

## Content and Pedagogical Standards for Grade 1- 4 Mathematics Teachers

| A. Pedagogical Standards                                                                                                                                                            | Knowledge Indicator                                                                                                                                                                                                            | Performance indicator                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
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| <b>Standard 1.</b><br>The competent teacher of mathematics communicates mathematical content and concepts.                                                                          | <p>The competent mathematics teacher:</p> <ul style="list-style-type: none"> <li>• Understands the dynamics of working collaboratively with others.</li> <li>• Understands learning styles and learning strategies.</li> </ul> | <p>The competent mathematics teacher:</p> <ul style="list-style-type: none"> <li>• Communicates verbally and in written, visual, and symbolic forms using appropriate technology.</li> <li>• Creates effective learning environments where students will be able to work collaboratively in one-to-one, small-group, and large-group contexts analyzes the thinking and learning strategies of all students to extend mathematical knowledge.</li> <li>• Selects or interpret appropriate concrete examples, pictorial illustrations, and symbolic representations in developing mathematical concepts.</li> </ul> |
| <b>STANDARD 2</b><br>The competent teacher of mathematics develops and utilizes a variety of problem-solving techniques.                                                            | <ul style="list-style-type: none"> <li>• Understands the many strategies for problem solving.</li> </ul>                                                                                                                       | <ul style="list-style-type: none"> <li>• Identify appropriate mathematical problems from real-world situations.</li> <li>• Apply problem-solving strategies to solve non routine problems with multiple steps.</li> <li>• generalizes results of problems and extends them to other problem situations</li> <li>• uses problem explorations and modeling to extend mathematical knowledge of all students.</li> </ul>                                                                                                                                                                                              |
| <b>STANDARD 3</b><br>The competent teacher of mathematics recognizes a variety of reasoning techniques and applies appropriate techniques to concepts, procedures, and conjectures. | <ul style="list-style-type: none"> <li>• Understands various ways of reasoning with respect to concepts, procedures, and conjectures.</li> </ul>                                                                               | <ul style="list-style-type: none"> <li>• Identify deductive and inductive reasoning.</li> <li>• Identify valid mathematical arguments (e.g., an explanation that the sum of two odd numbers is always even).</li> <li>• Identify the hypothesis and conclusion, given a conditional statement.</li> <li>• Identify the converse, inverse, and contra-positive of a conditional statement.</li> <li>• Select logical conclusions from given statements</li> <li>• Select appropriate technologies in the development of concepts, procedures, and conjectures</li> </ul>                                            |

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|                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <ul style="list-style-type: none"> <li>• Generalizes reasoning skills within the study of mathematics and applies or extends them to other contexts.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>STANDARD 4</b><br>The competent teacher of mathematics makes connections within and among the various branches of mathematics and other disciplines.                                    | <ul style="list-style-type: none"> <li>• Understands the connections within the mathematics curriculum.</li> <li>• Understands mathematical connections to school curriculums and to other disciplines.</li> <li>• Has knowledge of the historical development of mathematics that includes contributions of men and women from various cultures.</li> </ul>                                                                                                      | <ul style="list-style-type: none"> <li>• Develops the connections within and among the various branches of mathematics.</li> <li>• Connects mathematics to other disciplines.</li> <li>• Identify common misconceptions in mathematics.</li> <li>• Identify the relationship between mathematical concepts</li> <li>• Identify and analyze mathematical errors, including computation, algebraic, data analysis, and geometric errors.</li> </ul>                                                                                                                                                                       |
| <b>STANDARD 5</b><br>The competent teacher of mathematics selects, integrates and uses appropriate technologies.                                                                           | <ul style="list-style-type: none"> <li>• Understands the selection, integration, and utilization of appropriate technologies throughout the mathematics curriculum.</li> <li>• Becomes familiar with the capabilities and benefits of current and emerging technologies.</li> </ul>                                                                                                                                                                               | <ul style="list-style-type: none"> <li>• Integrates current technology as appropriate for instruction.</li> <li>• Selects appropriate technologies for instruction.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>STANDARD 6</b><br>The competent teacher of mathematics understands the process of reading and demonstrates instructional abilities to teach reading in the content area of mathematics. | <ul style="list-style-type: none"> <li>• Understands that the reading process is the construction of meaning through the interactions of the reader's background knowledge and experiences, the information in the text, and the purpose of the reading situation.</li> <li>• Recognizes the relationships among the four language arts (reading, writing, listening, and speaking), and knows how to provide opportunities to integrate these through</li> </ul> | <ul style="list-style-type: none"> <li>• Plans and teaches lessons for students that develop comprehension of content-area materials through instructional practices that include analyzing critically, evaluating sources, and synthesizing and summarizing material.</li> <li>• Monitor comprehension and correct confusions and misunderstandings that arise during reading.</li> <li>• Plans and models the use of comprehension strategies before, during, and after reading of text.</li> <li>• Provides opportunities for students to develop content-area vocabulary through instructional practices</li> </ul> |

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|                                                                                                                       | <p>instruction.</p> <ul style="list-style-type: none"> <li>• Understands how to design, select, modify and evaluate materials in terms of the reading needs of the learner.</li> <li>• Understands the importance of the relationship between assessment and instruction in planning.</li> <li>• Understands the relationship between oral and silent reading.</li> <li>• Understands the role of subject-area vocabulary in developing reading comprehension.</li> <li>• Understands the importance of the unique study strategies required of the specific content area in developing reading comprehension.</li> <li>• Understands the importance of and encourages the use of literature for adolescents in the curriculum and for independent reading.</li> </ul> | <p>that develop connections and relationships among words, use of context clues, and understanding of connotative and denotative meaning of words.</p> <ul style="list-style-type: none"> <li>• Plans and teaches lessons that encourage students to write about the content read in order to improve understanding.</li> <li>• Promotes the development of an environment that includes classroom libraries that foster reading.</li> <li>• Plans and teaches units that require students to carry out research or inquiry using multiple texts, including electronic resources.</li> <li>• Provides continuous monitoring of students' progress through observations, work samples, and various informal reading assessments.</li> <li>• Analyzes and evaluates the quality and appropriateness of instructional materials in terms of readability, content, length, format, illustrations, and other pertinent factors.</li> <li>• Plans and teaches lessons to help students develop study strategies that include previewing and preparing to read text effectively, recognizing organizational patterns unique to informational text, and using graphic organizers as an aid for recalling information.</li> </ul> |
| <b>B. Content Standard</b>                                                                                            | <b>Knowledge Indicator</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>Performance indicator</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <p><b>STANDARD 1</b><br/>The competent teacher of mathematics demonstrates, applies, and explains a knowledge and</p> | <ul style="list-style-type: none"> <li>• Knows the properties of prime and composite numbers</li> <li>• Understands decimals, fractions, ratios, proportions, and percents as ways to represent numbers and relationships.</li> <li>• Understands number sense,</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <ul style="list-style-type: none"> <li>• Uses number sense to judge the reasonableness of results.</li> <li>• Applies proportional reasoning to solve problems.</li> <li>• Uses the properties of prime and composite numbers to determine greatest common factors and least common multiples to solve problems.</li> <li>• Performs operations in base 10.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

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| <p>sense of number, concepts and operations.</p>                                                                      | <p>including concepts of order, magnitude, mental math, estimation, and place value, and senses the reasonableness of results.</p> <ul style="list-style-type: none"> <li>• Understands decimals, fractions, ratios, proportions, and percents as ways to represent numbers and relationships.</li> </ul> | <ul style="list-style-type: none"> <li>• Chooses appropriately from mental math, paper and pencil, manipulative, and technology to perform computations.</li> <li>• Identify elements and subsets of the real number system.</li> <li>• Compare the relative size of real numbers expressed in a variety of forms, including fractions, decimals, percents, and scientific notation.</li> <li>• Identify estimation strategies.</li> <li>• Identify equivalent forms of rational exponents and radicals.</li> <li>• Simplify expressions.</li> <li>• Determine the prime factorization of whole numbers.</li> <li>• Identify the greatest common factor (GCF) and least common multiple (LCM) of sets of numbers.</li> <li>• Evaluate numerical expressions using order of operations.</li> <li>• recognizes and analyzes appropriate alternative algorithms for the four basic operations with whole numbers, fractions, and decimals;</li> <li>• apply place value and other number properties to develop techniques of mental mathematics and computational estimation; and</li> <li>• demonstrate a sense of equivalency among different representations of rational numbers.</li> <li>• Solve real-world problems using proportions.</li> </ul> |
| <p><b>STANDARD 2</b><br/>The competent teacher of mathematics understands and applies the process of measurement.</p> | <ul style="list-style-type: none"> <li>• Has knowledge of non-standard and emerging units such as graphic screen pixels and font size.</li> <li>• Knows how to measure length, area, volume, capacity, time, temperature, angles, weight, and mass.</li> </ul>                                            | <ul style="list-style-type: none"> <li>• Uses customary, metric, and nonstandard measures.</li> <li>• Selects and uses appropriate tools to perform various measurements.</li> <li>• Estimates measurement.</li> <li>• Compares units of measurement and relates the smaller and larger units of time, length, weight, volume. Money and mass.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

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| <b>STANDARD 3</b><br>The competent teacher of mathematics demonstrates, applies and explains a knowledge and sense of algebra via patterns, functions, symbols, and models | <ul style="list-style-type: none"> <li>• Understands the order of operations.</li> <li>• Understands the concept of variables.</li> <li>• Understands symbolic, numeric, and graphical representations of mathematical situations.</li> <li>• Understands the properties and operations of whole numbers in an algebraic context.</li> <li>• Understands the properties of the whole number systems.</li> <li>• Understands the properties of sets and Venn diagrams.</li> </ul> | <ul style="list-style-type: none"> <li>• Applies the order of operations to numerical and algebraic expressions.</li> <li>• Identifies, completes, and extends patterns and sequences.</li> <li>• Represents mathematical situations symbolically, numerically, and graphically.</li> <li>• Applies properties and operations of whole numbers in an algebraic context.</li> <li>• Solves number sentences involving variables.</li> <li>• Translates word situations to algebraic sentences and solves them using algebra.</li> <li>• Uses equations and inequalities as a means of solving practical applications..</li> <li>• Performs simple operations with sets</li> <li>• Recognizes properties of sets</li> </ul> |
| <b>STANDARD 4</b><br>The competent teacher of mathematics knows and uses geometric: methods to analyze, categorize, and draw conclusions about                             | <ul style="list-style-type: none"> <li>• Understands terminology, properties of two- and three-dimensional shaper, and the relationships among them.</li> <li>• Understands inductive and deductive reasoning</li> <li>• Understands inductive and deductive reasoning and</li> </ul>                                                                                                                                                                                            | <ul style="list-style-type: none"> <li>• Recognizes relationships and patterns in geometric figures.</li> <li>• Uses characteristics of geometric figures to recognize, identify, build, draw, describe, analyze, and categorize two- and three-dimensional figures.</li> <li>• Applies geometric concepts to solve practical applications.</li> <li>• Explains the relationships between perimeter, area, and</li> </ul>                                                                                                                                                                                                                                                                                                 |

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| points, lines, planes, and space                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | volume of similar figures.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>STANDARD 5</b><br>The competent teacher of mathematics demonstrates knowledge and application of probability, descriptive and inferential statistics. | <ul style="list-style-type: none"> <li>• Understands how to create tables, graphs, charts, pictures, and other visual representations of a set of data.</li> <li>• Understands simple random sampling and recognizes bias.</li> <li>• Understands line of best fit.</li> <li>• Understands measures of central tendency, variation, and position.</li> <li>• Understands common distributions.</li> <li>• Understands the design of observations and experiments to answer questions.</li> <li>• Understands the concept of reliability and validity.</li> <li>• Understands dependent and independent events.</li> <li>• Understands probability and odds of events</li> </ul> | <ul style="list-style-type: none"> <li>• Creates tables, graphs, charts, pictures, and other visual representations of a set of data.</li> <li>• Collects simple random samples and recognizes sample bias.</li> <li>• Uses visual techniques for finding, interpreting, and applying the line of best fit.</li> <li>• Uses measures of central tendency and variation to describe a set of data.</li> <li>• Uses common distributions as appropriate to solve problems.</li> <li>• Develops a hypothesis based on a question or problem of interest and devises a plan for the collection of data.</li> <li>• Uses simple survey and sampling techniques.</li> <li>• Collects, records, organizes, displays, summarizes, and interprets data.</li> <li>• Computes probabilities for dependent and independent events.</li> <li>• Determines the probability and odds of events.</li> <li>• Analyzes problem situations (e.g., fairness of games, lotteries).</li> <li>• Creates simulations to analyze simple theoretical or experimental probabilities.</li> </ul> |