Proposed prerequisite change for MA 110

Current description:

> MA 110 ALGEBRA AND TRIGONOMETRY FOR CALCULUS. (4)
>
> This is a course specifically designed for students intending to enroll in a calculus sequence. Topics will include trigonometric functions, exponentials and logarithms, graphs, polar coordinates and conic sections. Students may not receive credit for MA 110 and either of MA 109 and MA 112. This course is not available for credit to students who have received credit in any higher numbered mathematics course except for MA 111, MA 123, MA 162, MA 201 or MA 202. Credit is not available by special examination. Math placement exam recommended. Lecture, three hours, recitation two hours per week. Prereq: Two years of high school algebra and a Math ACT score of 23 or above, or two years of high school algebra and a Math SAT score of 540 or above, or appropriate score on math placement exam, or a C in MA 109, or consent of department.

The course description would be unchanged. We propose the following change to the prerequisites.

> Prereq: Two years of high school algebra and a Math ACT score of 25 or above, or two years of high school algebra and a Math SAT2016 score of 590 or above, or appropriate score on math placement exam, or a C in MA 109, or consent of department.

Effective date: This change should become effective for students enrolling in the Fall of 2020.

Rationale

This course was created around 1990 at the request of the College of Engineering to prepare students for Calculus. Over time, a convention has developed that the admission requirement to pre-engineering status includes meeting the prerequisites for MA 110.

If we examine the performance of students in this course, in Calculus, and in the College of Engineering we find that very few of the students who begin

this course do well in Calculus (MA 113 or 137) or an Engineering major. This is poor investment of scarce University resources and of our students tuition dollars.

In discussions with the College of Engineering, the Department of Mathematics has come to an agreement that we should raise the prerequisites for MA 110 in concert with an increase of admission standards for the college of Engineering.

We note that our placement indicators are crude predictors of success and we will have the choice of either setting the prerequisites high and refuse entry to many students who would succeed in the course or set the prerequisites at a lower level and fail some students who meet the placement indicator.

In recognition of these problems, we provide students who feel they are prepared for MA 110 several alternate paths to meet the prerequisite. These include the option of taking a proctored ALEKS exam. We also provide placement via MathIndex3 (a linear combination of Math ACT and HS GPA). It appears that this will provide a slightly more reliable way to place students into our courses. Our expectation is that the HS GPA helps to identify students who are willing and able to do the work needed to succeed in our courses.

Proposal on MathIndex and ALEKS

1. Discontinue wide-spread ALEKS testing. It appears that the effort of testing all entering students is not productive.

   ALEKS testing would still be appropriate for students who are not happy with their initial placement. This includes APP students who should take the opportunity to place into a credit-bearing course. Placement using ALEKS would require a proctored score.

2. Since we will not have ALEKS scores for many students, we can no longer use MathIndex2 which incorporates ALEKS. Thus, we propose to discard MathIndex2 and replace it with a new placement indicator, MathIndex3, based only on Math ACT and High School GPA. The Department will allow students to register in MA 109, 110, 113, 123, and 137 using this indicator.

   The proposed MathIndex3 is given by

   $$\texttt{MathIndex3} = 8.333 * \texttt{HSGPA} + 1.852 * \texttt{ACT.Q}.$$

The resulting decimal is rounded to the nearest even integer to give the value used for placement.

The proposed cut scores for MathIndex3 are in the table below. The table also includes the proposed Math SAT2016 and Math ACT cut scores for MA 110. We used the "Guide to the 2018 ACT/SAT Concordance" published by the College Board to establish these equivalences. The Math ACT and Math SAT2016 scores for the other courses are the scores currently in use by the registrar's office.

Course	MI3 score	Math ACT	Math SAT2016	ALEKS
MA 109	68	21	540	46
MA 110	76	25	590	61
MA 111	62	19	500	30
MA 113/137	80	27	650	76
MA 123	78	26	620	61

Table 1: Proposed cut scores for MathIndex3

A longer document is available making the case that MathIndex3 is an appropriate placement indicator and showing that the cut scores are roughly equivalent to our ACT cut scores. In the case of MA 110, the MathIndex3 cut score is intended to be equivalent to the proposed MA 110 cut score of Math ACT 25.

Russell Brown, November 19, 2018