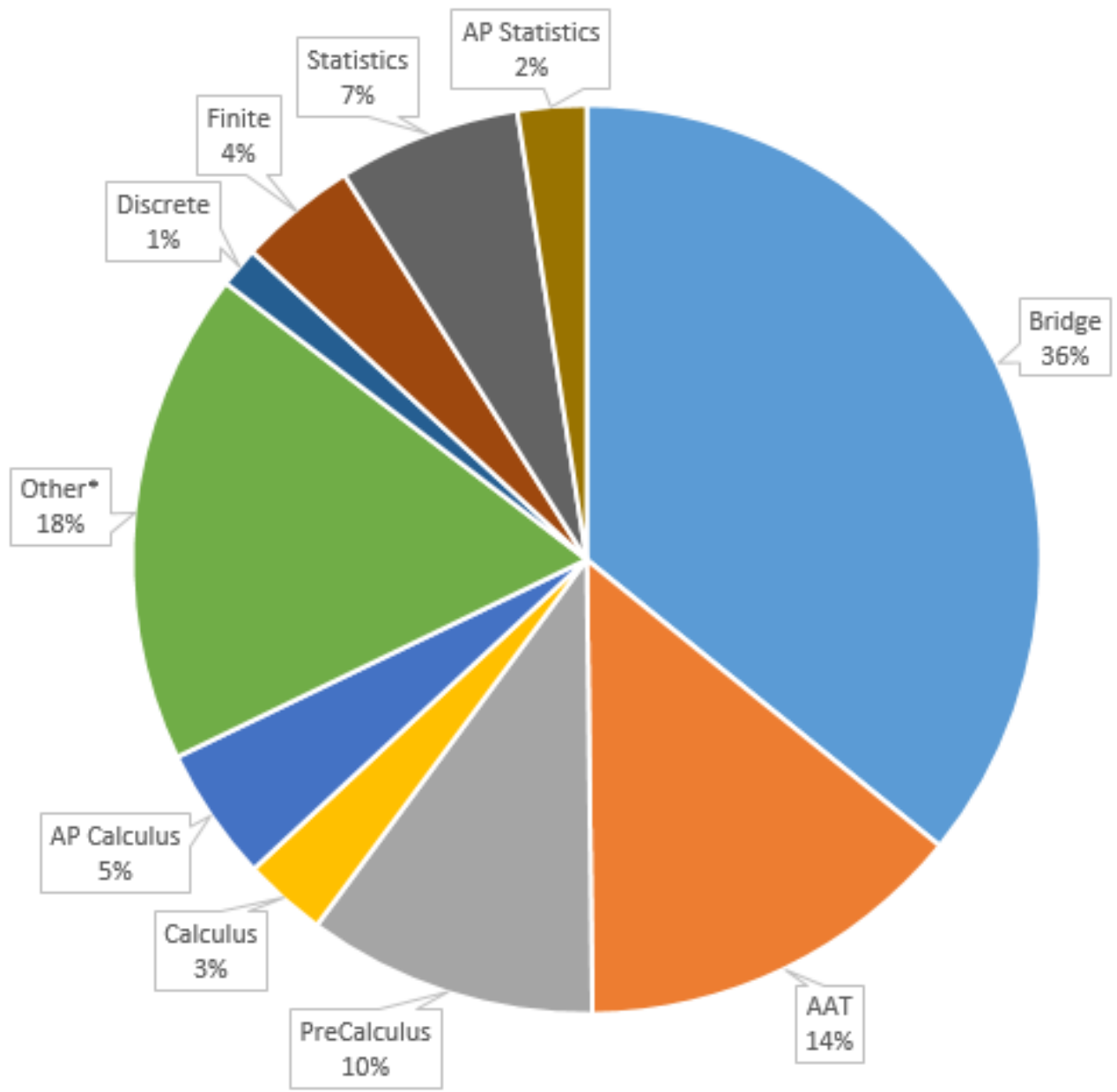


Tennessee Math Standards
High School Team

**Recommendations
for High School Math
Fourth-Year Courses**

Presented to the Board of Education

October 22, 2015



■ Bridge ■ AAT ■ PreCalculus ■ Calculus ■ AP Calculus ■ Other ■ Discrete ■ Finite ■ Statistics ■ AP Statistics

Current Placement Decisions

Based on:

- **Availability in the district**
- **Additional courses in district**
- **Student ability or preference**
- **Local agreements with post-secondary institutions**
- **Advice from parents and guidance counselors**

Guiding Principles and Goals

- **High expectations for Tennessee students**
- **Retention of rigorous standards**
- **Clearly defined and coherent pathways from K-11 courses through fourth year courses and into post-secondary work**
- **Equity and opportunity for all students**
- **Coursework aligned with student interest in post-secondary fields**

Shift from ability-based pathway to a discipline- and career-based pathway

Basic Plan for Fourth Year Courses

- **Five courses with state provided standards**

Applied Mathematical Concepts Bridge Math
Calculus Precalculus Statistics

- **Dual credit challenge exams for four of the courses to provide the opportunity for college credit**

(excludes Bridge Math)

- **Remove three courses from support**

Applied Algebra and Trigonometry
Senior Finite Math Discrete Mathematics

Bridge Math

- **1/3 of TN Seniors enroll in Bridge Math**
- **Overenrolled?**
- **Students capable of more?**
- **New Standards**
 - Created using a combination of previous standards, ACT standards, SAILS standards
 - More contextual

Highlights of Bridge Math Changes

Ways of Looking: Revisiting Concepts

Category	Domain	
Mathematics (GM)	Diagrammatic Mathematics (W-DM)	<ol style="list-style-type: none"> 1. Identify the graph of $f(x)$. 2. Create and use absolute value functions. 3. Given an equation of a line, find the x and y intercepts. 4. Compute the perimeter and area of a polygon. 5. Apply a variety of strategies to solve problems. 6. Investigate the area of a circle.
	Verbal Mathematics (W-VM)	<ol style="list-style-type: none"> 1. Understand that a line is a function. 2. Apply similar triangles. 3. Use several angle properties to solve problems. 4. Describe, compare, and contrast functions. 5. Multiply, divide and subtract. 6. Use mathematical models.
	Symbolic Mathematics (W-SM)	<ol style="list-style-type: none"> 1. Operate with numbers and algebraic expressions. 2. Develop a thorough understanding of rational and irrational numbers and operations. 3. Use mathematical symbols and notation. 4. Model a variety of problems. 5. Skillfully manipulate algebraic expressions. 6. Understand how mathematical models are used. 7. Perform polynomial and rational operations. 8. Demonstrate fluency in multiplication. 9. Rationalize denominators.
	Mathematics (GM)	<ol style="list-style-type: none"> 1. Understand that a line is a function. 2. Graph quadratic equations. 3. Find the solution of a system of linear equations. 4. Operate (add, subtract, multiply, divide) with rational numbers. 5. Operate (add, subtract, multiply, divide) with algebraic expressions.

Tennessee's State Math

Domain	Cluster	
The Real Number System (N-RN)	Use properties of rational and irrational numbers.	<ol style="list-style-type: none"> 1. Use rational numbers.
Quantities* (N-Q)	Reason quantitatively and use units to solve problems.	<ol style="list-style-type: none"> 2. Use units as a way to check answers. 3. Define appropriate quantities for the model. 4. Solve problems involving rates. 5. Solve problems involving unit rates. 6. Solve problems involving unit rates.
Complex Numbers (N-IM)	Work with complex numbers.	<ol style="list-style-type: none"> 1. Know there are complex numbers.

Bridge Math

- **Designed for students who have not score 19 or higher on ACT**
- **Opportunity for remediation**
- **College level expectations**
- **Standards comparable to ACT college and career readiness standards**
- **Extend topics from previous courses**
- **Emphasis on real-world contexts**
- **Major revision of former standards**

Precalculus

- **10% of high school students enroll in Precalculus with 14% in Advanced Algebra and Trigonometry**
- **98% of the districts offer one of the two classes with 74% offering both**
- **100% of the current AAT standards are standards in Precalculus**
- **Precalculus also includes parametric equations, conic sections, polar coordinates and trigonometric functions**

Precalculus

- **Designed for students interested in STEM majors or careers**
- **More rigorous than Advanced Algebra and Trigonometry**
- **Standards revised to incorporate movement of earlier standards**
- **Better alignment with ACT college and career readiness standards**
- **Better alignment with expectations in college-level Precalculus courses**

Statistics

- **9% of high school students enroll in Stats or AP Stats**
- **Entry level college math course shifting from College Algebra to Probability and Statistics**
- **Approximately 28% of Tennessee Transfer Pathways require basic statistics, while only 2.5% require College Algebra**

Statistics

- **Designed for students interested in business, social sciences, education, data analysis**
- **More relevant to non-STEM college majors and careers**
- **Standards revised to incorporate movement of earlier standards**
- **Better alignment with ACT college and career readiness**
- **Better alignment with standards in college-level Statistics courses**

Calculus

- **Designed for students interested in STEM majors who have completed Precalculus**
- **Current standards align with previous coursework, similar courses in other states, and ACT standards for college and career readiness**
- **Approximately 8% of TN Seniors take Calculus or AP Calculus**
- **Approximately 23% of Tennessee Transfer Pathways require Calculus 1**
- **No major changes to Calculus standards recommended**

Applied Mathematical Concepts - NEW

- **Only 5% of students enroll in Senior Finite Math or Discrete Mathematics**
- **60 – 70% of school districts do not offer Senior Finite Math or Discrete Mathematics**
- **From 2011 to 2014, Discrete Mathematics enrollment dropped from 1754 to 1015**
- **From 2011 to 2014, Senior Finite Math enrollment increased from 156 to 2871**
- **Both Discrete Mathematics and Senior Finite Math include content that is relevant to college and career readiness**

Applied Mathematical Concepts - NEW

- **Designed for students interested in careers that use applied mathematics such as banking, industry, or human resources**
- **Rich problem solving experience**
- **Combines standards from Senior Finite Math and Discrete Mathematics**
- **Designed with industry needs in mind**
- **Alignment with ACT college and career readiness standards**

Applied Mathematical Concepts - NEW

Topics include:

- **In-depth study of financial mathematics**
- **Linear programming**
- **Basic probability and statistics beyond earlier courses**
- **Counting techniques and combinatorial reasoning**
- **Problem solving approaches**
- **Logic and Boolean algebra**
- **Sets**
- **Analysis of arguments**

Tennessee Math Standards Review and Development Committee

**The Tennessee
Board of Education should
develop dual credit challenge
exams for four of the five
fourth-year courses
(excluding Bridge Math)**

Dual Credit Challenge Exams

- Develop in conjunction with post-secondary institutions
- Review existing exams for coherence, rigor and alignment with post-secondary expectations

High School Course	Corresponding College Course
Bridge Math	Provides entry into entry-level college mathematics course (college algebra, statistics, discrete mathematics, or finite mathematics)
Precalculus	Precalculus
Statistics	Statistics
Calculus	First course in Calculus
Applied Mathematical Concepts	College level discrete mathematics or finite mathematics course

Tennessee Math Standards Review and Development Committee

**Tennessee Board of Education
should remove standards
for three math courses:
Advanced Algebra and Trigonometry,
Discrete Mathematics,
and Senior Finite Math.**

Tennessee Math Standards High School Team

Questions?