Competencies for Middle Childhood Teachers: MATHEMATICS, Grades 4-8

In addition to the Arkansas Teaching Standards, the teacher of middle childhood mathematics, grades 4-8, shall be able to meet the expectations set by the following content-specific competencies:

1. Numbers and Operations Praxis (5169)	1.1 Understands operations and properties of the real number system 1.2 Understands the relationships among fractions, decimals, and percents 1.3 Knows how to use ration reasoning to solve problems 1.4 Knows how to use proportional relationships to solve real-world problems 1.5 Knows how to use basic concepts of number theory (e.g., divisibility, prime factorization, multiples) to solve problems 1.6 Knows a variety of strategies to determine the reasonableness of results
2. Algebra Praxis (5169)	2.1 Knows how to evaluate and manipulate algebraic expressions, equations, and formulas 2.2 Knows how to recognize and represent linear relationships algebraically 2.3 Knows of to solve linear equations and inequalities 2.4 Knows how to represent and solve nonlinear equations and inequalities 2.5 Knows how to represent and solve systems of equations and inequalities 2.6 Knows how to recognize and represent simple sequences or patterns (e.g., arithmetic, geometric)
3. Functions and Their Graphs Praxis (5169)	3.1 Knows how to identify, define, and evaluate functions 3.2 Knows how to determine and interpret the domain and the range of a function numerically, graphically, and algebraically 3.3 Understands basic characteristics of linear functions (e.g., slope, intercepts) 3.4 Understands the relationships among functions, tables, and graphs 3.5 Knows how to analyze and represent functions that model given information
4. Geometry and Measurement Praxis (5169)	4.1 Knows how to solve problems involving perimeter, area, surface area, and volume 4.2 Understands the concepts of similarity and congruence 4.3 Understands properties of lines (e.g., parallel, perpendicular, intersecting) and angles 4.4 Understands properties of triangles 4.5 Understands properties of quadrilaterals (e.g., rectangle, rhombus, trapezoid) and other polygons

	4.6	Understands properties of circles
	4.7	Knows how to interpret geometric relationships in the xy-plane (e.g., transformations, distance, midpoint)
	4.8	Understands systems of measurement (e.g., metric, customary)
	4.9	Is familiar with how geometric constructions are made
5. Probability, Statistics, and Discrete Mathematics Praxis (5169)	5.1	Knows how to interpret and analyze data presented in various forms
	5.2	Knows how to represent data in various forms
	5.3	Knows how to develop, use, and evaluate probability models
	5.4	Understands concepts associated with measures of central tendency and dispersion (spread)
	5.5	Knows how to model and solve problems using simple diagrams, flowcharts, or algorithms
6. Computing Concepts AR CSS K-8	6.1	Demonstrate understanding of computational thinking and problem solving by - Analyzing problem solving strategies - Analyzing connections between elements of mathematics and computer science - Solving problems cooperatively and collaboratively 6.2 Demonstrate understanding of data and information by - Analyzing various ways in which data is represented Collecting, arranging, and representing data - Interpreting and analyzing data and information 6.3 Demonstrate understanding of algorithms and computer programs by - Creating, evaluating, and modifying algorithms - Creating computer programs to solve problems 6.4 Demonstrate understanding of computers and communications by - Analyzing the utilization of computers - Utilizing appropriate digital tools for various applications - Analyzing various components and functions of computers 6.5 Demonstrate understanding of community, global, and ethical impacts by analyzing appropriate uses of technology
7. Mathematical Practices NCTM	7.1	Use problem solving to develop conceptual understanding, make sense of a wide variety of problems and persevere in solving them, apply and adapt a variety of strategies in solving problems confronted within the field of mathematics and other contexts, and formulate and test conjectures in order to frame generalizations
	7.2	Reason abstractly, reflectively, and quantitatively with attention to units, constructing viable arguments and proofs, and critiquing the reasoning of others; represent and model

		generalizations using mathematics; recognize structure and express regularity in patterns of mathematical reasoning; use multiple representations to model and describe mathematics; and utilize appropriate mathematical vocabulary and symbols to communicate mathematical ideas to others
	7.3	Formulate, represent, analyze, and interpret mathematical models derived from real-world contexts or mathematical problems
	7.4	Organize mathematical thinking and use the language of mathematics to express ideas precisely, both orally and in writing to multiple audiences
	7.5	Demonstrate the interconnectedness of mathematical ideas and how they build on one another and recognize and apply mathematical connections among mathematical ideas and across various content areas and real-world contexts
	7.6	Model how the development of mathematical understanding within and among mathematical domains intersects with the mathematical practices of problem solving, reasoning, communicating, connecting, and representing
8. Content Pedagogy NCTM	8.1	Apply knowledge of curriculum standards for middle grades mathematics and their relationship to student learning within and across mathematical domains
	8.2	Analyze and consider research in planning for and leading students in rich mathematical learning experiences
	8.3	Plan lessons and units that incorporate a variety of strategies, differentiated instruction for diverse populations, and mathematics-specific and instructional technologies in building all students' conceptual understanding and procedural proficiency
	8.4	Provide students with opportunities to communicate about mathematics and make connections among mathematics, other content areas, everyday life, and the workplace
	8.5	Implement techniques related to student engagement and communication including selecting high quality tasks, guiding mathematical discussions, identifying key mathematical ideas, identifying and addressing student misconceptions, and employing a range of questioning strategies
	8.6	Plan, select, implement, interpret, and use formative and summative assessments to inform instruction by reflecting on mathematical proficiencies essential for all students
	8.7	Monitor students' progress, make instructional decisions, and measure students' mathematical understanding and ability using formative and summative assessments
9. Mathematical Learning Environment	9.1	Exhibit knowledge of pre-adolescent and adolescent learning, development, and behavior and demonstrate a positive disposition toward mathematical processes and learning

NCTM	9.2	Plan and create developmentally appropriate, sequential, and challenging learning opportunities grounded in mathematics education research in which students are actively engaged in building new knowledge from prior knowledge and experiences
	9.3	Incorporate knowledge of individual differences and the cultural and language diversity that exists within classrooms and include culturally relevant perspectives as a means to motivate and engage students
	9.4	Demonstrate equitable and ethical treatment of and high expectations for all students
	9.5	Apply mathematical content and pedagogical knowledge to select and use instructional tools such as manipulatives and physical models, drawings, virtual environments, spreadsheets, presentation tools, and mathematics-specific technologies (e.g., graphing tools and interactive geometry software); and make sound decisions about when such tools enhance teaching and learning, recognizing both the insights to be gained and possible limitations of such tools
10. Impact on Student Learning NCTM	10.1	Verify that middle grades students demonstrate conceptual understanding; procedural fluency; the ability to formulate, represent, and solve problems; logical reasoning and continuous reflection on that reasoning; productive disposition toward mathematics; and the application of mathematics in a variety of contexts within major mathematical domains
	10.2	Engage students in developmentally appropriate mathematical activities and investigations that require active engagement and include mathematics-specific technology in building new knowledge
	10.3	Collect, organize, analyze, and reflect on diagnostic, formative, and summative assessment evidence and determine the extent to which students' mathematical proficiencies have increased as a result of instruction
11. Professional Knowledge and Skills AMLE NCTM	11.1	Take an active role in professional growth by participating in professional development experiences that directly relate to the learning and teaching of mathematics.
	11.2	Engage in continuous and collaborative learning that draws upon research in mathematics education to inform practice; enhance learning opportunities for all students' mathematical knowledge development; involve colleagues, other school professionals, families, and various stakeholders; and advance development as a reflective practitioner
	11.3	Utilize resources from professional mathematics education organizations such as print, digital, and virtual resources/collections

	11.4 Understand, reflect on, and succeed in unique roles as middle level professionals (e.g., members of teaching teams and advisors to young adolescents)
	11.5 Serve as advocates for all young adolescents and for developmentally responsive schooling practices
	11.6 Understand and value the ways diverse family structures and cultural backgrounds influence and enrich learning
	11.7 Demonstrate positive orientations toward teaching young adolescents and model high standards of ethical behavior and professional competence
12. Young Adolescent Development AMLE	12.1 Use comprehensive knowledge of young adolescent development to create healthy, respectful, supportive, and challenging learning environments for all young adolescents, including those whose language and cultures are different from your own
	12.2 Demonstrate understanding of the implications of diversity on the development of young adolescents by ● Implementing curriculum and instruction that is responsive to young adolescents' local, national, and international histories, language/dialects, and individual identities ● Participating successfully in middle level practices that consider and celebrate the diversity of all young adolescents
	12.3 Apply knowledge of young adolescent development when making decisions about respective roles in creating and maintaining developmentally responsive learning environments
13. Middle Level Philosophy and School Organization AMLE	13.1 Demonstrate an understanding of the philosophical foundations of developmentally responsive middle level programs and schools
	13.2 Utilize knowledge of the effective components of middle level programs and schools to foster equitable educational practices and to enhance learning for all students and apply this knowledge and function successfully within a variety of school organizational settings
14. Professional Responsibilities AMLE	14.1 Understand, reflect on, and succeed in unique roles as middle level professionals (e.g., members of teaching teams and advisors to young adolescents)
	14.2 Serve as advocates for all young adolescents and for developmentally responsive schooling practices
	14.3 Understand and value the ways diverse family structures and cultural backgrounds influence and enrich learning
	14.4 Demonstrate positive orientations toward teaching young adolescents and model high standards of ethical behavior and professional competence