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

2013

In addition to the Arkansas Teaching Standards, the teacher of middle childhood mathematics, grades 4-8, shall demonstrate knowledge and competencies in the following areas:

1. Operations and Algebraic Thinking (OA) AMLE: 2a,2b CCSS-MATH: OA, 4-5 NCTM: Grades 3-5 Expectations Praxis II (5169): IA, IE, IF, IIF, IVG	1.1 Knowledge of operations and properties of the real number system 1.2 Knowledge of how to use basic concepts of number theory (e.g., divisibility, prime factorization, multiples) to solve problems 1.3 Knowledge of a variety of strategies to determine the reasonableness of results 1.4 Knowledge of how to generate, recognize and represent and analyze sequences or patterns (e.g., arithmetic, geometric) 1.5 Knowledge of how to interpret geometric relationships in the xy-plane (e.g., transformations, distance, midpoint)
2. Number and Operations in Base-10 (NBT) AMLE: 2a,2b CCSS-MATH: NBT, 4-5 NCTM: Grades 3-5 Expectations Praxis II (5169): IA, IB	2.1 Knowledge of operations and properties of the real number system 2.2 Ability to understand the place value system and the relationships among fractions, decimals, and percent
3. Number and Operations – Fractions (NF) AMLE: 2a,2b CCSS-MATH: NF, 4-5 NCTM: Grades 3-5 Expectations Praxis II (5169): IA, IB, IF	3.1 Knowledge of operations, ordering and properties of the real number system 3.2 Ability to understand the relationships among fractions, decimals, and percent. (e.g., equivalent fractions, representations using various models) 3.3 Knowledge of how to use proportional relationships to solve real-world problems
4. Ratios and Proportional Relationships (RP) AMLE: 2a,2b CCSS-MATH: RP, 6-7 NCTM: Grades 3-5 Expectations Praxis II (5169): IC, ID	4.1 Knowledge of how to use ratio reasoning to solve problems 4.2 Knowledge of how to use proportional relationships to solve real-world problems
5. The Number System (NS)	5.1 Ability to understand operations and properties of the real number system. (e.g., rational and irrational numbers)

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AMLE: 2a,2b CCSS-MATH: NS, 6-8 NCTM: Grades 3-5 Expectations Praxis II (5169): IA, IB, IE, IF, IVG	5.2 Ability to understand the relationships among fractions, decimals, and percent 5.3 Knowledge of how to use basic concepts of number theory (e.g., divisibility, prime factorization, multiples) to solve problems 5.4 Knowledge of a variety of strategies to determine the reasonableness of results 5.5 Knowledge of how to interpret geometric relationships in the xy-plane (e.g., transformations, distance, midpoint)
6. Number and Quantity (NQ) AMLE: 2a,2b CCSS-MATH: NQ, HS NCTM: Grades 3-5 Expectations Praxis II (5169): IA, IB, IC, ID, IE, IF	6.1 Ability to understand operations and properties of the real number system 6.2 Ability to understand the relationships among fractions, decimals, and percent 6.3 Knowledge of how to use ratio reasoning to solve problems 6.4 Knowledge of how to use proportional relationships to solve real-world problems 6.5 Knowledge of how to use basic concepts of number theory (e.g., divisibility, prime factorization, multiples) to solve problems 6.6 Knowledge of a variety of strategies to determining the reasonableness of results
7. Algebra (A) AMLE: 2a,2b CCSS-MATH: A, HS NCTM: Grades 3-5 Expectations Praxis II (5169): IIA, IIB, IIC, IID, IIE	7.1 Knowledge of how to evaluate and manipulate algebraic expressions, equations, and formulas 7.2 Knowledge of how to recognize, represent, and create linear relationships algebraically 7.3 Knowledge of how to solve linear equations and inequalities 7.4 Knowledge of how to represent and solve nonlinear equations and inequalities 7.5 Knowledge of how to represent and solve systems of equations and inequalities
8. Expressions and Equations (EE) AMLE: 2a,2b CCSS-MATH: EE, 6-8 NCTM: Grades 3-5 Expectations Praxis II (5169): IA, IF, IIA, IIB, IIC, IIE, IIIC, IIID, IIIE	8.1 Ability to understand operations and properties of the real number system 8.2 Knowledge of a variety of strategies to determine the reasonableness of results 8.3 Knowledge of how to evaluate and manipulate algebraic expressions, equations, and formulas 8.4 Knowledge of how to recognize and represent linear relationships algebraically 8.5 Knowledge of how to solve linear equations and inequalities

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	8.6 Knowledge how to represent and solve systems of equations and inequalities 8.7 Ability to understand basic characteristics of linear functions (e.g., slope, intercepts) 8.8 Ability to understand the relationships among functions, tables and graphs. (e.g., radicals, integer exponents) 8.9 Knowledge of how to analyze and represent functions that model given information
9. Functions (F) AMLE: 2a,2b CCSS-MATH: F, 8 NCTM: Grades 3-5 Expectations Praxis II (5169): IIF, IIIA, IIIB, IIIC, IIID, IIIE	9.1 Knowledge of how to recognize and represents sequences or patterns (e.g., arithmetic, geometric) 9.2 Knowledge of how to identify, define, compare and evaluate functions 9.3 Knowledge of how to determine and interpret the domain and the range of a function numerically, graphically, and algebraically 9.4 Ability to understand basic characteristics of linear functions (e.g., slope, intercepts) 9.5 Ability to understand the relationships among functions, tables and graphs 9.6 Knowledge of how to analyze and represent functions that model given information
10. Modeling (M) AMLE: 2a,2b CCSS-MATH: M, HS NCTM: Grades 3-5 Expectations Praxis II (5169): IF, IIIE, VE	10.1 Knowledge of a variety of strategies to determine the reasonableness of results 10.2 Knowledge of how to analyze and represent functions that model given information 10.3 Knowledge of how to model and solve problems using simple diagrams, flowcharts, or algorithms
11. Measurement and Data (MD) AMLE: 2a,2b CCSS-MATH: MD, 4-5 NCTM: Grades 3-5 Expectations Praxis II (5169): IVA, IVE, IVH,VA	11.1 Knowledge of how to solve problems involving perimeter, area, surface area, and volume 11.2 Ability to understand properties of quadrilaterals (e.g., rectangle, rhombus, trapezoid) and other polygons 11.3 Ability to understand systems of measurement (e.g., metric, customary) 11.4 Knowledge of how to interpret and analyze data presented in various forms

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12. Geometry (G) AMLE: 2a,2b CCSS-MATH: G, 4-8, HS NCTM: Grades 3-5 Expectations Praxis II (5169): IC, IVA, IVB, IVC, IVD, IVE, IVF, IVG, IVI, IVJ	12.1 Knowledge of how to use ratio reasoning to solve problems 12.2 Knowledge of how to solve problems involving perimeter, area, surface area, and volume 12.3 Ability to understand the concepts of similarity and congruence 12.4 Ability to understand properties of lines (e.g., parallel, perpendicular, intersecting) and angles 12.5 Ability to understand properties of triangles 12.6 Ability to understand properties of quadrilaterals (e.g., rectangle, rhombus, trapezoid) and other polygons 12.7 Ability to understand properties of circles 12.8 Knowledge of how to interpret geometric relationships in the xy-plane (e.g., transformations, distance, midpoint) 12.9 Ability to understand how geometric constructions are made 12.10Ability to understand the basic concepts of trigonometry (e.g., the unit circle, right triangle trigonometry)
13. Statistics and Probability (SP) AMLE: 2a,2b CCSS-MATH: SP, 6-8, HS NCTM: Grades 3-5 Expectations Praxis II (5169): VA, VB, VC, VD, VE	13.1 Knowledge of how to interpret and analyze data presented in various forms 13.2 Knowledge of how to represent data in various forms 13.3 Knowledge of how to develop, use, and evaluate probability models 13.4 Ability to understand concepts associated with measures of central tendency and dispersion (spread) 13.5 Knowledge of how to model and solve problems using simple diagrams, flowcharts, or algorithms
14. Disciplinary Literacy* ACEI: 2.1 CCSS-ELA: RI.K-5.1-10; RH.6.1-10; RST.6.1-10; W.K-6.1-10; WHST.6.1-10	<u>Reading in Science and Technical Subjects, Grades 6-8</u> 14.1 Knowledge of developmentally appropriate scientific and technical texts across genres, cultures, and centuries 14.2 Ability to select developmentally appropriate scientific and technical texts, using all measures of text complexity: qualitative, quantitative, and reader and task 14.3 Ability to read scientific and technical texts closely and critically to analyze the key ideas and details as well as craft and structure with the purpose of integrating knowledge and ideas both within and across texts by • Citing specific textual evidence to support analysis of science and technical texts • Determining the central ideas or conclusions of a text ○ Providing an a accurate summary of the text distinct from prior knowledge or opinions • Following precisely a multistep procedure when carrying

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	out experiments, taking measurements, or performing technical tasks • Determining the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context • Analyzing the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic • Analyzing the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text • Integrating quantitative or technical information expressed in words in a text with a version of that information expressed visually • Distinguishing among facts, reasoned judgment based on research findings, and speculation in a text <u>Writing in History/Social Studies, Science, and Technical Subjects, Grades 6-8</u> 14.4 Ability to write opinion pieces on topics or texts, supporting a point of view with reasons and information by • Introducing a topic or text clearly, stating an opinion, and creating and organizational structure in which ideas are logically grouped to support the writer's purpose • Providing logically ordered reasons that are supported by facts and details • Linking opinion and reasons using words, phrases, and clauses • Providing a concluding statement or section related to the opinion presented 14.5 Ability to write arguments focused on discipline-specific content by • Introducing claim(s) about a topic or issue, acknowledging and distinguishing the claim(s) from alternate or opposing claims, and organizing the reasons and evidence logically • Supporting claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources • Using words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence • Establishing and maintaining a formal style • Providing a concluding statement or section that follows from and supports the argument presented

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	14.6 Ability to write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments or technical processes by • Introducing a topic clearly, previewing what is to follow o Organizing ideas, concepts, and information into broader categories as appropriate to achieving purpose o Including formatting, graphics, and multimedia when useful to aiding comprehension • Developing the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples • Using appropriate and varied transitions to create cohesion and clarifying the relationships among ideas and concepts • Using precise language and domain-specific vocabulary to inform about or explain the topic • Establishing and maintaining a formal style and objective tone • Providing a concluding statement or section that follows from and supports the information or explanation presented 14.7 Ability to incorporate narrative elements effectively into arguments and informative/explanatory texts by • Incorporating narrative accounts into analyses of individuals or events of historical import • Writing precise enough descriptions of the step-by-step procedures used in scientific investigations or technical work that others can replicate them and (possibly) reach the same results 14.8 Ability to produce and distribute writing by • Producing clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience • Developing and strengthening writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed • Demonstrating a command of Standard grammar and conventions 14.9 Ability to demonstrate the grade-level expectations for using technology by • Using the Internet to produce and publish writing as well as to collaborate with others • Presenting the relationships between information and

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	ideas clearly and efficiently 14.10 Ability to use research to build and present knowledge by • Conducting short research projects to answer a question (including a self-generated question) ○ Drawing on several sources ○ Generating additional related, focused questions that allow for multiple avenues of exploration • Gathering relevant information from multiple print and digital sources ○ Using search terms effectively ○ Assessing the credibility and accuracy of each source ○ Quoting or paraphrasing the data and conclusions of others ○ Avoiding plagiarism ○ Following a standard format for citation • Drawing evidence from informational texts to support analysis, reflection, and research

***Disciplinary Literacy Competencies for K-6 and 4-8**
Based on the CCSS, the Disciplinary Literacy Competencies for K-5 address all content areas across the Reading Informational and Writing strands. The competencies for grades 6-8 are presented in one grade band that is divided as follows: Reading in History/Social Studies, Reading in Science and Technical Subjects, and Writing in History/Social Studies, Science, and Technical Subjects.

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