**Common Sense for Common Core**

Steve Newman and Mike Waters

**College-and-Career Readiness.** College and career readiness is the overarching goal of education in Kentucky and throughout the nation. The common core state standards were designed to help states reach this goal. In Kentucky, these standards were incorporated into the Kentucky Core Academic Standards (KCAS). The following statement in the mathematics standards is central to our discussion.

*A second major transition is the transition from high school to post-secondary education for college and careers. The evidence concerning college and career readiness shows clearly that the knowledge, skills, and practices important for readiness include a great deal of mathematics prior to the boundary defined by (+) symbols in these standards. Indeed, some of the highest priority content for college and career readiness comes from Grades 6-8. This body of material includes powerfully useful proficiencies such as applying ratio reasoning in real-world and mathematical problems, computing fluently with positive and negative fractions and decimals, and solving real-world and mathematical problems involving angle measure, area, surface area, and volume. Because important standards for college and career readiness are distributed across grades and courses, systems for evaluating college and career readiness reach as far back in the standards as Grades 6-8*.

This is certainly true of the ACT, KYOTE and COMPASS math exams used to evaluate college readiness in Kentucky. These exams also give heavy emphasis to the basic algebra covered by the Grades 7-8 standards, the algebra that, according to the standards, students are assumed to have learned by the time they reach high school. For example, students are supposed to have learned positive and negative integer exponents by Grade 8; the high school standards begin with rational exponents.

In order to get more of our students ready for college and career, we must work to insure that high school students master these basic topics in arithmetic, algebra and simple geometry. We can do so by reinforcing these basic topics, and using them to teach more advanced topics.

However, if we try to cover too many topics too quickly, especially those for which students are not prepared, then our students end up with a superficial exposure to many topics and a mastery of very few or none. In particular, students will not master the basic topics in arithmetic, algebra and simple geometry they will need to become college and career ready. A curriculum that is “a mile wide and an inch deep” has long been a criticism of American mathematics instruction and ironically one that the common core state standards were intended to correct.

**Assessments.** The ACT QualityCore end-of-course (EOC) assessment in Algebra II is the current and only measure of achievement (proficiency) in high school mathematics. (ACT, PLAN, KYOTE and COMPASS measure college and career readiness.) There are concerns about this exam that we have discussed in previous KYOTE meetings. It covers an exceptionally large number of topics. A significant number of these topics are optional (+) topics in the KCAS or not in the KCAS at all. Still others are advanced topics in the KCAS, and many teachers feel their students are not yet prepared to study these topics.

Efforts by teachers to cover all these topics to improve achievement may ironically have a *negative impact* on efforts to get more Kentucky students college-and-career ready. Achievement goals and college-and-career readiness goals in the accountability system should be better aligned. Students would be better served by covering fewer topics in greater depth, and mastering the essential topics they need to become college-and-career ready.

We will consider how to focus an EOC assessment in Algebra II to promote college readiness more effectively. (It is likely that no existing assessment will align with our findings, but that will not be our concern at this meeting.) We will discuss topics that could be de-emphasized or eliminated on an EOC Algebra II exam in order to focus Algebra II courses on those topics that will help more of our students to become college-and-career ready.

The following topics are among those that an EOC assessment in Algebra II should not cover. Removing these topics would help focus an Algebra II course on more important topics essential for college readiness.

**Trigonometric Functions.** Topics covered by the trigonometric functions standards (F-TF-page 5, 6) should not be on an EOC assessment in Algebra II. Very few teachers covered these topics in Algebra II in the past and very few found time to cover them in any significant way to prepare for the ACT QualityCore assessment. Not all students need these topics to be successful in college. Students who intend to pursue STEM and other math intensive majors should take a precalculus or trigonometry course after completing Algebra II to get a thorough and in-depth understanding of these topics.

**Logarithmic Functions.** Logarithms are mentioned as topics for all students in standards (A-REI.11-page 3), (F-IF.7e-page 4), and (F-LE.4-page 5). The argument for not including logarithms on an EOC assessment in Algebra II is similar to the trigonometry topics. Logarithms are best covered thoroughly and in-depth in a precalculus course rather than superficially and quickly in an Algebra II course.

*Note 1*: The Kentucky team of postsecondary and K-12 math teachers who examined an early version of the common core state standards in January of 2010 unanimously recommended that the content on unit-circle trigonometry and logarithms should be put in the optional (+) category. The next version of the standards followed this recommendation but later versions changed course and required these topics for all students.

*Note 2*: A similar discussion arose during the development of the American Diploma Project benchmarks in mathematics in 2003, a national initiative to define college readiness in which Kentucky played a leading role. It was decided in that case to make these topics optional and *not* to require them for all students.

*Note 3*: Kentucky colleges and universities teach trigonometry and logarithms in their precalculus courses, and not in their college algebra courses, to insure that students get a comprehensive treatment of these topics.

**Statistics.** Descriptivestatistics (representing and categorizing data, mean and median of data sets) is an important part of college readiness. But many of the topics in (S-ID-page 6) go much further than what is needed for all students and will take a significant amount of time to cover in Algebra II, making it very difficult to cover the needed algebra. The ACT QualityCore does not contain any statistics and so teachers have not experienced this to the extent they have in the probability.

The inferential statistics (S-IC-page 7) should not be covered in Algebra II nor put on an EOC assessment in Algebra II. Students in mathematics intensive majors should consider taking a course covering this content, but a new kind of statistics course must be created to cover this simulation-based approach to inferential statistics. Neither AP Statistics nor any undergraduate statistics courses now offered in most colleges and universities would cover the content in the way suggested by these standards. Needless to say, this content is not covered by any of Kentucky’s college readiness exams.

*Note 4*: The NKU Department of Mathematics and Statistics has developed a new required course STA 204: Statistics for Middle Grades Teachers for middle school mathematics teachers that approaches statistics content in the way suggested by the standards. An equivalent course for elementary teachers is under development.

**Probability.** The probability content in the high school math KCAS (S-CP-page7) involves primarily conditional probability and independence**.** These topics can consume a significant amount of instructional time in Algebra II and are *not* assessed on the ACT or on the college placement exams KYOTE and COMPASS used to define college readiness in Kentucky. There is some elementary probability on the ACT, but this content is best described by the Grade 7 mathematics standards.

Conditional probability and independence topics in the KCAS should not be included in an EOC assessment in Algebra II for these reasons. This will help focus the Algebra II course and help improve college readiness.

*Note 5*: Kentucky colleges and universities offer a variety of courses in statistics and in probability, and courses that cover a mixture of both topics. But no attempt has been made to cover any statistics and probability in a college algebra course or a precalculus course.

**Conclusion**. The topics we suggest be de-emphasized or eliminated on an end-of-course assessment in Algebra II are important. But we feel they should be taught in other high school courses where they can get the in-depth treatment they deserve. Our objective is to reduce the number of topics students and teachers must cover in Algebra II so they can focus in depth on the essential topics in algebra so critical for college and career readiness.

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