Elementary Mathematics

Standard 1: Knowledge of Mathematical Problem Solving			
Description	**Indicators**	**Map to Field Experiences/ Map to Curriculum and Course Experiences**	**Assessment Strategies**
Candidates know, understand, and apply the process of mathematical problem solving.	Candidates can: • Apply and adapt a variety of appropriate strategies to solve problems. • Solve problems that arise in mathematics and those involving mathematics in other contexts. • Build new mathematical knowledge through problem solving. • Monitor and reflect on the process of mathematical problem solving.		
Standard 2: Knowledge of Reasoning and Proof			
Description	**Indicators**	**Map to Field Experiences/ Map to Curriculum and Course Experiences**	**Assessment Strategies**
Candidates reason, construct, and evaluate mathematical arguments and develop an appreciation for mathematical rigor and inquiry.	Candidates can: • Recognize reasoning and proof as fundamental aspects of mathematics. • Make and investigate mathematical conjectures. • Develop and evaluate		

	mathematical arguments and proofs. • Select and use various types of reasoning and methods of proof.		

Standard 3: Knowledge of Mathematical Communication			
Description	**Indicators**	**Map to Field Experiences/ Map to Curriculum and Course Experiences**	**Assessment Strategies**
Candidates communicate their mathematical thinking orally and in writing to peers, faculty, and others.	Candidates can: • Communicate their mathematical thinking coherently and clearly to peers, faculty, and others. • Use the language of mathematics to express ideas precisely. • Organize mathematical thinking through communication. • Analyze and evaluate the mathematical thinking and strategies of others.		

Standard 4: Knowledge of Mathematical Connections			
Description	**Indicators**	**Map to Field Experiences/ Map to Curriculum and Course Experiences**	**Assessment Strategies**
Candidates recognize, use, and make connections between and among mathematical ideas and	Candidates can: • Recognize and use connections among		

in contexts outside mathematics to build mathematical understanding.	mathematical ideas. • Recognize and apply mathematics in contexts outside of mathematics. • Demonstrate how mathematical ideas interconnect and build on one another to produce a coherent whole.		

Standard 5: Knowledge of Mathematical Representation

Description	Indicators	Map to Field Experiences/ Map to Curriculum and Course Experiences	Assessment Strategies
Candidates use varied representations of mathematical ideas to support and deepen students' mathematical understanding.	Candidates can: • Use representations to model and interpret physical, social, and mathematical phenomena. • Create and use representations to organize, record, and communicate mathematical ideas. • Select, apply, and translate among mathematical representations to solve problems.		

Standard 6: Knowledge of Technology

Description	Indicators	Map to Field Experiences/ Map to Curriculum and Course Experiences	Assessment Strategies

Candidates embrace technology as an essential tool for teaching and learning mathematics.	Candidates can: • Use knowledge of mathematics to select and use appropriate technological tools, such as but not limited to, spreadsheets, dynamic graphing tools, computer algebra systems, dynamic statistical packages, graphing calculators, data-collection devices, and presentation software.		

Standard 7: Dispositions

Description	Indicators	Map to Field Experiences/ Map to Curriculum and Course Experiences	Assessment Strategies
Candidates support a positive disposition toward mathematical processes and mathematical learning.	Candidates can: • Attention to equity • Use of stimulating curricula • Effective teaching • Commitment to learning with understanding • Use of various assessments • Use of various teaching tools including technology		

Standard 8: Knowledge of Mathematics Pedagogy

Description	Indicators	Map to Field Experiences/ Map to Curriculum and Course Experiences	Assessment Strategies
Candidates possess a deep understanding of how students learn mathematics and of the pedagogical knowledge specific to mathematics teaching and learning.	The candidate: • Selects, uses, and determines suitability of the wide variety of available mathematics curricula and teaching materials for all students including those with special needs such as the gifted, challenged and speakers of other languages. • Selects and uses appropriate concrete materials for learning mathematics. • Uses multiple strategies, including listening to and understanding the ways students think about mathematics, to assess students' mathematical knowledge. • Plans lessons, units and courses that address appropriate learning goals, including those that address local, state, and national mathematics standards and legislative mandates. • Participates in		

	professional mathematics organizations and uses their print and on-line resources. • Demonstrates knowledge of research results in the teaching and learning of mathematics. • Uses knowledge of different types of instructional strategies in planning mathematics lessons. • Demonstrates the ability to lead classes in mathematical problem solving and in developing in-depth conceptual understanding, and to help students develop and test generalizations. • Develop lessons that use technology's potential for building understanding of mathematical concepts and developing important mathematical ideas.		
Standard 9: Knowledge of Number and Operation			
Description	**Indicators**	**Map to Field Experiences/ Map to Curriculum and Course Experiences**	**Assessment Strategies**
Candidates demonstrate computational proficiency, including a conceptual	Candidates can: • Develop the meaning of addition, subtraction,		

understanding of numbers, ways of representing number, relationships among number and number systems, and meanings of operations.	multiplication, and division and provide multiple models for whole number operations and their applications. • Recognize the meaning and use of place value in representing whole numbers and finite decimals, comparing and ordering numbers, and understanding the relative magnitude of numbers. • Demonstrate proficiency in multi-digit computation using algorithms, mental mathematics, and computational estimation. • Analyze integers and rational numbers, their relative size, and how operations with whole numbers extend to integers and rational numbers. • 9.5 Demonstrate knowledge of the historical development of number and number systems • Includes contributions from diverse cultures.		

Standard 10: Knowledge of Different Perspectives on Algebra

Description	Indicators	Map to Field Experiences/ Map to Curriculum and Course Experiences	Assessment Strategies

Candidates emphasize relationships among quantities including functions, ways of representing mathematical relationships, and the analysis of change.	Candidates can: • Explore and analyze patterns, relations, and functions. • Recognize and analyze mathematical structures. • Investigate equality and equations. • Use mathematical models to represent quantitative relationships. • Analyze change in various contexts. • Demonstrate knowledge of the historical development of algebra including contributions from diverse cultures.		
Standard 11: Knowledge of Geometries			
Description	**Indicators**	**Map to Field Experiences/ Map to Curriculum and Course Experiences**	**Assessment Strategies**
Candidates use spatial visualization and geometric modeling to explore and analyze geometric shapes, structures, and their properties.	Candidates can: • Use visualization, the properties of two- and three-dimensional shapes, and geometric modeling. • Build and manipulate representations of two- and three-dimensional objects using concrete		

	models, drawings, and dynamic geometry software. • Specify locations and describe spatial relationships using coordinate geometry. • Apply transformations and use symmetry, congruence, and similarity. • Demonstrate knowledge of the historical development of Euclidean and non-Euclidean geometries including contributions from diverse cultures.		
Standard 12: Knowledge of Data Analysis, Statistics, and Probability			
Description	**Indicators**	**Map to Field Experiences/ Map to Curriculum and Course Experiences**	**Assessment Strategies**
Candidates demonstrate an understanding of concepts and practices related to data analysis, statistics, and probability.	Candidates can: • Design investigations that can be addressed by creating data sets and collecting, organizing, and displaying relevant data. • Use appropriate statistical methods and technological tools to analyze data and describe shape, spread, and center.		

	• Apply the basic concepts of probability. • Demonstrate knowledge of the historical development of probability and statistics including contributions from diverse cultures.		
Standard 13: Knowledge of Measurement			
Description	**Indicators**	**Map to Field Experiences/ Map to Curriculum and Course Experiences**	**Assessment Strategies**
Candidates apply and use measurement concepts and tools.	Candidates can: • Recognize and apply measurable attributes of objects and the units, systems, and processes of measurement. • Employ estimation as a way of understanding measurement units and processes. • Demonstrate knowledge of the historical development of measurement and measurement systems including contributions from diverse cultures.		
Standard 14: Field-Based Experiences			
Description	**Indicators**	**Map to Field Experiences/**	**Assessment Strategies**

		Map to Curriculum and Course Experiences	
Candidates complete field-based experiences in mathematics classrooms.	Candidates can: • Engage in a sequence of planned opportunities prior to student teaching that includes observing and participating in middle grades mathematics classrooms under the supervision of experienced and highly qualified teachers. • Experience full-time student teaching in elementary grades mathematics that is supervised by an experienced and highly qualified teacher and an organizational supervisor with elementary grades mathematics teaching experience. • Demonstrate the ability to increase students' knowledge of mathematics.		