

Math 105A: Mathematics and Pedagogy for Teaching Secondary Mathematics

- [Math 105B](#)
- [Math 105C](#)

Description

Math 105A is a team-taught course that aims to help you connect your undergraduate coursework to the secondary mathematics curriculum and to deepen your understanding of the mathematics you will teach. This course also aims to teach you new mathematics content using various research-based instructional strategies. It emphasizes problem solving and student presentation of solutions.

Math 105A also aims to teach you a variety of research based instructional strategies, skill with the technology and software used in schools, and skill with various models for secondary mathematics topics. This course includes readings of current math education research as well as state and national content standards for the teaching of secondary mathematics. It also requires observation in local secondary schools.

General Information

Prerequisites:

Undergraduate students should be mathematics majors and graduate students should be in the GSE&IS Teacher Education Program. Success in the course depends upon a solid foundation in the coursework required for a bachelor's degree in mathematics (specifically upper division coursework in Algebra, Geometry and Analysis), as well as a commitment to teaching secondary mathematics. (Senior math majors may be a few courses short of the math course requirement for the bachelor's degree, and TEP students may have a strong minor in mathematics rather than a major.) Course enrollment is by PTE. Enrollment is restricted to the following groups of students:

- senior mathematics majors with demonstrated success in the above-mentioned upper- division mathematics coursework and demonstrated interest in mathematics teaching
- graduate students in the GSE&IS Teacher Education Program

Required Texts/Supplies:

Z. Usiskin, A. Perssini, E.A. Marchisotto, and D. Stanley, *Mathematics for High School Teachers, An Advanced Perspective*. (2003) Prentice Hall, Saddle River, NJ

The Mathematics Framework for California Public Schools (available at <http://www.cde.ca.gov/ci/ma/cf/documents/mathfrwkcomplete.pdf>)

The National Council of Teachers of Mathematics Principles and Standards for School Mathematics (sign up for online access to this document at <http://standardstrial.nctm.org/triallogin.asp>)

J.D. Bransford, A.L. Brown, R.R. Cocking, Eds., *How People Learn: Brain, Mind, Experience, and School*, Expanded Edition. (2000) National Research Council, Washington, D.C.

J. Stigler, J. Hiebert, *The Teaching Gap* (1999) The Free Press, NY

TI 84 Plus graphing calculator (distributed by TI at a required training on October 28th)

Instructor Information:

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Meeting Information:

Mondays, 4 - 8 PM, MS 6221. Usually there will be a 20 minute break for nourishment.

Course Grade Components:

Problems of the Week and Homework Exercises: 25%

Several homework exercises (mostly from the text) will be assigned each week, with solutions due the following week. When a POW is assigned, a complete solution, including a thorough description of the solution process, and problem solving strategies used is due the following week.

Quizzes: 10%

A brief quiz covering straightforward mathematics material recently covered in the course will be given at the start of each class.

Reading Summaries: 10%

Readings of math education research or professional standards will be assigned regularly, with brief summaries and reflections due via online submission.

Course and Lesson Design: 10%

Students will work in groups to write a course and unit plan for an Algebra or Pre-algebra course which is in accordance with the California Framework and the NCTM Standards and Principles.

Secondary Classroom Observations: 10%

Students will observe for 5 hours in an assigned secondary classroom. Observation notes will be taken. Students will write a Standards in Practice paper identifying the California Standards and NCTM Principles and Standards covered in the observed classes.

Final: 25%

A final exam will be given in the first two quarters of the sequence and a final portfolio will be due in the third quarter of the sequence. Collection of the elements for the final portfolio will be incorporated throughout the three quarter 105 sequence, including work on a paper tracing the development of a mathematical idea through the secondary and undergraduate curriculum.

Participation: 10%

Attendance and promptness to class, active pursuit of problem solutions, presentation of problem solutions to fellow students, and engagement in and completion of the work of the model lessons plans will be assessed.

Please note the following policies:

No late assignments will be accepted.

A student who misses a final exam may receive an incomplete grade in the course providing the student (i) has completed all other grade components at a passing level, (ii) has an ironclad excuse (such as a medical emergency), and (iii), if possible, contacts one of the instructors on or before the day of the final exam to arrange a meeting.

Week	
1	Intro to Problem Analysis; intro to definition
2	Number: integers - history and algebraic structure; comparing methods for teaching $(-a)(-b) = +ab$
3	Number: rationals - definition and algebraic structure; comparing models for rational division
4	Number: reals - decimals, irrationals, countability; method for teaching rational operations
5	Attendance at all day Texas Instruments PTE
6	Number: complex - polar, rectangular, and exponential representations and their advantages, De Moivre's Theorem; model lesson to introduce i
7	Number: complex - stereographic projection; model lesson on modeling probabilistic data with linear functions
8	Function: definitions; model lesson on modeling probabilistic data with exponential functions
9	Joint Meeting with the science team: modeling one dimensional motion with linear and quadratic functions
10	Function: model lesson on maximum box volume problem; review for final
For each of the above content pieces, the teaching, curriculum, and assessment of the content at the secondary level are introduced and analyzed in the context of current research and recommendations.	