE MAJOR: 14 COURSES

**Students must declare the major before reaching 160 units (not including AP units).**

| | Quarter | Grade |
|---|---|---|
| MATH 115A+ | | |
| MATH 131A+ | | |
| MATH 131B | | |
| MATH 164 | | |
| MATH 174E | | |

(MATH 179, ECON 141, or STATS C183/C283 is also accepted)

| | Quarter | Grade |
|---|---|---|
| ECON 101+ | | |
| ECON 102+ | | |
| ECON 103 | | |
| ECON 103L | | |

**Two** additional upper division economics courses chosen from: ECON 106–199

1. _____ _____ _____
2. _____ _____ _____

**One** 2-term probability sequence:

**A. Introduction to Probability and Statistics**

| | | |
|---|---|---|
| MATH 170E | | |
| MATH 170S | | |

**or**

**B. Probability Theory**

| | | |
|---|---|---|
| MATH 170A | | |
| MATH 170B | | |

**One** upper division mathematics course chosen from:
MATH 134, MATH 135, MATH 136, MATH 171

1. _____ _____ _____

+Students must pass this course with a "C-" or better. It is strongly recommended that students take MATH 115A as one of their first upper division courses before MATH 131A.

All required courses for the major must be at least 4.0 units and taken for a letter grade, unless the class is a supplement to a larger course (e.g. a required lab).

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# MATHEMATICS/ECONOMICS B.S.

## PRE-MAJOR: 11 COURSES

**Students can declare the pre-major at any time while in good academic standing.**

| | Quarter | Grade | | Quarter | Grade |
|---|---|---|---|---|---|
| MATH 31A* | | | ECON 1** | | |
| MATH 31B* | | | ECON 2** | | |
| MATH 32A* | | | ECON 11** | | |
| MATH 32B* | | | | | |
| MATH 33A* | | | | | |
| MATH 33B* | | | | | |
| MATH 11 **or** 61* | | | | | |
| PIC 10A* | | | | | |

*Mathematics sequenced courses, ** Economics preparation courses: Each are calculated separately and must be completed with a minimum overall **2.7** grade-point average and a grade of "C" or better in each course. Repetition of more than two mathematics sequenced courses, or of any mathematics sequenced course more than once, results in automatic dismissal from the major. Repetition of more than one economics preparation course, or of any economics preparation course more than once, results in automatic dismissal from the major.

## THE MAJOR: 16 COURSES

**Students must declare the major before reaching 160 units (not including AP units).**

| | Quarter | Grade | | Quarter | Grade |
|---|---|---|---|---|---|
| MATH 115A+ | | | ECON 101+ | | |
| MATH 131A+ | | | ECON 102+ | | |
| MATH 131B | | | ECON 103 | | |
| MATH 164 | | | ECON 103L | | |
| MATH 174E | | | Econ 104 | | |
| (MATH 179, ECON 141, or STATS C183/C283 is also accepted) | | | Econ 104L | | |

**One** 2-term probability sequence:

**A. Introduction to Probability and Statistics**

| | | |
|---|---|---|
| MATH 170E | | |
| MATH 170S | | |

**or**

**B. Probability Theory**

| | | |
|---|---|---|
| MATH 170A | | |
| MATH 170B | | |

**Two** additional upper division economics courses chosen from: ECON 106–199

| | | | |
|---|---|---|---|
| 1. | | | |
| 2. | | | |

**One** upper division mathematics course chosen from:
MATH 134, MATH 135, MATH 136, MATH 171

| | | | |
|---|---|---|---|
| 1. | | | |

+Students must pass this course with a "C-" or better. It is strongly recommended that students take MATH 115A as one of their first upper division courses before MATH 131A.

All required courses for the major must be at least 4.0 units and taken for a letter grade, unless the class is a supplement to a larger course (e.g. a required lab).

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COMING SOON

# SPECIALIZATION IN COMPUTING

The Specialization in Computing provides an extensive education in elementary computer science and an introduction to its applications in mathematics. This not a major, but a supplement to the following majors:

- Mathematics
- Applied Mathematics
- Financial Actuarial Mathematics
- Mathematics/Applied Science
- Mathematics for Teaching
- Mathematics/Economics

Students who complete the specialization will receive a notation on their diploma. Mathematics/Economics majors interested in a Specialization in Computing must follow the specialization offered through the Mathematics Department.

Students planning to complete the Specialization in Computing must petition to add this program to their major after completing PIC 10B. Petitions should emailed to the Student Services Office at ugrad@math.ucla.edu.

ww3.math.ucla.edu/petitions

Students who have added the Specialization in Computing to their major and choose to graduate before completing the specialization must officially drop the program by emailing a petition to the Student Services Office at ugrad@math.ucla.edu.

## REQUIRED FOR THE SPECIALIZATION: 7 COURSES

| | Quarter | Grade |
|---|---|---|
| PIC 10A | | |
| PIC 10B | | |

**Two** PIC courses from the following:

| | | |
|---|---|---|
| PIC 10C | | |
| PIC 15 | | |
| PIC 16A | | |
| PIC 16B | | |
| PIC 20A | | |
| PIC 20B | | |
| PIC 30 | | |
| PIC 40A | | |
| PIC 60 | | |

**One** mathematics course chosen from:
MATH 61, 180*, 182* or 184

| | Quarter | Grade |
|---|---|---|
| 1. | | |

**Two** upper division mathematics courses chosen from:
MATH 149–159, 180*, 182*

| | | |
|---|---|---|
| 1. | | |
| 2. | | |

All PIC and Math courses applied to the specialization must be completed with a minimum 2.0 GPA, with a grade of "C-" or better in each course.

All required courses for the specialization must be at least 4.0 units and taken for a letter grade, unless the class is a supplement to a larger course (e.g. a required lab).

*MATH 180 and 182 may only be applied once to the Specialization in Computing.

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# MINOR IN MATHEMATICS

The Mathematics minor is designed to provide students who are not math majors the opportunity to deepen their understanding of the role of mathematics in various disciplines.

Students must petition to add this minor after completing 12.0 units of mathematics towards the minor at UCLA. At least one of the courses taken for these 12.0 units must be an upper division course taken at UCLA.

ww3.math.ucla.edu/petitions

Students who have added the minor and choose to graduate before completing the minor must officially drop the minor by emailing a petition to the Student Services Office at ugrad@math.ucla.edu.

## REQUIRED FOR THE MINOR: 8 COURSES

| | Quarter | Grade |
|---|---|---|
| MATH 32A | | |
| MATH 33A | | |
| MATH 33B | | |

**Five** upper division mathematics courses chosen from:
MATH 106–199

| | | Quarter | Grade |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |

Students must complete all lower division courses with grades of "C" or better. Upper division courses must have an overall grade-point average of 2.0 or better when calculated separately from the lower division courses. A minimum of 20.0 units applied toward the Mathematics minor requirements must be in addition to units applied toward major or other minor requirements.

All required courses for the minor must be at least 4.0 units and taken for a letter grade, unless the class is a supplement to a larger course (e.g. a required lab).

Although MATH 31A, 31B, 32B are not required for the minor, all upper division mathematics course prerequisites are enforced for all students.

This minor is not open to students declared in a mathematics major.

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# MINOR IN MATHEMATICS FOR TEACHING

The Mathematics for Teaching minor is designed for students majoring in fields other than mathematics who plan to teach secondary mathematics after graduation. For non-majors joining the Mathematics Department and School of Education's Joint Mathematics Education Program (JMEP), the minor provides recognition for completion of prerequisite coursework for the program. The minor provides additional upper division course work in mathematics relevant to the secondary school curriculum: algebra, geometry, and analysis. This coursework also prepares students for content on the California Subject Examination for Teachers, which is required to prove competence in the subject matter. In addition, the minor provides the coursework on secondary mathematics from an advanced standpoint which is recommended by the Conference Board of Mathematical Sciences.

To enter the minor, students must have completed Mathematics 115A with a grade of "C" or better. If Mathematics 115A was not completed at UCLA, students must show proof that they completed an equivalent course with a grade of "C" or better.

A minimum of 20.0 units applied toward the Mathematics for Teaching minor requirement must be in addition to units applied toward major or other minor requirements.

ww3.math.ucla.edu/petitions

Students who have added the minor and choose to graduate before completing the minor must officially drop the program by emailing a petition to the Student Services Office at ugrad@math.ucla.edu.

## REQUIRED FOR THE MINOR: 7 COURSES

| | Quarter | Grade |
|---|---|---|
| MATH 115A[+] | | |
| MATH 117 **or** MATH 110A | | |
| MATH 123 **or** MATH 120A | | |
| MATH 131A | | |
| MATH 105A | | |
| MATH 105B | | |
| MATH 105C | | |

[+]It is strongly recommended that students take MATH 115A as one of their first upper division courses before MATH 131A.

All upper division mathematics courses must be completed with a minimum 2.0 GPA, with a grade of "C-" or better in each course.

All required courses for the minor must be at least 4.0 units and taken for a letter grade, unless the class is a supplement to a larger course (e.g. a required lab).

Although MATH 31A, 31B, 32A, 32B, 33A, and 33B are not required for the minor, all upper division mathematics course prerequisites are enforced for all students.

This minor is not open to students declared in a mathematics major.

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# SUGGESTED ACADEMIC SCHEDULE

## MINIMUM REQUIREMENTS

- Pass the calculus sequenced courses with a letter grade of "C" or better in each course and with a minimum overall 2.5 grade point average. Repetition of more than two mathematics sequenced courses, or of any mathematics sequenced course more than once, results in automatic dismissal from the major.
- The Mathematics/Economics major requires a minimum overall **2.7** grade point average.
  The Data Theory major requires a minimum overall **3.3** grade point average.
- Pass MATH 115A and 131A with a grade of "C-" or better in each course.

Students must declare a math major before reaching 160.0 units (minus AP units awarded). Pre-major requirements will vary depending on the major.

| | | |
|---|---|---|
| **FIRST YEAR** | MATH 31A<br>MATH 31B<br>MATH 32A | **ALL MAJORS**<br>Start the two-year calculus sequence with MATH 31A, MATH 31B, or MATH 32A according to initial placement. Take one course per quarter until done.<br>Begin taking other required pre-major courses. |
| **SECOND YEAR** | MATH 32B<br>MATH 33A<br>MATH 33B<br>(MATH 11's) | **ALL MAJORS**<br>Finish the two-year calculus sequence.<br>Take MATH 115A if MATH 33A is completed.<br>Recommended: MATH 11's for more practice in abstract math. |
| **THIRD YEAR** | MATH 115A<br>MATH 131A<br>+ Other Upper Division Major Requirements | **ALL MAJORS**<br>Take MATH 115A, if not taken at the end of 2nd Year.<br>Take MATH 131A. It is strongly recommended to take this course after taking MATH 115A. For everything else, let your interests guide you. You can take the course as long as you meet the prerequisites.<br>**MATHEMATICS**<br>MATH 110A, MATH 110B, MATH 120A, MATH 131B, MATH 132<br>**APPLIED MATHEMATICS**<br>MATH 132 or MATH 131B, MATH 142, at least one of the required two-quarter sequences and/or math electives<br>**DATA THEORY**<br>MATH 118, [MATH 170E and 170S] or [STATS 100A and 100B], STATS 101A, STATS 101C, STATS 102A, STATS 102B<br>**FINANCIAL-ACTUARIAL MATHEMATICS**<br>MATH 170E, MATH 170S, MATH 177, MATH 178A, MATH 178B<br>**MATHEMATICS OF COMPUTATION**<br>[MATH 131B or MATH 132], MATH 151A, MATH 151B, MATH and/or CS electives<br>**MATHEMATICS/ECONOMICS**<br>MATH 131B, MATH 170E, MATH 170S, ECON 101, ECON 102, ECON 103 + ECON 103L<br>**MATHEMATICS FOR TEACHING**<br>[MATH 117 or MATH 110A], [MATH 123 or MATH 120A],<br>[MATH 170E or STATS 100A or MATH 170A], math electives |
| **FOURTH YEAR** | Remaining Upper Division Major Requirements | **ALL MAJORS**<br>Complete the major requirements. |

ugeducation.ucla.edu/degreepath/majors
ucla.mymajors.com/quiz/?

# DEPARTMENTAL HONORS & SCHOLAR PROGRAMS

The Departmental Honors and Scholar Programs are two of our most rigorous programs, designed to further prepare students for graduate study.

While the Departmental Honors Program grants eligible students the opportunity to work closer with faculty and apply their learning to an original project, the Departmental Scholar Program allows students with exceptional academic records to simultaneously pursue a Bachelors (B.S.) and Masters (M.A.) degree in mathematics.

If you are interested in applying or have any questions about either of these programs, please consult with an undergraduate math advisor.

## ADMISSION TO THE HONORS PROGRAM

To be considered for admission to the Departmental Honors Program for any math major, a student must:

- Be officially enrolled in his/her respective math major;
- Have completed at least four courses at UCLA in the mathematics department from those required in the "Preparation for the Major" or "Major"; and
- Have at least a 3.6 GPA in such mathematics courses taken at UCLA

To be considered for admission to the Honors Program in Mathematics/Economics, a student must:

- Be officially enrolled in the Mathematics/Economics major;
- Have completed all of the "Preparation for the Major" courses; and
- Have at least a 3.6 GPA in the "Preparation for the Major"

In addition to the requirements listed above, students must complete specific courses within the major. Please refer to our website at for more information and consult with the undergraduate math advisor.

ww3.math.ucla.edu/majors-minors-specializations

## ELIGIBILITY AND TIMELINE FOR THE SCHOLAR PROGRAM

Admission to the Departmental Scholar Program is by application only. Students typically apply immediately after passing the Basic Exam, no later than the end of their junior year. In addition, candidates must fulfill all university level requirements:

- Cumulative UC GPA of 3.5 or higher
- Undergraduate major GPA of 3.5 or higher
- Completion of 24 courses (96.0 *undergraduate* quarter units - AP units, or similar, do not apply)
- Completion of preparation for the major
- Satisfy Writing II requirement with a grade of "C" or better

A successful applicant will have passed the Basic Exam, have a very high GPA in math courses, and have letters of recommendation from at least two (2) ladder faculty that strongly support the applicant. Applications are reviewed and decided by the Undergraduate and Graduate program faculty, in consultation with other faculty.

To apply, students must:

- Be declared in a mathematics major
- Pass the Basic Exam no later than the beginning of spring quarter of their third year

To remain in the program, students must:

- Remain a UCLA mathematics student in good academic standing
- Maintain at least a 3.5 GPA in mathematics courses in each individual quarter

The following timeline is recommended:

**FIRST YEAR**
Complete or have credit from another institution, all lower-division calculus-based courses (MATH 31A, 31B, 32A, 32B, 33A, 33B). If possible, take MATH 115AH in spring. Complete Writing II requirement.

**SECOND YEAR**
Complete pre-major courses, take MATH 115AH (Honors Linear Algebra), 115B (Linear Algebra), 131AH (Honors Analysis) and 131BH (Honors Analysis). Begin preparation for Basic Exam (offered in September and March) using online copies of past exams.

**THIRD YEAR**
Pass the Basic Qualifying Exam, preferably by the start of fall quarter. Apply to the Scholar Program immediately after passing the Basic. Complete remaining undergraduate math major courses. During the quarter of admission to the Scholar Program, it is possible to begin graduate coursework which counts toward the Master's degree. Only graduate courses taken after acceptance into the program can count towards the M.A.

**FOURTH YEAR**
Complete remaining graduate level courses for the M.A. The M.A. requirements include 11 courses, of which eight (8) must be graduate math courses, in addition to the B.S. requirements. Three courses can be upper division math courses that must be pre-approved by the Mathematics Department.

ww3.math.ucla.edu/majors-minors-specializations

# GRADUATE SCHOOL OPPORTUNITIES

Graduate school is an opportunity to examine a field of your choice with more specificity and direction. It gives you the tools you need to succeed in the industry of your choice. Preparation for grad school can begin as early as your first year of college.

Graduate school constitutes an advanced program of study focused on a particular academic discipline or profession. Traditionally, graduate school has been "academic" (centered on generating original research in a particular discipline), but it may be "professional" (centered on developing skills and knowledge for a specific profession), or a combination of both.

Successful graduate work in mathematics requires skills in formal reasoning and in constructing rigorous mathematical proofs. These skills are more essential for success at the graduate level than is the knowledge of any particular topic. The honors sequences will provide training in these skills to a far greater degree than the regular sequences. In fact, a typical graduate admissions committee will look more favorably upon an "A-" earned in a honors sequence than a "A", or even "A+", earned in the regular sequence.

Most applications for graduate programs in mathematics must be submitted between December and February, so it is best to contact colleges during the summer or access their websites for online applications and additional information.

Most universities will require the following materials with their applications:

- Three letters of recommendation
- GRE general and mathematics subject exams
- Personal statement

## RECOMMENDED COURSES TO PREPARE FOR GRADUATE SCHOOL

**For Pure Mathematics**

- MATH 115AH + 115B
- MATH 131AB (Honors) + 131C
- MATH 110AB (Honors) + 110C
- MATH 120A, 121
- MATH 132H
- MATH 133, 134, 135 and 136

**For Applied Mathematics**

- MATH 115AH + 115B
- MATH 131AB (Honors) + 131C
- MATH 110AB (Honors) + 110C
- MATH 132H
- MATH 133, 134, 135 and 136
- MATH 151AB (Honors), 155, 156
- MATH 170AB, 171

Do research on the graduate or professional schools you are interested in before meeting with an undergraduate math advisors.

Visit the Career Center for information about applying to medical or professional schools.

career.ucla.edu

## TIMELINE

One of the initial steps in applying to a graduate or professional school is to research the application deadlines so that you can develop a timeline of when to submit test scores, letters of recommendation, personal essays, etc. Below is a general timeline to help you in planning your application process.

**Junior Year**

- Begin researching available programs
  - Review grad school guides/directories
  - Request promotional materials
  - Visit schools' websites
  - Talk to faculty/alumni/current students in the program
- Start exploring financial aid resources
- Sign up for required standardized test and take a practice test
- Identify potential letter writers
- Order an unofficial transcript and check for and correct any discrepancies
- Take the required standardized test

**Senior Year, Fall**

- Write the first draft of your statement of purpose
- Request your letters of recommendation from faculty
- Order official transcripts
- Write final draft of statement of purpose
- Complete and submit your applications
- Apply for aid available through program, assistantships, fellowships, scholarships, etc.

**Senior Year, Spring**

- Complete and submit financial aid applications
- Visit prospective campuses if possible and talk to faculty/students to help you make your final decision
- Follow-up with schools to make sure your file is complete
- After receiving acceptance from the school of your choice, send in the required deposit, and contact other schools to decline acceptances
- Write thank you notes to people who helped you

**Find More Information Online**

- career.ucla.edu
- ets.org/gre
- studentaid.gov
- gradsource.com
- gradschools.com
- kaptest.com
- petersons.com
- princetonreview.com
- usnews.com/best-graduate-schools

# RESEARCH OPPORTUNITIES AT UCLA

## DIRECTED READING PROGRAM

The Directed Reading Program (DRP) pairs undergraduate students with graduate students for quarter-long independent study projects in mathematics. Projects culminate in a brief presentation given by the undergraduates in a DRP colloquium. Applicants are strongly recommended to have some familiarity with reading and writing mathematical proofs (e.g. MATH 115A, 131A).

math.ucla.edu/~drp

## IPAM RESEARCH IN INDUSTRIAL PROJECTS FOR STUDENTS (RIPS)

RIPS is based on the successful Math Clinic concept that originated at Harvey Mudd College in 1973, as well as the Research Experience for Undergraduates (REU) program sponsored by the National Science Foundation (NSF). In the RIPS program, teams of students, directed by faculty advisors, work to solve industry-related problems. RIPS brings together highly qualified undergraduates in mathematics, or related majors, with sponsoring industry, government, and nonprofit organizations to collaborate on projects. Each team of three to four advanced students spends two summer months working on a problem posed by the sponsoring organization under the leadership of a faculty advisor. Projects focus on problems of serious interest to the sponsor and stimulating challenges to the students. Participation in RIPS provides valuable real-world technical and managerial experience for students and valuable R&D for the sponsor.

ipam.ucla.edu/programs/student-research-programs

## NSF RESEARCH EDUCATION FOR UNDERGRADUATES (REU) PROGRAM

The Applied REU program includes both individual research and group activities. Each student is assisted by a faculty advisor and some also by a graduate-student advisor. Group activities include seminars and other social and professional events. Students are encouraged to continue their research during the following academic year, under the direction of their summer mentor or another faculty member. Eligible students will receive a stipend for their work.

math.ucla.edu/~bertozzi/research

## UNDERGRADUATE RESEARCH PORTAL

You can search for research opportunities in all disciplines through the Research Portal in MyUCLA. When you log in, click on “Academics” and then “Undergraduate Research Portal”.

my.ucla.edu

## UNDERGRADUATE RESEARCH CENTER (URC)

The URC - Sciences serves students and faculty in all areas of life and physical sciences, engineering and mathematics. The primary mission is to promote, develop and celebrate undergraduate student research with the overall goal of enhancing undergraduate education and preparing students, including those from disadvantaged backgrounds, for academic and research careers. Research takes different forms in different disciplines. However, in all disciplines, research involves creative activities and meaningful research to produce results that are worthy of communication to others. Undergraduate research involves the close collaboration between a student and a faculty mentor, as well as other members of their research group.

Some of the programs that the URC runs through the school year and summer include, but are not limited to:

- Amgen Scholars Summer Program
- Beckman Scholars Program
- Biomedical Sciences Enrichment Program (BISEP)
- CARE Fellows & Scholars Program
- CARE Science, Engineering & Math Summer Research Program
- Clare Boothe Luce Scholars Program
- Sustainable LA Grand Challenge Undergraduate Research Scholars Program
- i²URP (formerly HHURP)
- Maximizing Access to Research Careers (MARC) Program
- Student Research Program (SRP)
- Transfer Research Entry Program
- UC Leadership Excellence through Advanced Degrees (UC LEADS)
- Undergraduate Research Fellows Program (URFP)
- Undergraduate Research Scholars Program (URSP)
- URC Sciences Summer Program

ugresearchsci.ucla.edu

# RESEARCH OPPORTUNITIES OFF CAMPUS

While UCLA has many opportunities for undergraduate research, we also highly encourage students to take advantage of research opportunities from other institutions. Below are some examples of research opportunities outside of UCLA.

## NATIONAL SCIENCE FOUNDATION (NSF) REU PROGRAMS

NSF funds research and education in most fields of science and engineering. It does this through grants, and cooperative agreements to more than 2,000 colleges, universities, K-12 school systems, businesses, informal science organizations and other research organizations throughout the United States. The Foundation accounts for about one-fourth of federal support to academic institutions for basic research. The agency operates no laboratories itself but does support National Research Centers. The Foundation also supports cooperative research between universities and industry, US participation in international scientific and engineering efforts, and educational activities at every academic level.

nsf.gov/crssprgm/reu

## SCIENCE UNDERGRADUATE LABORATORY INTERNSHIPS (SULI)

The SULI program encourages undergraduate students to pursue science, technology, engineering, and mathematics (STEM) careers by providing research experiences at the Department of Energy (DOE) laboratories. Selected students participate as interns appointed at one of 17 participating DOE facilities/laboratories. They perform research, under the guidance of laboratory staff scientists or engineers, on projects supporting the DOE mission. The SULI program is sponsored and managed by the DOE Office of Science's and Office of Workforce Development for Teachers and Scientists (WDTS) in collaboration with the DOE facilities/laboratories.

science.osti.gov/wdts/suli

## DIMACS REU: RESEARCH EXPERIENCE FOR UNDERGRADUATES AT RUTGERS UNIVERSITY

The Center for Discrete Mathematics & Theoretical Computer Science (DIMACS) was founded as one of 24 Science and Technology Centers funded by the NSF. It is located at Rutgers University, and is a joint project of Rutgers, Princeton, AT&T Laboratories, Applied Communication Sciences, NEC Laboratories America, and Nokia Bell Labs. Applicants should be undergraduates with a major in computer science, mathematics, or a closely related STEM field. They should be current juniors (graduating in the fall or spring immediately following the program), although sophomores with exceptionally strong backgrounds will be considered. Freshmen who have completed advanced course work in CS or math may apply, but they are very rarely accepted.

reu.dimacs.rutgers.edu

## MATHPROGRAMS.ORG

The MathPrograms service hosts a database of undergraduate summer research programs, small travel grant programs, and various other opportunities in mathematics at institutions across the nation.

mathprograms.org/db

## SUMMER RESEARCH PROGRAMS OUTSIDE UCLA

Summer is a great time to try research. There are hundreds of summer programs across the US. The Undergraduate Research Center maintains a list of clearinghouses for summer programs.

sciences.ugresearch.ucla.edu/

sciences.ugresearch.ucla.edu/research-programs-outside-of-ucla/

sciences.ugresearch.ucla.edu/resources/research-programs-by-our-campus-partners/

# CAREER OPPORTUNITIES

Math can be found in almost every sector of the world of work. Students majoring in math should consider if they want to use math skills directly or indirectly in the workplace. This may determine the types of work experiences and further education necessary to prepare for an area of interest.

People with a math background may work in jobs with titles such as: analyst, research associate, technical consultant, computer scientist, or systems engineer.

Math majors develop many transferable skills, including critical thinking, problem diagnosis and solving, computer skills, and quantitative skills. Other important skills to develop include good reasoning, persistence, and written and verbal communication.

career.ucla.edu

The UCLA Career Center offers services and resources to help UCLA students, UC graduates and employers reach their goals. As a UCLA student, from the first day you arrive, the Career Center can introduce you to an array of career possibilities and internships that can help you explore the link between your major and career choices.

Handshake is a platform that the Career Center provides to connect students with internships, jobs and career opportunities. Handshake utilizes a user-friendly interface to help students find skill-specific jobs and internships, schedule appointments with undergraduate career educators or graduate career advisors, register for professional development events, career fairs and employer events.

career.ucla.edu/handshake

# STUDENT ORGANIZATIONS

## UCLA BRUIN ACTUARIAL SOCIETY (BAS)

The UCLA Bruin Actuarial Society is designated for those students interested in the actuarial profession. They serve as a support group for motivated students who plan on taking actuarial exams and want to find internships and jobs in the field. They are also dedicated to informing fellow Bruins who are interested in the actuarial field. During the last year, weekly e-mails were sent out to club members regarding company information sessions, internships, jobs, workshops, and scholarships.

math.ucla.edu/~actuary
bruinactuaries@gmail.com

## UNDERGRADUATE MATHEMATICS STUDENTS ASSOCIATION (UMSA)

The UCLA Undergraduate Mathematics Students Association is an officially recognized student group for all mathematics majors, and students of the other majors, who are interested in mathematics. UMSA was established in response to students' desire to have a connection to the Mathematics Department. The purpose of UMSA is to:

- Promote the academic awareness of the mathematics major
- Promotes better student-faculty relations
- Provide information on career opportunities in mathematics
- Provide a peer network in which students can discuss and further develop ideas and concepts that are presented in mathematics courses

math.ucla.edu/~umsa
umsaatucla@gmail.com

## UCLA PI MU EPSILON (PME)

Pi Mu Epsilon, Inc., is the Honorary National Mathematics Society. Their purpose is "to promote scholarly activities in the mathematics among students, awareness of higher educational programs and career opportunities in mathematics, as well as social activities among its members." Current and future chapter projects include arranging popular talks on mathematical topics, a weekly problem-solving group, on-campus and off-campus community involvement (i.e., setting up high school competitions), and social activities.

pme-math.org
PMEinLA@gmail.com

# TEACHING PREPARATION PROGRAMS

## Do you love mathematics? Do you care about helping others do math?

You can leverage these interests into a rewarding, well paid career in K-12 mathematics education. Mathematics and STEM majors are in high demand in K-12 education. The work is intellectually challenging, personally rewarding, and salaries range from $56k to $150k for 10 months' work.

More UCLA graduates go on to earn a CA Teaching Credential from almost any other university in CA. A significant number of our Math for LA graduates go on to become teacher-leaders, increasing local community access to high quality K-12 mathematics.

We encourage you to participate in our programs! We offer outstanding preparation for a career in K-12 mathematics education, a strong foundation for future leadership in the field, a cohort of colleagues to support you in the classroom, and financial support toward your goals.

For general questions about our programs, contact an undergraduate math advisor - ugrad@math.ucla.edu.

For additional questions or general inquiries about a career in K-12 mathematics education, contact the Curtis Center - curtiscenter@math.ucla.edu.

### PEDAGOGICAL CONTENT COURSEWORK

Math for LA offers six courses for undergraduates interested in careers in K-12 mathematics education. In the courses, university and K-12 mathematics instructors will help you develop the mathematics content and pedagogical content knowledge necessary to be a high-quality mathematics teacher. The courses also include clinical practice, credential preparation and professional networking opportunities. Students may enroll in anywhere from one to all six courses, and those who complete all six are thoroughly prepared for admission to a CA credential program.

For more information about these courses, see the Undergraduate pages on The Curtis Center website.

curtiscenter.math.ucla.edu

Field work experiences for Math 73XP, Math 74XP, and Math 75XP are offered in collaboration with CaTeach. To apply for a PTE number for these courses, email cateach@chem.ucla.edu.

cateach.ucla.edu

### THE INTEGRATED PATHWAY

This pathway is a collaboration between the UCLA School of Education's Teacher Education Program and Math for LA. It is an accelerated pathway to a CA Preliminary Single Subject Teaching Credential in Mathematics. In this pathway, students complete a Preliminary Credential during their junior and senior years. This pathway enables students to earn a full-time salary (around $56k) while teaching full time in Los Angeles public schools during the academic year following their bachelor's degree.

For more information about the Integrated Pathway, visit Teaching Credential Pathways under the Undergraduate pages on The UCLA Curtis Center website.

curtiscenter.math.ucla.edu

### THE JOINT MATHEMATICS EDUCATION PROGRAM (JMEP)

This program, also a collaboration of the UCLA School of Education's Teacher Education Program and Math for LA is an accelerated pathway to both a CA Preliminary Single Subject Teaching Credential in Mathematics and a Masters of Education.

In the program, students begin work towards a Preliminary Credential during their senior year and complete their credential coursework by the following summer. The program enables students to earn a full-time salary (around $56k) while teaching full-time in Los Angeles public schools during the academic year following their bachelor's degree. Students then complete a Master's in Education by the following June.

curtiscenter.math.ucla.edu/undergraduates/credential-pathways

### SUBJECT MATTER PREPARATION PROGRAM (SMPP) FOR THE CA TEACHING CREDENTIAL

Applicants for a CA Preliminary Single Subject Teaching Credential in Mathematics must verify their "subject matter competence" to teach mathematics in one of two ways: 1.) Complete a CA-approved "subject matter program" and obtain verification of completion from the university with the approved program or 2.) Achieve a passing score on the three part California Subject Matter Examination for Teachers (CSET).

The UCLA Mathematics Department is a CA-approved "subject matter program" in mathematics. The program is comprised of mathematics courses, most of which are common to most mathematics majors, and the MATH 105ABC sequence. Students who complete the department's Mathematics for Teaching major will qualify for the department's CA-approved subject matter program. At the end of their senior year, students may request a letter from the Curtis Center's Executive Director's office verifying their completion of these courses and their subject matter competence for the CA Single Subject Teaching Credential in mathematics.

For more information and to apply, see the UCLA Curtis Center website.

curtiscenter.math.ucla.edu/undergraduates/credential-requirements

# ACADEMIC YEAR PLANNER

## FIRST YEAR

| FALL | | WINTER | | SPRING | | SUMMER | | |
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| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| Total units: | | Total units: | | Total units: | | Total units: | | A |

## SECOND YEAR

| FALL | | WINTER | | SPRING | | SUMMER | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| Total units: | | Total units: | | Total units: | | Total units: | | B |

## THIRD YEAR

| FALL | | WINTER | | SPRING | | SUMMER | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| Total units: | | Total units: | | Total units: | | Total units: | | C |

## FOURTH YEAR

| FALL | | WINTER | | SPRING | | SUMMER | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| Total units: | | Total units: | | Total units: | | Total units: | | D |

Overall upper division units: _____

*60.0/180.0 units must be upper division*

Overall units (A+B+C+D): _____

*180.0 units minimum*

# QUARTER COURSE PLANNER

| | MONDAY | TUESDAY | WEDNESDAY | THURSDAY | FRIDAY |
|---|---|---|---|---|---|
| 8:00 AM | | | | | |
| 9:00 AM | | | | | |
| 10:00 AM | | | | | |
| 11:00 AM | | | | | |
| 12:00 PM | | | | | |
| 1:00 PM | | | | | |
| 2:00 PM | | | | | |
| 3:00 PM | | | | | |
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| 5:00 PM | | | | | |
| 6:00 PM | | | | | |
| 7:00 PM | | | | | |