

Course Outline for MATH 4972, Advanced Mathematics for Teaching

MATH 4972 Advanced Mathematics for Teaching (3 units)

Prerequisite: MATH 442 or [MATH 3511](#); and MATH 481 or [MATH 4201](#).

Advanced exploration of the mathematics taught in California's public high schools and middle schools through problem analysis, concept analysis, and problem connections. Introduction to mathematics education research. 3 lectures. Formerly MATH 423.

Course Learning Objectives	
1	Identify and solve problems related to place-value and properties of numbers that connect undergraduate and school mathematics and that use concrete manipulatives and/or technology when appropriate.
2	Identify and solve problems related to limits and functions that connect undergraduate and school mathematics and that use concrete manipulatives and/or technology when appropriate.
3	Identify and solve problems related to number theory and equivalence that connect undergraduate and school mathematics and that use concrete manipulatives and/or technology when appropriate.
4	Identify and solve problems related to geometric ideas that connect undergraduate and school mathematics and that use concrete manipulatives and/or technology when appropriate.
5	Identify and solve problems related to algebraic structures and equations that connect undergraduate and school mathematics and that use concrete manipulatives and/or technology when appropriate.
6	Identify and solve problems related to trigonometry that connect undergraduate and school mathematics and that use concrete manipulatives and/or technology when appropriate.
7	Read and critique mathematics education literature and the common core mathematics standards.

Expanded Course Content

Textbooks, materials, and/or other resources
Instructor Course Notes Optional Supplementary Texts 1. Boaler, Jo, What's Math Got to Do with It 2. Stigler, James and Hiebert, James, The Teaching Gap

Week	Readings	Topics of Discussion
1	Course notes and workbook	Topics relating to numbers including place value, base-n, standard and non-standard algorithms in base-n
2	Course notes and workbook	Topics relating to numbers including operations, algorithms for addition, subtraction, multiplication, division, number talks
3	Course notes and workbook	Topics relating to numbers including operations with positive and negative values, area models for multiplication and division, types of division
4	Course notes and workbook	Topics relating to numbers including prime numbers, fundamental theorem of arithmetic, divisibility rules
5	Course notes and workbook	Topics relating to numbers including decimals, percent, repeating decimals, division by 0, ratio and proportion
6	Course notes and workbook	Topics relating to functions including zero-product property, difference of squares, rules for functions and relations
7	Course notes and workbook	Topics relating to functions including quadratics, completing the square, quadratic formula, discriminant, properties of parabolas
8	Course notes and workbook	Topics relating to functions including trigonometric functions, radians and pi, trigonometric identities
9	Course notes and workbook	Topics relating to geometry including volume and area, optimization in a geometric context
10	Course notes and workbook	Topics relating to geometry including representing 3D shapes in 2D, spatial reasoning
11	Course notes and workbook	Topics relating to geometry including reasoning with planar figures, congruence, similarity, classifying geometric shapes, and proof in geometry
12	Course notes and workbook	Probability topics, including conditional and unconditional probabilities, disjoint vs independent events, 'and' and 'or,' and counting principles

Week	Readings	Topics of Discussion
13	Course notes and workbook	Data and measurement topics including measures of center, reporting findings, making statistically sound arguments
14	Course notes and workbook Student-identified readings in mathematics education research	Final course project
15	Course notes and workbook Student-identified readings in mathematics education research	Final course project

Method of Assessment

The possible methods of assessment are written individual examinations, quizzes, in-class worksheets and presentations, projects, and homework. One or more midterms and a cumulative final exam are required.

Instructional Mode

The instructional mode for this class is face-to-face. This designation means that the essential academic standards of the course require in-class student engagement, and thus remote instruction is not appropriate.