

CCG & MATH PATHWAYS

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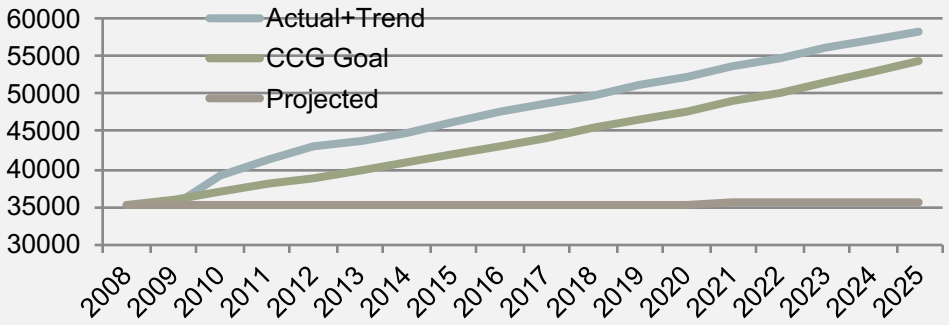
STEM Initiative Meeting, May 18, 2017



COMPLETE COLLEGE GEORGIA



USG Degree Bachelor's and Below Production 2008-2016 and Trend to 2025



Math Recommendations for Programs of Study

Math Pathways for non-STEM majors

(based on Regents Advisory Committee Recommendations)

¹USG institutions cannot require students to take a particular course from among MATH 2001, MATH 1101, and MATH 1111 as long as they are not STEM majors. No matter which of these math courses non-STEM students take, it must count toward satisfying Area Az requirements and it must count toward graduation. However, students in non-STEM majors should be ADVISED to take the math course most appropriate for their intended majors. Where MATH 2001 or MATH 1101 is the default recommendation for a particular major students with strong math interests and abilities may opt to take MATH 1111, but MOST students should be advised to take MATH 1001 or MATH 1101.

Program/Major	Area Az Mathematics Default Recommendation
Anthropology	MATH 1001 (Quantitative Reasoning) or MATH 1101 (Introduction to College Mathematical Modeling) ¹
Birth-to-Five Teacher Preparation	MATH 1111 (College Algebra)
Business Administration	See institution-specific recommendations
Communication	MATH 1001 (Quantitative Reasoning) or MATH 1101 (Introduction to College Mathematical Modeling) ¹
Criminal Justice	MATH 1001 (Quantitative Reasoning) or MATH 1101 (Introduction to College Mathematical Modeling) ¹
Dental Hygiene	MATH 1001 (Quantitative Reasoning) or MATH 1101 (Introduction to College Mathematical Modeling) ¹

Math Pathways for STEM majors

(based on Academic and Student Affairs Handbook 2.4.4 - Area Az Quantitative Skills)

Program/Major	Area Az Mathematics Default Recommendation	Calculus
Agricultural Science	MATH 1111 (Precalculus) or higher	✓
Architecture	MATH 1111 (Precalculus) or higher	✓
Astronomy	MATH 1111 (Precalculus) or higher	✓
Biology	MATH 1111 (Precalculus) or higher	✓
Chemistry	MATH 1111 (Precalculus) or higher	✓
Computer Science	MATH 1111 (Precalculus) or higher	✓
Engineering	MATH 1111 (Precalculus) or higher	✓
Engineering Technology	MATH 1111 (Precalculus) or higher	✓
Environmental Science	MATH 1111 (Precalculus) or higher	✓
Forestry	MATH 1111 (Precalculus) or higher	✓
Geography (B.S.)	MATH 1111 (Precalculus) or higher	✓



MATH AND COLLEGE COMPLETION

“Mathematics courses are the most significant barrier to degree completion in both STEM and non-STEM fields.”

Karen Saxe and Linda Braddy, *A Common Vision for Undergraduate Mathematical Sciences Programs in 2025*,
Mathematical Association of America, 2015.



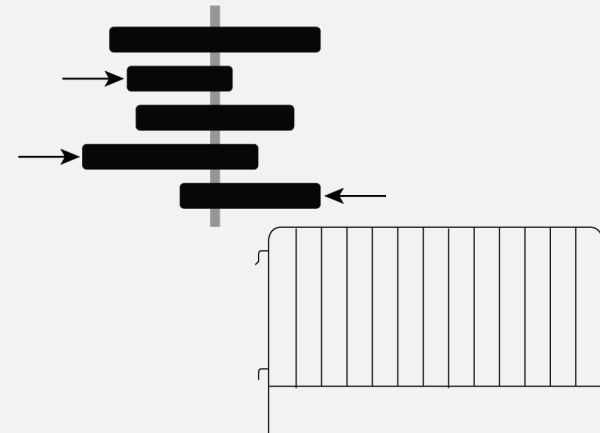
WHY IS CCG LOOKING AT MATH?

Momentum

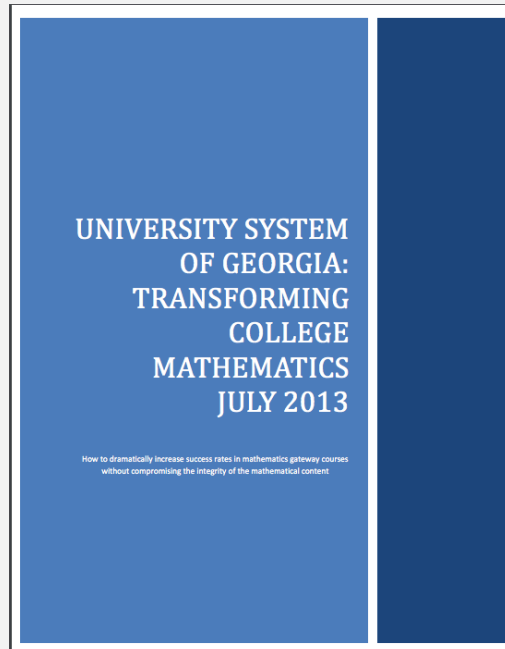
Alignment

Removing barriers

$$p=mv$$



BACKGROUND



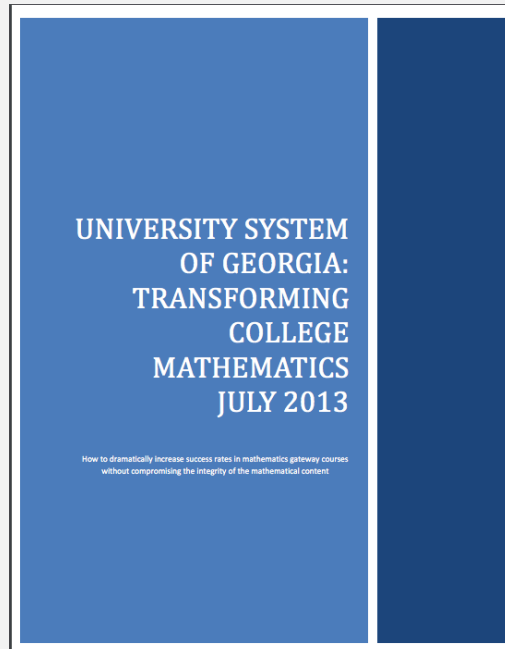
2013 USG Mathematics Task Force

8 recommendations

#2: “Align gateway mathematics course sequences with academic programs of study. In particular, College Algebra should not be the default class for non-STEM majors.”



BACKGROUND



2013 USG Mathematics Task Force

“Most students in non-STEM majors would be better served by enrolling in Quantitative Reasoning or Introduction to Mathematical Modeling, possibly followed by a statistics course in Area D (Natural Science, Mathematics, and Technology) of the core curriculum.”

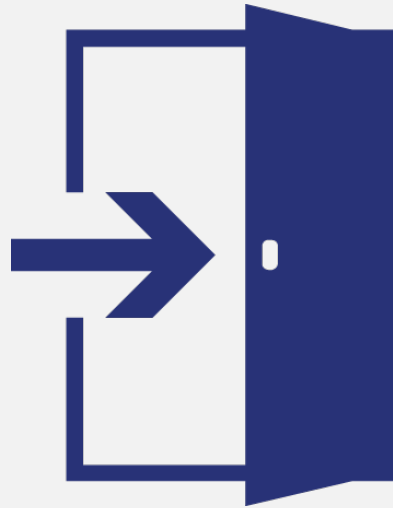


THE ALGEBRA PATHWAY

According to the Mathematical Association of America, the principle purpose of college algebra is to prepare students for pre-calculus and calculus.



THREE MATH GATEWAYS

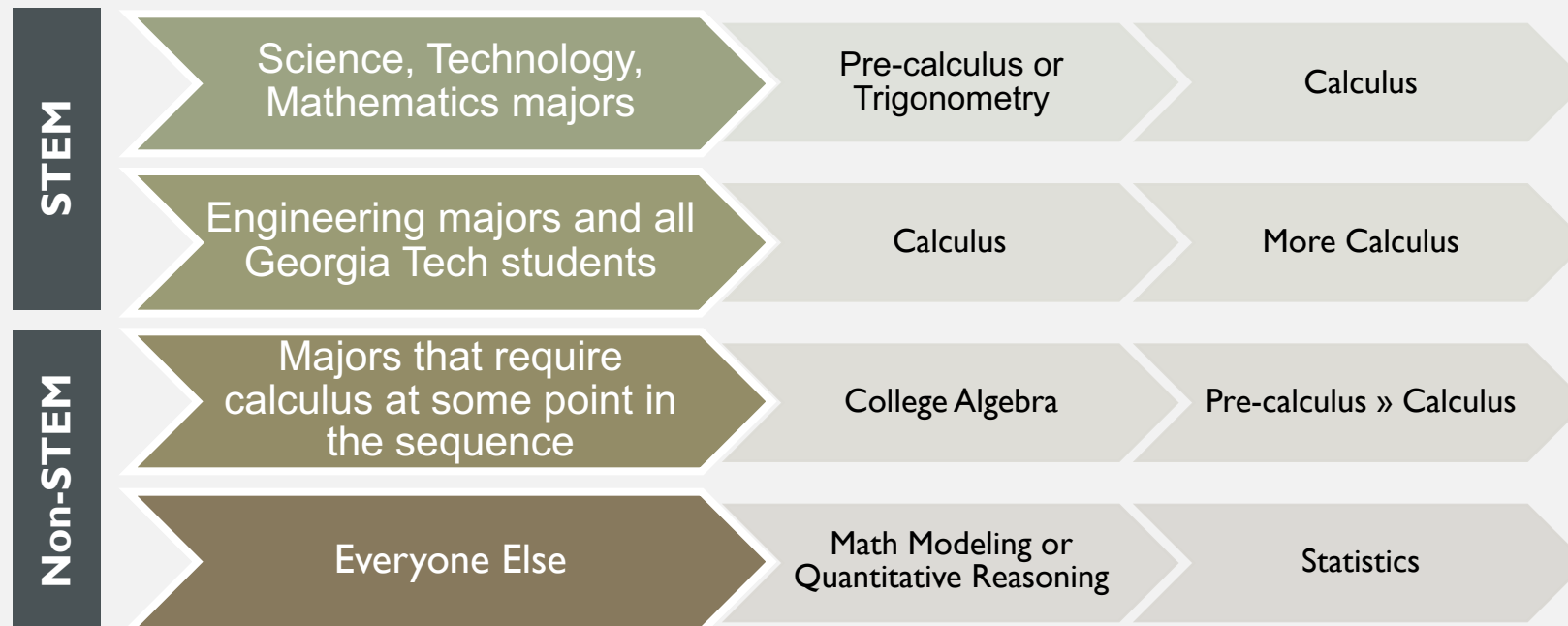


1. **MATH 1001** Introduction to Quantitative Reasoning
2. **MATH 1101** Introduction to Math Modeling
3. **MATH 1111** College Algebra



USG'S FOUR MATH PATHWAYS

For many disciplines, quantitative reasoning or math modeling, perhaps with further study in statistics is the best fit.

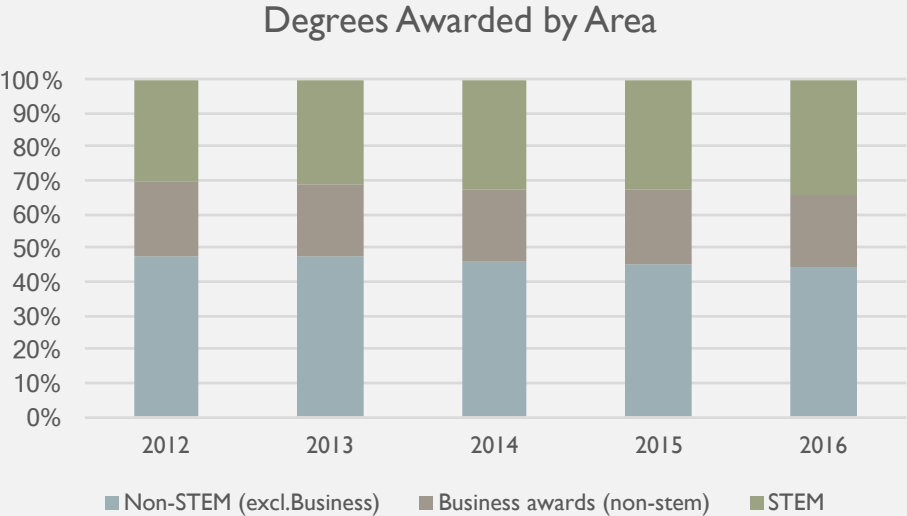


GUIDED PATHWAYS



STEM DEGREES IN THE USG

Across the System, about 32 percent of all bachelor's degrees conferred are in STEM fields, an additional 20 percent are in Business.

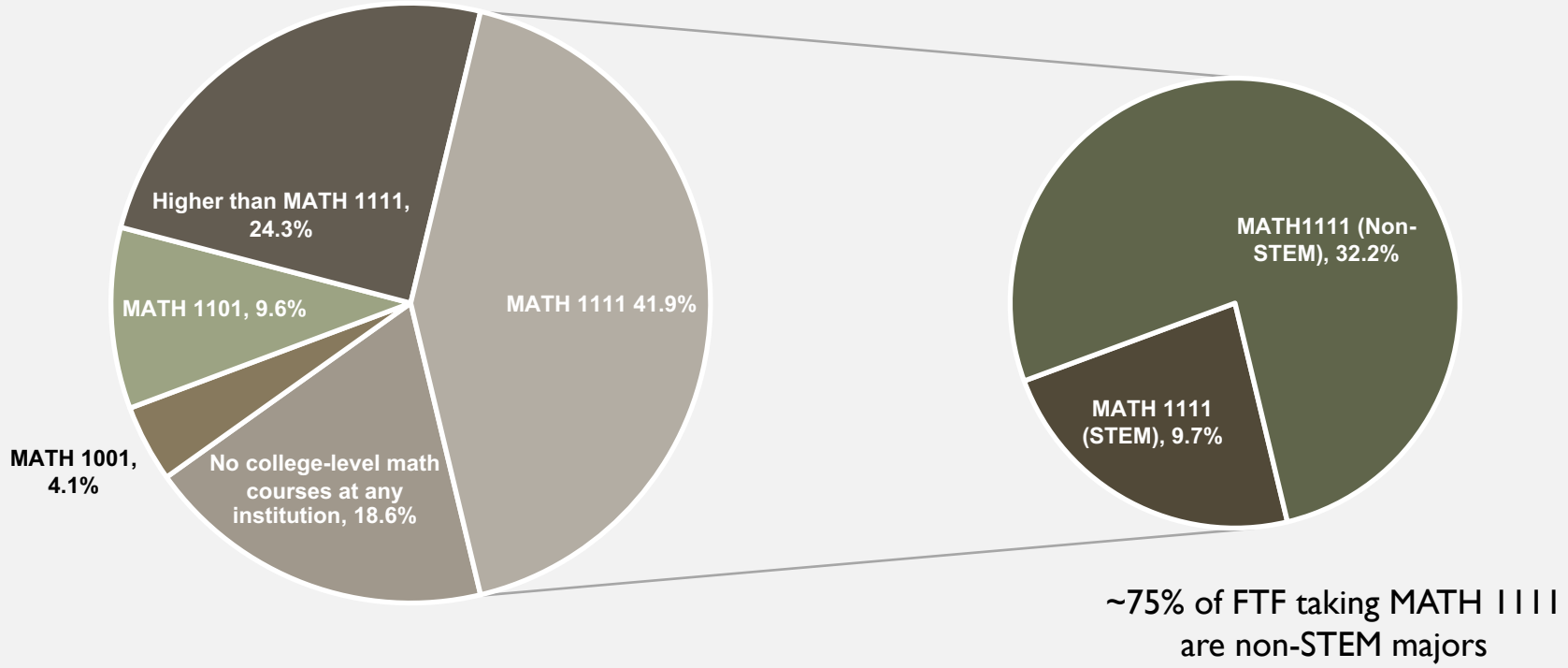


INTERESTING FACT:
Between 2012 and 2016, STEM degrees grew at nearly 3.5x the pace of non-STEM degrees.



MATH COURSE ENROLLMENT

System-wide first-time freshmen (FTF) math course enrollment within 2 academic years of first enrolling in any USG institution (5 year average)



COLLEGE ALGEBRA = DEFAULT MATH

College Algebra (MATH 1111) was the most common first math course at 24 USG institutions in Fall 2014.

(ranging from 34% to 90% of students taking College Algebra as their first math course depending on the institution)



TO SUM UP

- 40% of students are in College Algebra as their first math
- 77% of MATH 1111 students are not STEM majors
- Pass rates for non-STEM majors in College Algebra are in the upper 50% range.
- One in five students who PASS College Algebra go on to take Calculus.

For 75% of USG students, College Algebra is the last math class they will take in college.



WHY IS THIS THE CASE?

Students may be advised into
College Algebra as a “safe”
option.

(e.g., it is guaranteed to “count” even if a student
transfers or changes major)

Students may be selecting
College Algebra on their own.

(“I’m in college; I’ll take a college math”)



WHY IS THIS THE CASE?

Other departments are skeptical of the rigor of non-College Algebra options.

(“Our students need ‘real’ math to succeed.”)

College Algebra is being used as a proxy for filtering out candidates from non-STEM disciplines.

(“Success in college algebra shows students can think.”)



THIS IS A CHALLENGE.

Mathematics Prerequisites for Success in Introductory Statistics

Roxy Peck
California Polytechnic
State University,
San Luis Obispo

Rob Gould
University of California,
Los Angeles

Jessica Utts
University of California, Irvine
President-Elect, American
Statistical Association

The Charles A. Dana Center invited the authors to present their views on the prerequisite skills that students need to be successful in a college-level statistics course. The authors provide a set of mathematics prerequisites that would prepare students for introductory statistics. This resource is offered to faculty who are reviewing placement and prerequisite requirements in their own departments.

For more information about the Dana Center's position on prerequisite requirements for introductory statistics courses, see the Call to Action at www.utdallascenter.org/rmp/call-to-action_access_to_stats

Many colleges and universities are now exploring multiple pathways to a credit-bearing, college-level mathematics course. Because the required mathematics course for a wide variety of majors—such as nursing, criminal justice, social work, psychology and kinesiology—is statistics, much attention is now focused on providing a productive pathway to statistics.

In order to place students appropriately and in order to design an efficient and effective pathway to statistics for students who require additional preparation, it is important to think carefully about the mathematical prerequisites for success in the introductory statistics course. While these prerequisites include topics typically taught in courses up to and including beginning and intermediate algebra, there are topics in beginning and intermediate algebra that are not necessary for success in an introductory statistics course.

This paper describes the topics and concepts that are considered necessary mathematics preparation for success in statistics. In the table that follows, the mathematics prerequisites for statistics have been grouped into the following general categories: numbers and the number line, operations on numbers, sets, equations and inequalities, graphing points and lines in two dimensions, and reading tables and graphs and approximating areas. The first column of the table lists mathematical prerequisites, and the second column provides examples of content topics in the introductory statistics course that are dependent on mastery of the associated mathematical prerequisite.

"The authors have provided a dependable set of prerequisites for college-level Introductory Statistics courses that includes an emphasis on the development of the critical thinking skills our students will need as the changing landscape of the statistics profession continues to impact the requirements for statistics literacy."

*Professor Mary DeLart
Chair, Statistics Committee
American Mathematical Association of Two-Year Colleges
(AMATYC)*

Statement endorsed by the AMATYC Executive Board

This matters because College Algebra is not well aligned to a statistics sequence, which most non-STEM (and many STEM) students will need.



MULTI-PRONGED SOLUTION

- ✓ Advising & Program Maps
- ✓ Discipline-specific math recommendations (available at completega.org/math-pathways)
- ❑ Assurance of the rigor of non-College Algebra courses
- ❑ Research on student outcomes in “other” math courses.



CCG MATH PATHWAYS RESOURCES

The screenshot shows the 'Math Pathways' page on the Complete College Georgia website. It features a navigation menu with 'Resources' highlighted. The main content area includes sections for 'Completion toolkit', 'Math Pathways', and 'Math Pathway Recommendations by Program of Study or Major'. There are filters for 'FULL RECOMMENDATIONS', 'NON-STEM RECOMMENDATIONS', and 'STEM RECOMMENDATIONS'. A 'Background' section explains the purpose of the pathways. A 'Shortening Time to Degree' section discusses how these pathways help students complete their degrees faster. A '15-to-Finish' section promotes an initiative to help students complete their degrees in 15 credit hours. A 'Who?' section includes a diagram showing the flow from high school to college and then to various careers.

The screenshot shows the 'Math Recommendations for Programs of Study' page on the Complete College Georgia website. It features a navigation menu with 'Resources' highlighted. The main content area includes sections for 'Math Pathways for non-STEM majors' and 'Math Pathways for STEM majors'. A table provides default recommendations for various programs and majors, categorized by Area A2 Quantitative Skills (MATH 1101, MATH 1111, MATH 1113, MATH 1201, MATH 1202, MATH 1205).

Program/Major	Area A2 Mathematics Default Recommendation
Agricultural Science	MATH 1113 (Precalculus) or higher
Architecture	✓
Astronomy	✓
Biology	✓
Chemistry	✓
Computer Science	✓
Engineering	✓
Engineering Technology	✓
Environmental Science	✓
Forestry	✓
Geography (B.S.)	✓

[Completega.org/math-pathways](https://completega.org/math-pathways)



THANK YOU

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