Subject: Action Required: Default Area A2 Mathematics Course
Date: Tuesday, February 9, 2016 at 3:34:06 PM Eastern Standard Time
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CC: Marci M. Middleton, Ginger Durham, Rob E. Anderson, Bob Michael, Judith Monsaas, Rachana
Bhatt, Jon Sizemore, Ben R. Robinson, Jennifer Rippner, Tabitha Press
Priority: High

Dear BOR Academic Advisory Committee Chair,

I am writing the chairs of Academic Advisory Committees for non-STEM programs to ask them to
get the opinion of their committees as to the most appropriate mathematics course to name as the
default Area A2 mathematics course for their majors. Houston Davis requested at the Academic
Advisory Committee Chair meeting that all committees make recommendations on this by the end of
fall semester 2016. If you are receiving this email, it means that I have not heard from your
committee. (Or that I misplaced your email – for which I apologize in advance if that happened. I’ve
searched through my email for strays and have not found any.)

I am attaching a document that will summarize the major issues regarding mathematics pathways
for non-STEM majors.

I need a response from your committee by the end of February. If your committee will be meeting
before then, please place this on the agenda for discussion. If your committee will not be meeting
before then, please circulate this issue for an email vote.

Below is the form for you to fill out to document your committee’s decision. Please return to me
(Barbara.Brown@usg.edu) as soon as possible.

Committee name:

Committee Chair:

This decision was made via:

_____ a face-to-face committee meeting (please give meeting date)
_____ an email vote

Default mathematics pathway for (please list the majors your committee has oversight for):

• Replace this text

The Committee recommends that students in this major take the following mathematics course in
Area A2.

_____ MATH 1001 or 1101
_____ MATH 1111 College Algebra

If MATH 1111 College Algebra is chosen, please provide a justification in the text box below.
Please do not hesitate to contact me with questions.

Thank you for your prompt assistance with this matter.

Best,
Barbara

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Recommending Default Mathematics Pathways for Non-STEM Majors

The University System of Georgia actually has four mathematics pathways, each defined by the first mathematics course that students take in Area A2.

**Math Pathways**

<table>
<thead>
<tr>
<th>Who?</th>
<th>All majors other than those listed to the right</th>
<th>Majors that require calculus at some point in the sequence</th>
<th>Science, Technology, Mathematics majors</th>
<th>Engineering majors and all Georgia Tech students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area A2 Math course&gt;&gt;</td>
<td>MATH 1001 - Quantitative Reasoning or MATH 1101 - Mathematical Modeling</td>
<td>MATH 1111 - College Algebra</td>
<td>MATH 1113 - Precalculus or MATH 1112 - Trigonometry</td>
<td>Calculus</td>
</tr>
<tr>
<td>Next Math course&gt;&gt;</td>
<td>Statistics</td>
<td>Precalculus&gt;&gt;&gt; Calculus</td>
<td>Calculus</td>
<td>More Calculus</td>
</tr>
</tbody>
</table>

The mathematics pathways for STEM majors are defined in the Academic and Student Affairs Handbook, Section 2.4.4 Details Regarding Areas A – F (see A2 Quantitative Skills) and do not need to be reconsidered at this time. Students majoring in science, technology, or mathematics are expected to start with MATH 1113 Pre-calculus in Area A2; students majoring in engineering are expected to start with Calculus in Area A2.

Non-STEM majors have a choice of taking MATH 1001 Quantitative Reasoning, MATH 1101, Introduction to Mathematical Modeling, or MATH 1111 College Algebra (or higher mathematics course) in Area A2. Up to now, the default for non-STEM majors has been MATH 1111 College Algebra. Academic advisors have tended to advise students into MATH 1111 no matter what their major, seeing this as a “safe choice” that can apply to any major. The problem is that it really isn't a “safe choice.” MATH 1111 has a very high withdrawal or failure rate, and for many students it becomes the singular barrier to degree completion. In addition, while MATH 1111 could be part of the pathway for STEM majors, STEM majors must take MATH 1113 Pre-Calculus or Calculus in Area A2, so students who would need to start in MATH 1111 are already a step behind as STEM majors. Moreover, the mathematicians have told us that MATH 1111 College Algebra is a course that exists to prepare students for taking Pre-Calculus and
Calculus. It is not the most appropriate mathematics course for students whose programs of study will not require them to take a Calculus course.

The Area A2 alternatives to MATH 1111 College Algebra for non-STEM majors are MATH 1001 Quantitative Reasoning or MATH 1101 Introduction to Mathematical Modeling. Most institutions only offer one of these two courses. For purposes of this discussion, these courses are equivalent in the sense that they are alternatives to College Algebra for non-STEM majors.

USG mathematicians have issued the following statement:

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. Quantitative Reasoning and Introduction to Mathematical Modeling were designed to meet the needs of non-STEM majors and include significant real-world applications. They are appropriate, rigorous mathematics courses for a broad array of non-STEM programs of study in which deep knowledge of and facility with basic mathematics are essential to prepare students for responsible citizenship.

It is important to note that these courses are not “algebra free.” They are rigorous mathematical courses that incorporate essential algebra skills for non-STEM majors in an appropriate context.

You are being asked to decide which mathematics course will be established as the default Area A2 mathematics course for students in your discipline. The default course is the course that academic advisors will recommend to most students majoring in your discipline. Please remember that students are free to take higher level mathematics courses if they place higher.

Your choice is between MATH 1111 College Algebra and the alternative (MATH 1001 Quantitative Reasoning or MATH 1101 Introduction to Mathematical Modeling). You do not need to specify which of the alternative courses is appropriate, since most institutions do not offer both. If you specify MATH 1111 College Algebra as the default for your discipline, you must offer justification as to why this is the most appropriate Area A2 course; typically justification will need to include documentation that Calculus is required at some point in this program of study.
Changing the CIP to a STEM discipline should not change this answer to this question.

The Academic and Student Affairs Handbook, section 2.4.7 states that students in "sciences" which they define as science, technology and math must take pre-calculus as their Area A2 math. Students majoring in engineering and all Tech students must take calculus as their Area A2 mathematics.

Here's the essential verbiage: For students majoring in mathematics, physics, chemistry, biology, engineering technology, architecture, computer science, geology, geography (B.S.), forestry, pharmacy, physical therapy, secondary science, or mathematics education, pre-calculus must be the required mathematics course in Area A2 at all institutions. In this document, these majors are collectively referred to as "science programs." Institutions may require pre-calculus in Area A2 for majors in agricultural science and environmental science. While students may fulfill this requirement with a math course higher than pre-calculus, institutions may not require them to do so.

A calculus course is required in Area A2 for all engineering majors and for all programs at Georgia Institute of Technology. While students may fulfill this requirement with a math course higher than a first course in calculus, institutions may not require them to do so.

Because psychology programs are not included on the list of "science" programs, my interpretation is that institutions may not require psychology students to take pre-calculus or calculus in Area A2, as is required for other STEM majors. Recognizing Psychology as a STEM subject does not determine the appropriate mathematics courses for psychology students to take.

My suggestion would be that if there is a recognized math sequence for psychology students that includes pre-calculus and calculus, then those student should start in MATH 1111 (or higher if they place higher). MATH 1111 >>> MATH 1113 (Pre-calculus) >>>>>> Calculus
If psychology students are not required to take pre-calculus or calculus, then they should start with MATH 1001 or 1101, followed by statistics in Area D. MATH 1001 or 1101 >>>> Statistics.

This should not affect or be affected by Psychology’s status as a STEM discipline.