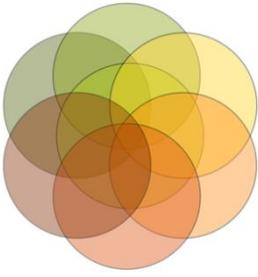


**Oklahoma Academic
Standards for Mathematics**

Third DRAFT

September, 2015



Acknowledgements

The Oklahoma Academic Standards for Mathematics 2015 is the result of the contributions of many mathematics teachers and mathematics educators from across the state. We believe this document reflects a balanced synthesis of the work of all members of the Oklahoma Academic Standards for Mathematics Writing Committee.

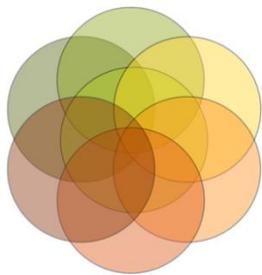
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Introduction

The Oklahoma Academic Standards for Mathematics 2015 specify what students should know and be able to do as learners of mathematics at the end of each grade level or course. Students are held responsible for learning standards listed at earlier grade levels as well as their current grade level. Following each of the standards are **Sample Problems or Classroom Activities (Forthcoming)** that clarify the standards and provide possibilities for their implementation.

Throughout this document, the standards are written to allow time for study of additional material at every grade level. The order of the standards at any grade level is not meant to imply a sequence of topics and should be considered flexible for the organization of any course. The document provides standards for PK-7, Pre-Algebra, Algebra I, Geometry, Algebra II with Algebra I as the pre-requisite for both Geometry and Algebra II.

Development of the Oklahoma Academic Standards for Mathematics

The Oklahoma Academic Standards for Mathematics writing team drew on the work of the National Council of Teachers of Mathematics (NCTM) standards documents; the National Research Council's report *Adding It Up*, the Oklahoma Priority Academic Standards (PASS), and other states' standards documents and curriculum framework guides (e.g., Minnesota, Virginia, and Massachusetts). Please see the reference list at the end of this document for a more complete list of all resources consulted.

Vision and Guiding Principles

These standards envision all students in Oklahoma will become mathematically proficient and literate through a strong mathematics program that emphasizes and engages them in problem solving, communicating, reasoning and proof, making connections, and using representations. Mathematically proficient and literate students can confidently and effectively use mathematics concepts, computation skills, and numbers to problem-solve, reason and analyze information. Developing mathematical proficiency and literacy for Oklahoma students depends in large part on a clear, comprehensive, coherent, and developmentally appropriate set of standards to guide curricular decisions. The understanding and implementation of these standards throughout PK-12 mathematics experience for students is based on the following guiding principles:

Guiding Principle 1: Excellence in mathematics education requires equity--high expectations and strong support for all students.

All students must have opportunities to study—and support to learn—mathematics. Equity does not mean that every student should receive identical instruction; instead, it demands that reasonable and appropriate accommodations be made as needed to promote access and attainment for all students.

Guiding Principle 2: Mathematical ideas should be explored in ways that stimulate curiosity, create enjoyment of mathematics, and develop depth of understanding.

Students need to understand mathematics deeply and use it effectively. To achieve mathematical understanding, students should be actively engaged in doing meaningful mathematics, discussing mathematical ideas, and applying mathematics in interesting, thought provoking situations. Student understanding is further developed through ongoing reflection about cognitively demanding and worthwhile tasks.

Tasks should challenge and engage students in mathematics in multiple ways. Short- and long-term investigations that connect procedures and skills with conceptual understanding are integral components of an effective mathematics program. Activities should build upon curiosity and prior knowledge, and enable students to solve progressively deeper, broader, and more sophisticated problems. Mathematical tasks reflecting significant mathematics should generate active classroom talk, promote the development of conjectures, and lead to an understanding of the necessity for mathematical reasoning.

Guiding Principle 3: An effective mathematics program focuses on problem solving.

Mathematical problem solving is the hallmark of an effective mathematics program. Skill in mathematical problem solving requires practice with a variety of mathematical problems as well as a firm grasp of mathematical techniques and their underlying principles. Students who possess a deeper knowledge of mathematics can then use mathematics in a flexible way to attack various problems and devise different ways of solving any particular problem. Mathematical problem solving calls for reflective thinking, persistence, learning from the ideas of others, and going back over one's own work with a critical eye. Success in solving mathematical problems helps to create an abiding interest in mathematics.

Guiding Principle 4: Technology is essential in teaching and learning mathematics.

Technology enhances the mathematics curriculum in many ways. Technology enables students to communicate ideas within the classroom or to search for needed information. It can be especially helpful in assisting students with special needs in regular and special classrooms, at home, and in the community. Technology changes what mathematics is to be learned and when and how it is learned. Tools such as measuring instruments, manipulatives (such as base ten blocks and fraction pieces), scientific and graphing calculators, and computers with appropriate software, if properly used, contribute to a rich learning environment for developing and applying mathematical concepts. Appropriate use of calculators is essential; calculators should not be used as a replacement for basic understanding and skills. Although the use of a graphing calculator can help middle and secondary students to visualize properties of functions and their graphs, graphing calculators should be used to enhance their understanding and skills rather than replace them.

Standards Overview

The Oklahoma Academic Standards for Mathematics are developed around both content and process strands. The four main content strands, Algebraic Reasoning and Algebra, Number and Operations,

Geometry and Measurement, and Data and Probability organize the content standards throughout PK-7 and Pre-Algebra. The standards for Algebra I, Algebra II, and Geometry are fundamentally organized around these strands as well. The process standards are defined as the Mathematical Actions and Processes and are comprised of the skills and abilities students should develop and be engaged in developing throughout their PK-12 mathematics education. Among these are the ability to problem solve and communicate and reason about mathematics which will help students be ready for the mathematics expectations of college and the skills desired by many employers. The process and content standards work in concert to create clear, concise and rigorous mathematics standards and expectations for Oklahoma students with the aim of helping them be college and career ready. Both content and process strands are described below.

Algebraic Reasoning and Algebra Strand: All students should be able to reason algebraically and learn algebra. This strand provides focus for the PK-7 and Pre-Algebra standards around the notion that algebra is more than moving symbols around. It is about understanding patterns, relations and functions, representing and analyzing mathematical situations and structures using algebraic symbols, using mathematical models to represent and understanding quantitative relationships, and analyzing change in various contexts. Understanding change is fundamental to algebraic reasoning and understanding the concept of function with depth. It is also fundamental to understanding many real-world problems and ideas presented in the news.

Number and Operations Strand: A focus on number and operations is the cornerstone of a strong mathematics program. Developing students' fluency with number and operations throughout their PK-12 mathematics experience requires a balance and connection between conceptual understanding and computational proficiency. This strand provides focus on the importance of students' understanding of numbers, ways of representing numbers, relationships among numbers, relationships among number systems, and meanings of operations and how they relate to one another. Further, it requires that students should be able to compute fluently and make reasonable estimates.

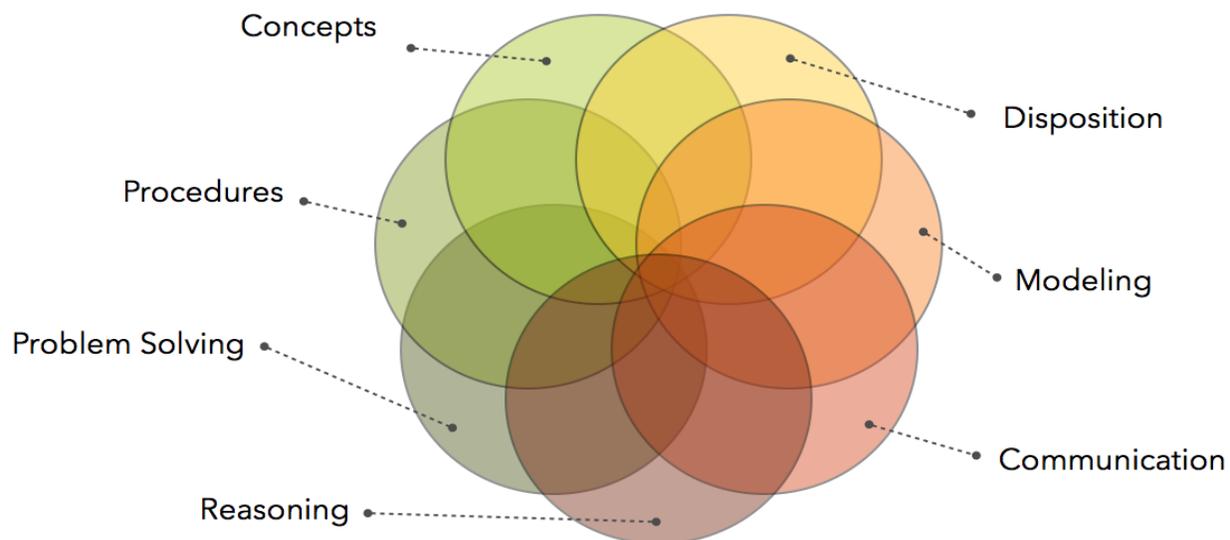
Geometry and Measurement Strand: All students should gain experience using a variety of visual and coordinate representations to analyze problems and solve mathematics and learn how to use appropriate units and tools for measuring. This strand provides focus for the PK-7 and Geometry standards around the notion that geometry and measurement help students understand and represent ideas and solve problems they will encounter in their daily lives. A focus on geometry should enable students to analyze characteristics of two- and three-dimensional objects, develop arguments based on geometric relationships, describe spatial relationships using coordinate geometry and other representational systems, apply transformations and symmetry to analyze mathematical situations, and utilize visualization, spatial reasoning and geometric modeling to solve problems. A focus on measurement should enable students to understand measurable attributes of objects and the units, systems, and processes of measurement, and apply appropriate techniques, tools, and formulas to determine measurements.

Data and Probability Strand: An increased emphasis on understanding data should span all grade levels. The idea that making sense of data and probability has become a part of our daily lives provides support for the importance of this strand throughout a students' PK-12 mathematics experience. A focus on data and probability should enable all students to formulate questions that can be addressed with data, and collect, organize, and display relevant data to answer them, select and use appropriate statistical methods to analyze data, develop and evaluate inferences and predictions that are based on data, and understand and

apply basic concepts of probability. The study of data is also an opportunity to apply the basic skills of computing with numbers while the study of probability provides application and use of fractions in daily life.

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Mathematical Actions & Processes



Throughout their Pk-12 education experience, mathematically literate students will:



Develop a Deep and Flexible *Conceptual* Understanding

Demonstrate a deep and flexible conceptual understanding of mathematical concepts, operations, and relations while making mathematical and real-world connections.



Develop Accurate and Appropriate *Procedural* Fluency

Pursue efficient procedures for various computations and repeated processes based on a strong sense of numbers. They will develop a sophisticated understanding of the development and application of algorithms and procedures.



Develop Strategies for *Problem Solving*

Analyze the parts of complex mathematical tasks and identify entry points to begin the search for a solution. They will select from a variety of problem solving strategies and use corresponding multiple representations (verbal, physical, symbolic, pictorial, graphical, tabular) when appropriate. They will pursue

solutions to various tasks from real-world situations and applications that are often interdisciplinary in nature. They will find methods to verify their answers in context and will always question the reasonableness of solutions.



Develop Mathematical *Reasoning*

Explore and communicate a variety of reasoning strategies to think through problems. They will apply their logic to critique the thinking and strategies of others to develop and evaluate mathematical arguments, including making arguments and counterarguments and making connections to other contexts.



Develop a Productive Mathematical *Disposition*

Hold the belief that mathematics is sensible, useful and worthwhile. They will develop the habit of looking for and making use of patterns and mathematical structures. They will persevere and become resilient, effective problem solvers.



Develop the Ability to Make Conjectures, *Model*, and Generalize

Make predictions and conjectures and draw conclusions throughout the problem solving process based on patterns and the repeated structures in mathematics. They will create, identify, and extend patterns as a strategy for solving and making sense of problems.



Develop the Ability to *Communicate* Mathematically

Develop the ability to communicate mathematically. They will discuss, write, read, interpret and translate ideas and concepts mathematically. As they progress, students' ability to communicate mathematically will include their increased use of mathematical language and terms and analysis of mathematical definitions.

Oklahoma Academic Standards for Mathematics

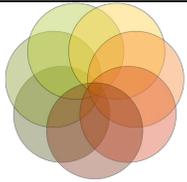
2nd Grade

The second-grade standards are divided into four strands: Algebraic Reasoning and Algebra, Number and Operations, Geometry and Measurement, and Data and Probability. The Algebraic Reasoning and Algebra strand provides opportunities for students to work with a variety of patterns and will develop a strong understanding of the equal sign and variables through the use of concrete materials. The Number and Operations strand emphasizes the study of number, ways of representing numbers, relationships among numbers, and the number system. Students will be asked to demonstrate fluency with basic addition and related subtraction facts. Place value will play an important role in developing, modeling and using addition and subtraction with multi digit numbers. The Geometry and Measurement Strand provides opportunities for students to describe and analyze the characteristics and properties of 2-D and 3-D objects. Students will focus on measurable attributes of objects and the units and processes of measurement. The Data and Probability Strand places an emphasis on formulating questions and gathering data, sorting and classifying objects according to attributes, describing data and making inferences and predictions based on the data gathered.

Problem solving has been integrated throughout the content strands. The development of problem solving skills should be a major goal of the mathematics program at every grade level. Experience with the process of problem solving will need to be integrated early and continuously into each student's mathematics education. Students must be helped to develop a wide range of skills and strategies for solving a variety of problem types.

While learning mathematics, students should be actively engaged, using concrete materials and appropriate technologies such as calculators and computers. However, facility in the use of technology should not be regarded as a substitute for a student's understanding of quantitative concepts and relationships or for proficiency and fluency with basic computations.

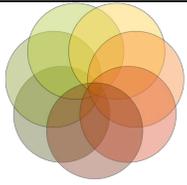
Mathematics has its own language, and the acquisition of specialized vocabulary and language patterns is crucial to a student's understanding, appreciation of, and disposition for the subject. Students should be encouraged to correctly use the concepts, skills, symbols, and vocabulary identified in the following set of standards.



Algebraic Reasoning and Algebra

2.A.1 Apply mathematical actions and processes to recognize, create, describe, and use patterns and rules to solve real-world and mathematical problems.

Mathematical Actions and Processes	Mathematical Benchmark
<p>Develop a Deep and Flexible Conceptual Understanding</p> <p>Develop Accurate and Appropriate Procedural Fluency</p> <p>Develop Strategies for Problem Solving</p> <p>Develop Mathematical Reasoning</p> <p>Develop a Productive Mathematical Disposition</p> <p>Develop the Ability to Make Conjectures, Model, and Generalize</p> <p>Develop the Ability to Communicate Mathematically</p>	<p>2.A.1.1 Create, describe, complete, and extend repeating, growing, and shrinking patterns involving numbers in a variety of contexts (e.g., repeated addition or subtraction, skip counting, arrays of objects).</p> <p>2.A.1.2 Recognize and describe repeating patterns involving geometric shapes in a variety of contexts.</p>
<p>Sample Problems or Classroom Activities</p> <p style="text-align: center; color: red; font-weight: bold; font-size: 1.5em;">FORTHCOMING</p>	



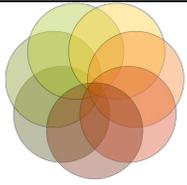
Algebraic Reasoning and Algebra

2.A.2 Apply mathematical actions and processes to use number sentences involving addition, subtraction and unknowns to represent and solve real-world and mathematical problems; create real-world situations corresponding to number sentences.

Mathematical Actions and Processes	Mathematical Benchmark
<p>Develop a Deep and Flexible Conceptual Understanding</p> <p>Develop Accurate and Appropriate Procedural Fluency</p> <p>Develop Strategies for Problem Solving</p> <p>Develop Mathematical Reasoning</p> <p>Develop a Productive Mathematical Disposition</p> <p>Develop the Ability to Make Conjectures, Model, and Generalize</p> <p>Develop the Ability to Communicate Mathematically</p>	<p>2.A.2.1 Use objects and number lines and create real-world situations to represent number sentences.</p> <p>2.A.2.2 Use number sense and properties (commutative and identity) of addition and subtraction to find values for the unknowns that make the number sentences true. (Introduction to properties, but not mastery of vocabulary).</p>

Sample Problems or Classroom Activities

FORTHCOMING



Number and Operations

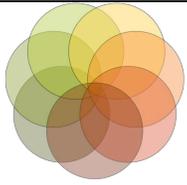
2.N.1 Apply mathematical actions and processes to compare and represent whole numbers up to 1000 with an emphasis on place value and equality.

Mathematical Actions and Processes	Mathematical Benchmark
<p>Develop a Deep and Flexible Conceptual Understanding</p> <p>Develop Accurate and Appropriate Procedural Fluency</p> <p>Develop Strategies for Problem Solving</p> <p>Develop Mathematical Reasoning</p> <p>Develop a Productive Mathematical Disposition</p> <p>Develop the Ability to Make Conjectures, Model, and Generalize</p> <p>Develop the Ability to Communicate Mathematically</p>	<p>2.N.1.1 Read, write, discuss, and represent whole numbers up to 1000. Representations may include numerals, words, pictures, tally marks, number lines and manipulatives.</p> <p>2.N.1.2 Create and use knowledge of number relationships to locate the position of a given whole number on an open number line up to 100.</p> <p>2.N.1.3 Use place value to describe whole numbers between 10 and 1000 in terms of hundreds, tens and ones. Know that 100 is 10 tens, and 1000 is 10 hundreds.</p> <p>2.N.1.4 Find 10 more or 10 less than a given three-digit number. Find 100 more or 100 less than a given three-digit number.</p> <p>2.N.1.5 Recognize when to round numbers to the nearest 10 and 100. Emphasis on understanding how to round instead of memorizing the rules for rounding.</p> <p>2.N.1.6 Use place value to compare and order whole numbers up to 1000 using comparative language, numbers, and symbols (e.g., $425 > 276$, $73 < 107$, page 351 comes after 350, 753 is between 700 and 800).</p>

Sample Problems or Classroom Activities

FORTHCOMING

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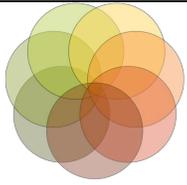
Number and Operations

2.N.2 Apply mathematical actions and processes to add and subtract one- and two-digit numbers in real-world and mathematical problems.

Mathematical Actions and Processes	Mathematical Benchmark
<p>Develop a Deep and Flexible Conceptual Understanding</p> <p>Develop Accurate and Appropriate Procedural Fluency</p> <p>Develop Strategies for Problem Solving</p> <p>Develop Mathematical Reasoning</p> <p>Develop a Productive Mathematical Disposition</p> <p>Develop the Ability to Make Conjectures, Model, and Generalize</p> <p>Develop the Ability to Communicate Mathematically</p>	<p>2.N.2.1 Use the relationship between addition and subtraction to generate basic facts (e.g., making tens, fact families, doubles plus or minus one, counting on, counting back, commutative and associative properties).</p> <p>2.N.2.2 Demonstrate fluency with basic addition facts and related subtraction facts up to 20.</p> <p>2.N.2.3 Use strategies to estimate sums and differences up to 100 [e.g., compose, decompose and regroup numbers, use knowledge of 10 to estimate quantities and sums (two numbers less than 10 cannot add up to more than 20)].</p> <p>2.N.2.4 Use strategies and algorithms based on knowledge of place value and equality to add and subtract two-digit numbers (e.g., mental strategies, standard algorithm, decomposition, expanded notation, partial sums and differences).</p> <p>2.N.2.5 Solve real-world and mathematical addition and subtraction problems involving whole numbers up to 2 digits.</p> <p>2.N.2.6 Use concrete models and structured arrangements, such as repeated addition, arrays and ten frames to develop understanding of multiplication.</p>

Sample Problems or Classroom Activities

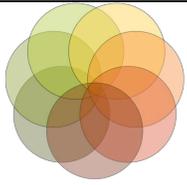
FORTHCOMING



Number and Operations

2.N.3 Apply mathematical actions and processes to explore the foundational ideas of fractions.

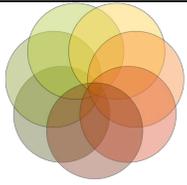
Mathematical Actions and Processes	Mathematical Benchmark
<p>Develop a Deep and Flexible Conceptual Understanding</p> <p>Develop Accurate and Appropriate Procedural Fluency</p> <p>Develop Strategies for Problem Solving</p> <p>Develop Mathematical Reasoning</p> <p>Develop a Productive Mathematical Disposition</p> <p>Develop the Ability to Make Conjectures, Model, and Generalize</p> <p>Develop the Ability to Communicate Mathematically</p>	<p>2.N.3.1 Identify the parts of a set and/or area that represent fractions for halves, thirds and fourths.</p> <p>2.N.3.2 Construct equal sized portions through fair sharing including length and set area models for halves, thirds, and fourths.</p>
<p>Sample Problems or Classroom Activities</p> <p style="text-align: center;">FORTHCOMING</p>	



Number and Operations

2.N.4 Apply mathematical actions and processes to determine the value of coins in order to solve monetary transactions.

Mathematical Actions and Processes	Mathematical Benchmark
<p>Develop a Deep and Flexible Conceptual Understanding</p> <p>Develop Accurate and Appropriate Procedural Fluency</p> <p>Develop Strategies for Problem Solving</p> <p>Develop Mathematical Reasoning</p> <p>Develop a Productive Mathematical Disposition</p> <p>Develop the Ability to Make Conjectures, Model, and Generalize</p> <p>Develop the Ability to Communicate Mathematically</p>	<p>2.N.4.1 Determine the value of a collection(s) of coins up to one dollar (e.g., given 2 dimes and 1 quarter, recognize you have 45¢; person 1 has 15¢ and person 2 has 25¢, together they have 40¢). Limited to: whole numbers.</p> <p>2.N.4.2 Select a combination of coins to represent a given amount of money up to one dollar.</p>
<p>Sample Problems or Classroom Activities</p> <p style="text-align: center; color: red; font-weight: bold; font-size: 1.2em;">DRAFT</p> <p style="text-align: center; color: red; font-weight: bold; font-size: 1.5em;">FORTHCOMING</p>	



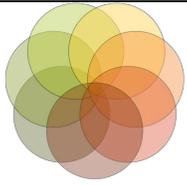
Geometry and Measurement

2.GM.1 Apply mathematical actions and processes standards to analyze attributes of two- and three-dimensional figures develop generalizations about their properties.

Mathematical Actions and Processes	Mathematical Benchmark
Develop a Deep and Flexible Conceptual Understanding Develop Accurate and Appropriate Procedural Fluency Develop Strategies for Problem Solving Develop Mathematical Reasoning Develop a Productive Mathematical Disposition Develop the Ability to Make Conjectures, Model, and Generalize Develop the Ability to Communicate Mathematically	2.GM.1.1 Describe, compare, and classify two- and three-dimensional figures according to their geometric attributes including developing appropriate vocabulary for faces, and the number of sides, edges and vertices. 2.GM.1.2 Identify and name basic two- and three-dimensional shapes, such as squares, circles, triangles, rectangles, trapezoids, hexagons, cubes, rectangular prisms, cones, cylinders and spheres (architecture, technology, art).

Sample Problems or Classroom Activities

FORTHCOMING



Geometry and Measurement

2.GM.2 Apply mathematical actions and processes to understand length as a measurable attribute; use tools to measure length.

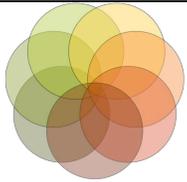
Mathematical Actions and Processes	Mathematical Benchmark
Develop a Deep and Flexible Conceptual Understanding Develop Accurate and Appropriate Procedural Fluency Develop Strategies for Solving Diverse Problems Develop Mathematical Reasoning Develop a Productive Mathematical Disposition Develop the Ability to Make Conjectures, Model, and Generalize Develop the Ability to Communicate Mathematically	2.GM.2.1 Explain the relationship between the size of the unit of measurement and the number of units needed to measure the length of an object. 2.GM.2.2 Explain the relationship between length and the numbers on a ruler by using a ruler to measure lengths to the nearest inch and centimeter.

Sample Problems or Classroom Activities

Example for 2.GM.2.1:

To help students understand that it takes more centimeters to measure the length of a table than it does meters because centimeters are smaller than meters, students can be engaged in an activity where some groups measure a table, for example, in meters while other groups measure the same table in centimeters. Each group can present their results and the class can discuss the difference in findings. Following the group discussion, students should be asked to write about why it required fewer meters than centimeters to measure the length of the table when meters are longer than centimeters. This relationship seems proportionally counterintuitive for many students so they may need several concrete experiences measuring with several units to fully understand and be able to explain with confidence that the smaller the unit, the more will be needed to measure the length of any object.

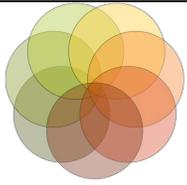
MORE FORTHCOMING



Geometry and Measurement

2.GM.3 Apply mathematical actions and processes to tell time.

Mathematical Actions and Processes	Mathematical Benchmark
<p>Develop a Deep and Flexible Conceptual Understanding</p> <p>Develop Accurate and Appropriate Procedural Fluency</p> <p>Develop Strategies for Problem Solving</p> <p>Develop Mathematical Reasoning</p> <p>Develop a Productive Mathematical Disposition</p> <p>Develop the Ability to Make Conjectures, Model, and Generalize</p> <p>Develop the Ability to Communicate Mathematically</p>	<p>2.GM.3.1 Tell time to 5 minutes. Read and write time to the quarter-hour and distinguish between a.m. and p.m. (analog and digital).</p>
<p>Sample Problems or Classroom Activities</p> <p style="text-align: center; color: red; font-weight: bold; font-size: 1.5em;">FORTHCOMING</p>	



Data and Probability

2.D.1 Apply mathematical actions and processes to organize data to make it useful for interpreting information and solving problems.

Mathematical Actions and Processes	Mathematical Benchmark
<p>Develop a Deep and Flexible Conceptual Understanding</p> <p>Develop Accurate and Appropriate Procedural Fluency</p> <p>Develop Strategies for Problem Solving</p> <p>Develop Mathematical Reasoning</p> <p>Develop a Productive Mathematical Disposition</p> <p>Develop the Ability to Make Conjectures, Model, and Generalize</p> <p>Develop the Ability to Communicate Mathematically</p>	<p>2.D.1.1 Explain that the length of a bar in a bar graph or the number of objects in a picture graph represents the number of data points for a given category.</p> <p>2.D.1.2 Organize a collection of data with up to four categories using pictographs and bar graphs with intervals of 1s, 2s, 5s or 10s.</p> <p>2.D.1.3 Write and solve one-step word problems involving addition or subtraction using data represented within pictographs and bar graphs with intervals of one.</p> <p>2.D.1.4 Draw conclusions and make predictions from information in a graph.</p>

Sample Problems or Classroom Activities

FORTHCOMING

Oklahoma Academic Standards for Mathematics

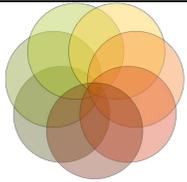
3rd Grade

The third grade standards are divided into four strands, Number and Operations, Algebraic Reasoning and Algebra, Geometry and Measurement, and Data and Probability. The Number and Operation strand continues to develop number sense with respect to larger numbers including multiplication and division. Students begin to understand numbers are related in a variety of ways such as 46 is more than 30, 4 less than, 50 and can be made up of 30 and 16. Students will demonstrate fluency with addition and subtraction facts up to 20. Multiplication involves counting groups of like size and determining how many there are in all. Division and fraction concepts are developed through “fair sharing”. Students will understand and apply place value, as well as build on the foundation of fractions by reading, writing, recognizing in different contexts, ordering and comparing fractions with like denominators. Students will investigate and describe the identity and commutative properties for addition and multiplication. The Algebraic Reasoning and Algebra strand has students searching for patterns in a variety of contexts. Students will recognize, extend and generalize with both words and symbols. Students will express mathematical relationships using equations and model problem situations with objects. The Geometry and Measurement strand involves recognizing and comparing attributes and making meaningful measurements. Students will use standard units (U.S. Customary and metric) to measure temperature, length, liquid volume, and weight and identify relevant properties of shapes and lines, and find the perimeter of polygons. The Data and Probability strand emphasizes the formulating of questions that can be addressed with data. Students will collect, organize, and display relevant data to answer the questions. Students will develop inferences and predictions based on data. Students will understand that the occurrence of an event can be characterized along a continuum from impossible to certain.

Problem solving has been integrated throughout the content strands. The development of problem solving skills should be a major goal of the mathematics program at every grade level. Experience with the process of problem solving will need to be integrated early and continuously into each student’s mathematics education. Students must be helped to develop a wide range of skills and strategies for solving a variety of problem types.

While learning mathematics, students should be actively engaged, using concrete materials and appropriate technologies such as calculators and computers. However, facility in the use of technology should not be regarded as a substitute for a student’s understanding of quantitative concepts and relationships or for proficiency and fluency with basic computations.

Mathematics has its own language, and the acquisition of specialized vocabulary and language patterns is crucial to a student’s understanding, appreciation of, and disposition for the subject. Students should be encouraged to correctly use the concepts, skills, symbols, and vocabulary identified in the following set of standards.



Algebraic Reasoning and Algebra

3.A.1 Apply mathematical actions and processes to use single-operation input-output rules to represent patterns and relationships and to solve real-world and mathematical problems.

Mathematical Actions and Processes	Mathematical Benchmark
<p>Develop a Deep and Flexible Conceptual Understanding</p> <p>Develop Accurate and Appropriate Procedural Fluency</p> <p>Develop Strategies for Problem Solving</p> <p>Develop Mathematical Reasoning</p> <p>Develop a Productive Mathematical Disposition</p> <p>Develop the Ability to Make Conjectures, Model, and Generalize</p> <p>Develop the Ability to Communicate Mathematically</p>	<p>3.A.1.1 Create, describe, and extend patterns involving addition, subtraction or multiplication to solve problems in a variety of contexts (e.g., skip counting, arrays of objects, function machine, hundreds chart).</p> <p>3.A.1.2 Describe the rule (single operation) for a pattern from an input/output table or function machine involving addition, subtraction or multiplication.</p> <p>3.A.1.3 Construct and explore models of growing patterns and construct the next steps.</p>

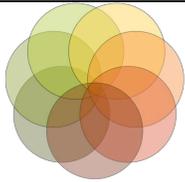
Sample Problems or Classroom Activities

Example for 3.A.1.3



What is the next stage?
How many triangles will there be in the 10th stage?
Do you notice any patterns?

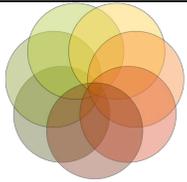
MORE FORTHCOMING



Algebraic Reasoning and Algebra

3.A.2 Apply mathematical actions and processes to use number sentences involving multiplication and unknowns to represent and solve real-world and mathematical problems; create real-world situations corresponding to number sentences.

Mathematical Actions and Processes	Mathematical Benchmark
<p>Develop a Deep and Flexible Conceptual Understanding</p> <p>Develop Accurate and Appropriate Procedural Fluency</p> <p>Develop Strategies for Problem Solving</p> <p>Develop Mathematical Reasoning</p> <p>Develop a Productive Mathematical Disposition</p> <p>Develop the Ability to Make Conjectures, Model, and Generalize</p> <p>Develop the Ability to Communicate Mathematically</p>	<p>3.A.2.1 Find unknowns represented by symbols in arithmetic problems by solving open sentences (equations) and other problems involving addition, subtraction, and multiplication. Create real-world situations to represent number sentences.</p> <p>3.A.2.2 Recognize, represent and apply the number properties (commutative and identity properties of addition and multiplication) using models and manipulatives. (Introduction to properties, but not mastery of vocabulary).</p>
<p>Sample Problems or Classroom Activities</p> <p style="text-align: center; color: red; font-weight: bold; font-size: 1.5em;">FORTHCOMING</p>	



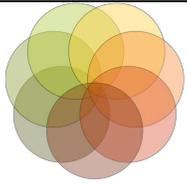
Number and Operations

3.N.1 Apply mathematical actions and processes to compare and represent whole numbers up to 10,000 with an emphasis on place value and equality.

Mathematical Actions and Processes	Mathematical Benchmark
<p>Develop a Deep and Flexible Conceptual Understanding</p> <p>Develop Accurate and Appropriate Procedural Fluency</p> <p>Develop Strategies for Problem Solving</p> <p>Develop Mathematical Reasoning</p> <p>Develop a Productive Mathematical Disposition</p> <p>Develop the Ability to Make Conjectures, Model, and Generalize</p> <p>Develop the Ability to Communicate Mathematically</p>	<p>3.N.1.1 Read, write, discuss, and represent whole numbers up to 10,000. Representations may include numerals, expressions with operations, words, pictures, number lines, and manipulatives.</p> <p>3.N.1.2 Use place value to describe whole numbers between 1000 and 10,000 in terms of ten thousands, thousands, hundreds, tens and one, including expanded form.</p> <p>3.N.1.3 Find 1,000 more or 1,000 less than a given four- or five-digit number. Find 100 more or 100 less than a given four- or five-digit number.</p> <p>3.N.1.4 Recognize when to round numbers to the nearest 10,000, 1000, 100 and 10 and/or use compatible numbers to estimate sums and differences. Emphasis on understanding why and how to round rather than memorization of the rules for rounding.</p> <p>3.N.1.5 Use place value to compare and order whole numbers up to 10,000, using comparative language, numbers, and symbols (e.g., $15,023 < 25,156$; 2345 is between 2000 and 3000).</p>

Sample Problems or Classroom Activities

FORTHCOMING



Number and Operations

3.N.2 Apply mathematical actions and processes to add and subtract multi-digit whole numbers; represent multiplication and division in various ways; solve real-world and mathematical problems.

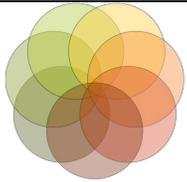
Mathematical Actions and Processes	Mathematical Benchmark
<p>Develop a Deep and Flexible Conceptual Understanding</p> <p>Develop Accurate and Appropriate Procedural Fluency</p> <p>Develop Strategies for Problem Solving</p> <p>Develop Mathematical Reasoning</p> <p>Develop a Productive Mathematical Disposition</p> <p>Develop the Ability to Make Conjectures, Model, and Generalize</p> <p>Develop the Ability to Communicate Mathematically</p>	<p>3.N.2.1 Represent multiplication facts by using a variety of approaches, such as repeated addition, equal-sized groups, arrays, area models, equal jumps on a number line and skip counting.</p> <p>3.N.2.2 Demonstrate fluency in addition, subtraction, and multiplication (10 x 10) facts up to 100.</p> <p>3.N.2.3 Use strategies and algorithms based on knowledge of place value and equality to add and subtract multi-digit numbers(e.g., mental strategies, standard algorithm, decomposition, expanded notation, partial sums and differences).</p> <p>3.N.2.4 Use addition and subtraction to solve real-world and mathematical problems involving whole numbers. Use various strategies, including the relationship between addition and subtraction, the use of technology, and the context of the problem to assess the reasonableness of results.</p> <p>3.N.2.5 Represent division facts by using a variety of approaches, such as repeated subtraction, equal sharing and forming equal groups.</p> <p>3.N.2.6 Recognize the relationship between multiplication and division to model and solve real world problems (e.g. partitioning, missing factors, arrays).</p> <p>3.N.2.7 Use strategies and algorithms based on knowledge of place value, equality and properties of addition and multiplication to multiply a two-</p>

	digit number by a one-digit number (e.g., mental strategies, partial products, standard algorithm, and commutative, associative, and distributive properties).
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Sample Problems or Classroom Activities

FORTHCOMING

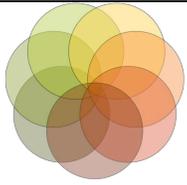
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Number and Operations

3.N.3 Apply mathematical actions and processes to understand meanings and uses of fractions in real-world and mathematical situations.

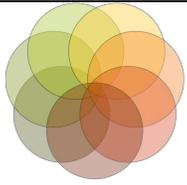
Mathematical Actions and Processes	Mathematical Benchmark
<p>Develop a Deep and Flexible Conceptual Understanding</p> <p>Develop Accurate and Appropriate Procedural Fluency</p> <p>Develop Strategies for Problem Solving</p> <p>Develop Mathematical Reasoning</p> <p>Develop a Productive Mathematical Disposition</p> <p>Develop the Ability to Make Conjectures, Model, and Generalize</p> <p>Develop the Ability to Communicate Mathematically</p>	<p>3.N.3.1 Read and write fractions with words and symbols.</p> <p>3.N.3.2 Construct fractions using set, area and length models.</p> <p>3.N.3.3 Order and compare, including unit fractions and equivalent fractions with like denominators by using models, reasoning about their size and an understanding of the concept of numerator and denominator.</p>
<p>Sample Problems or Classroom Activities</p> <p style="text-align: center;">FORTHCOMING</p>	



Number and Operations

3.N.4 Apply mathematical actions and processes to determine the value of coins in order to solve monetary transactions.

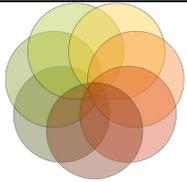
Mathematical Actions and Processes	Mathematical Benchmark
<p>Develop a Deep and Flexible Conceptual Understanding</p> <p>Develop Accurate and Appropriate Procedural Fluency</p> <p>Develop Strategies for Problem Solving</p> <p>Develop Mathematical Reasoning</p> <p>Develop a Productive Mathematical Disposition</p> <p>Develop the Ability to Make Conjectures, Model, and Generalize</p> <p>Develop the Ability to Communicate Mathematically</p>	<p>3.N.4.1 Use addition to determine the value of a collection of coins or bills up to \$20. (e.g. $45\text{¢} + 30\text{¢} = 75\text{¢}$, $\\$11 + \\$9 = \\$20$). Limited to: whole numbers.</p> <p>3.N.4.2 Select the fewest amount of coins for a given amount of money up to one dollar.</p>
<p>Sample Problems or Classroom Activities</p> <p style="text-align: center; color: red; font-weight: bold; font-size: 1.2em;">FORTHCOMING</p>	



Geometry and Measurement

3.GM.1 Apply mathematical actions and processes to use geometric attributes to describe and create shapes in various contexts.

Mathematical Actions and Processes	Mathematical Benchmark
<p>Develop a Deep and Flexible Conceptual Understanding</p> <p>Develop Accurate and Appropriate Procedural Fluency</p> <p>Develop Strategies for Problem Solving</p> <p>Develop Mathematical Reasoning</p> <p>Develop a Productive Mathematical Disposition</p> <p>Develop the Ability to Make Conjectures, Model, and Generalize</p> <p>Develop the Ability to Communicate Mathematically</p>	<p>3.GM.1.1 Identify points, lines, line segments, rays, angles, endpoints, and parallel and perpendicular lines in various contexts and use them (parallel and perpendicular) to describe and create shapes such as right triangles, rectangles, parallelograms, and trapezoids.</p>
<p>Sample Problems or Classroom Activities</p> <p style="text-align: center; color: red; font-weight: bold; font-size: 1.5em;">FORTHCOMING</p>	



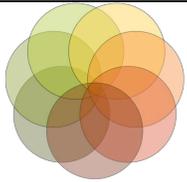
Geometry and Measurement

3.GM.2 Apply mathematical actions and processes to understand perimeter as a measurable attribute of real-world and mathematical objects. Use various tools to measure distances.

Mathematical Actions and Processes	Mathematical Benchmark
<p>Develop a Deep and Flexible Conceptual Understanding</p> <p>Develop Accurate and Appropriate Procedural Fluency</p> <p>Develop Strategies for Problem Solving</p> <p>Develop Mathematical Reasoning</p> <p>Develop a Productive Mathematical Disposition</p> <p>Develop the Ability to Make Conjectures, Model, and Generalize</p> <p>Develop the Ability to Communicate Mathematically</p>	<p>3.GM.2.1 Choose an appropriate measurement instrument (e.g., ruler, yard/meter, measuring tape) and measure the length of objects to the nearest whole or half unit.</p> <p>3.GM.2.2 Establish personal benchmarks for metric units and estimate the measures of a variety of objects (e.g., mass: the mass of a raisin is about 1 gram, length: the width of a finger is about 1 centimeter).</p> <p>3.GM.2.3 Find the perimeter of a polygon.</p> <p>3.GM.2.4 Use an analog thermometer to determine temperature to the nearest degree in Fahrenheit and Celsius.</p>

Sample Problems or Classroom Activities

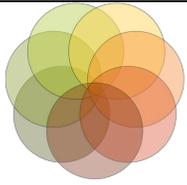
FORTHCOMING



Geometry and Measurement

3.GM.3 Apply mathematical actions and processes to tell time.

Mathematical Actions and Processes	Mathematical Benchmark
<p>Develop a Deep and Flexible Conceptual Understanding</p> <p>Develop Accurate and Appropriate Procedural Fluency</p> <p>Develop Strategies for Problem Solving</p> <p>Develop Mathematical Reasoning</p> <p>Develop a Productive Mathematical Disposition</p> <p>Develop the Ability to Make Conjectures, Model, and Generalize</p> <p>Develop the Ability to Communicate Mathematically</p>	<p>3.GM.3.1 Read and write time to the nearest 5-minute (analog and digital).</p> <p>3.GM.3.2 Determine the solutions to problems involving addition and subtraction of time intervals of 5-minutes using pictorial models or tools up to one hour (e.g. 15-minute event plus a 30-minute event equals 45 minutes).</p>
<p>Sample Problems or Classroom Activities</p> <p style="text-align: center; color: red; font-weight: bold; font-size: 1.5em;">FORTHCOMING</p>	



Data and Probability

3.D.1 Apply mathematical actions and processes to organize data to make it useful for interpreting information and solving problems.

Mathematical Actions and Processes	Mathematical Benchmark
Develop a Deep and Flexible Conceptual Understanding Develop Accurate and Appropriate Procedural Fluency Develop Strategies for Problem Solving Develop Mathematical Reasoning Develop a Productive Mathematical Disposition Develop the Ability to Make Conjectures, Model, and Generalize Develop the Ability to Communicate Mathematically	<p>3.D.1.1 Summarize and construct a data set with multiple categories using a frequency table, line plot, dot plot*, pictograph, and/or bar graph with scaled intervals.</p> <p>3.D.1.2 Solve one- and two-step problems using categorical data represented with a frequency table, dot plot, pictograph, and/or bar graph with scaled intervals.</p> <p>*Dot plot is a type of graphic display using filled in circles (dots) and a simple scale to compare the counts (frequency) within categories or groups. Dots are stacked in a column. Column heights represent count.</p>

Sample Problems or Classroom Activities

FORTHCOMING

Oklahoma Academic Standards for Mathematics

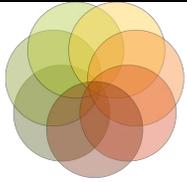
4th Grade

The fourth-grade standards are divided into four strands, Number and Operations, Algebraic Reasoning and Algebra, Geometry and Measurement, and Data and Probability. The Number and Operation strand emphasizes multiplication and division with whole numbers and solving problems involving addition and subtraction of fractions by finding common multiples and factors using concrete or pictorial models. Students will be fluent in the basic multiplication and division facts as they become proficient in multiplying larger numbers. The Algebraic Reasoning and Algebra strand involves students identifying creating, describing, and extending a wide variety of patterns involving numbers and/or geometric shapes. Students will identify rules for a variety of patterns. The Geometry and Measurement strand focuses on students identifying, classifying, and constructing triangles and quadrilaterals. Students will predict, identify, and describe slides, flips, turns and lines of symmetry. Concrete materials and two-dimensional representations will be used to solve problems involving area, patterns, and equivalence of fractions and decimals. Students will establish personal benchmarks for measurement, choose appropriate measurement tools and solve problems involving measurements in a variety of situations. The Data and Probability strand emphasizes representation of data using tables, bar graphs, timelines, and Venn Diagrams. Students will develop inferences and predictions based on data. Students will identify the occurrence of an event happening as likely, not likely, most likely, and equally likely based on the mathematics involved.

Problem solving has been integrated throughout the content strands. The development of problem solving skills should be a major goal of the mathematics program at every grade level. Experience with the process of problem solving will need to be integrated early and continuously into each student's mathematics education. Students must be helped to develop a wide range of skills and strategies for solving a variety of problem types.

While learning mathematics, students should be actively engaged, using concrete materials and appropriate technologies such as calculators and computers. However, facility in the use of technology should not be regarded as a substitute for a student's understanding of quantitative concepts and relationships or for proficiency and fluency with basic computations.

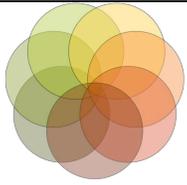
Mathematics has its own language, and the acquisition of specialized vocabulary and language patterns is crucial to a student's understanding, appreciation of, and disposition for the subject. Students should be encouraged to correctly use the concepts, skills, symbols, and vocabulary identified in the following set of standards.



Algebraic Reasoning and Algebra

4.A.1 Apply mathematical actions and processes to use single-operation input-output rules, tables and charts to represent patterns and relationships and to solve real-world and mathematical problems.

Mathematical Actions and Processes	Mathematical Benchmark
<p>Develop a Deep and Flexible Conceptual Understanding</p> <p>Develop Accurate and Appropriate Procedural Fluency</p> <p>Develop Strategies for Problem Solving</p> <p>Develop Mathematical Reasoning</p> <p>Develop a Productive Mathematical Disposition</p> <p>Develop the Ability to Make Conjectures, Model, and Generalize</p> <p>Develop the Ability to Communicate Mathematically</p>	<p>4.A.1.1 Create, describe, and extend a wide variety of patterns involving numbers, using tables, charts and/or rules (e.g., determine the rule from a table or “function machine”, extend number patterns). Record the inputs and outputs in a chart or table.</p> <p>4.A.1.2 Describe the rule for a pattern from a input/output table or function machine involving addition, subtraction, multiplication, or division.</p> <p>4.A.1.3 Create, describe, and extend a wide variety of patterns involving geometric shapes and define the rule of the pattern.</p>
<p>Sample Problems or Classroom Activities</p> <p style="text-align: center; color: red; font-weight: bold; font-size: 2em;">FORTHCOMING</p>	



Algebraic Reasoning and Algebra

4.A.2 Apply mathematical actions and processes to use multiplication and division with unknowns to create number sentences representing a given problem situation using a number sentence.

Mathematical Actions and Processes	Mathematical Benchmark
Develop a Deep and Flexible Conceptual Understanding Develop Accurate and Appropriate Procedural Fluency Develop Strategies for Problem Solving Develop Mathematical Reasoning Develop a Productive Mathematical Disposition Develop the Ability to Make Conjectures, Model, and Generalize Develop the Ability to Communicate Mathematically	4.A.2.1 Use number sense, properties of multiplication (commutative, identity, and associative) and the relationship between multiplication and division to find values for the unknowns represented by letters and symbols that make number sentences true. (Introduction to properties, but not mastery of vocabulary). 4.A.2.2 Solve for unknowns in one-step problems by solving open sentences (equations) and other problems involving addition, subtraction, multiplication, or division with whole numbers. Use real-world situations to represent number sentences.

Sample Problems or Classroom Activities

Example for 4.A.2.1

$$4 \times 12 = \square \times 4$$

$$6 \times ? = 6$$

$$2 \times (3 \times 4) = (2 \times 3) \times \square$$

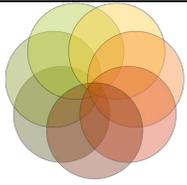
Example for 4.A.2.2

Find the value of the unknown in the following number sentences to make them true.

$$4 \times y = 12$$

$$c + 9 = 17$$

MORE FORTHCOMING



Number and Operations

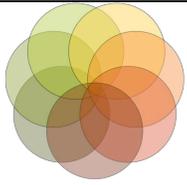
4.N.1 Apply mathematical actions and processes to multiply multi-digit numbers and solve real-world and mathematical problems using arithmetic.

Mathematical Actions and Processes	Mathematical Benchmark
<p>Develop a Deep and Flexible Conceptual Understanding</p> <p>Develop Accurate and Appropriate Procedural Fluency</p> <p>Develop Strategies for Solving Diverse Problems</p> <p>Develop Mathematical Reasoning</p> <p>Develop a Productive Mathematical Disposition</p> <p>Develop the Ability to Make Conjectures, Model, and Generalize</p> <p>Develop the Ability to Communicate Mathematically</p>	<p>4.N.1.1 Demonstrate fluency with multiplication and division facts up to 12×12.</p> <p>4.N.1.2 Use an understanding of place value to multiply or divide a number by 10, 100 and 1000.</p> <p>4.N.1.3 Multiply 3-digit by 1-digit or a 2-digit by 2-digit whole numbers, using efficient and generalizable procedures and strategies, based on knowledge of place value, including but not limited to standard algorithms.</p> <p>4.N.1.4 Estimate products of 3-digit by 1-digit or a 2-digit by 2-digit whole numbers by using rounding, benchmarks and place value to assess the reasonableness of results. Explore larger numbers using technology to investigate patterns.</p> <p>4.N.1.5 Solve multi-step real world and mathematical problems requiring the use of addition, subtraction and multiplication of multi-digit whole numbers. Use various strategies, including the relationship between operations, the use of appropriate technology, and the context of the problem to assess the reasonableness of results.</p> <p>4.N.1.6 Use strategies and algorithms based on knowledge of place value, equality and properties of operations to divide 3-digit dividend by 1-digit whole number divisors. (e.g., mental strategies, standard algorithms, partial quotients, the commutative, associative, and distributive properties and repeated subtraction).</p>

Sample Problems or Classroom Activities

FORTHCOMING

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Number and Operations

4.N.2 Apply mathematical actions and processes to represent and compare fractions and decimals in real-world and mathematical situations; use place value to understand how decimals represent quantities.

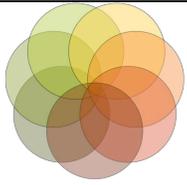
Mathematical Actions and Processes	Mathematical Benchmark
<p>Develop a Deep and Flexible Conceptual Understanding</p> <p>Develop Accurate and Appropriate Procedural Fluency</p> <p>Develop Strategies for Problem Solving</p> <p>Develop Mathematical Reasoning</p> <p>Develop a Productive Mathematical Disposition</p> <p>Develop the Ability to Make Conjectures, Model, and Generalize</p> <p>Develop the Ability to Communicate Mathematically</p>	<p>4.N.2.1 Represent equivalent fractions using fraction models (e.g., parts of a set, fraction circles, fraction strips, number lines and other manipulatives).</p> <p>4.N.2.2 Use benchmark fractions (0, $\frac{1}{4}$, $\frac{1}{3}$, $\frac{1}{2}$, $\frac{2}{3}$, $\frac{3}{4}$, 1) to locate additional fractions on a number line. Use models to order and compare whole numbers and fractions less than and greater than one.</p> <p>4.N.2.3 Decompose a fraction in more than one way into a sum of fractions with the same denominator using concrete and pictorial models and recording results with symbolic representations (e.g., $\frac{3}{4} = \frac{1}{4} + \frac{1}{4} + \frac{1}{4}$).</p> <p>4.N.2.4 Use fraction models to add and subtract fractions with like denominators in real world and mathematical situations.</p> <p>4.N.2.5 Represent tenths and hundredths with concrete models, making connections between fractions and decimals.</p> <p>4.N.2.6 Model, read and write decimals up to at least the hundredths place in a variety of context including money.</p> <p>4.N.2.7 Compare and order decimals and whole numbers using place value, a number line and models such as grids and base 10 blocks.</p> <p>4.N.2.8 Rename and compare benchmark fractions</p>

	($\frac{1}{4}$, $\frac{1}{3}$, $\frac{1}{2}$, $\frac{2}{3}$, $\frac{3}{4}$) and decimals (0.25, 0.50, 0.75) in real-world and mathematical situations; use place value to understand how decimals represent quantities, including money (e.g. half of a dollar is \$0.50; $\frac{1}{4}$ is the same as 0.25).
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Sample Problems or Classroom Activities

FORTHCOMING

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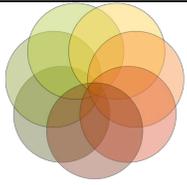
Number and Operations

4.N.3 Apply mathematical actions and processes to determine the value of coins in order to solve monetary transactions.

Mathematical Actions and Processes	Mathematical Benchmark
Develop a Deep and Flexible Conceptual Understanding Develop Accurate and Appropriate Procedural Fluency Develop Strategies for Solving Diverse Problems Develop Mathematical Reasoning Develop a Productive Mathematical Disposition Develop the Ability to Make Conjectures, Model, and Generalize Develop the Ability to Communicate Mathematically	4.N.3.1 Given a total cost (whole dollars and/or decimal) and amount paid (whole dollars and/or decimal), find the change required in a variety of ways.

Sample Problems or Classroom Activities

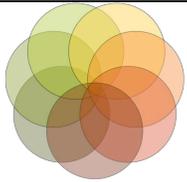
FORTHCOMING



Geometry and Measurement

4.GM.1 Apply mathematical actions and processes to name, describe, classify and construct polygons.

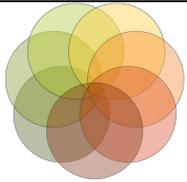
Mathematical Actions and Processes	Mathematical Benchmark
<p>Develop a Deep and Flexible Conceptual Understanding</p> <p>Develop Accurate and Appropriate Procedural Fluency</p> <p>Develop Strategies for Problem Solving</p> <p>Develop Mathematical Reasoning</p> <p>Develop a Productive Mathematical Disposition</p> <p>Develop the Ability to Make Conjectures, Model, and Generalize</p> <p>Develop the Ability to Communicate Mathematically</p>	<p>4.GM.1.1 Describe, classify and construct triangles, including equilateral, right, scalene, and isosceles triangles. Recognize triangles in various contexts.</p> <p>4.GM.1.2 Describe, classify and construct quadrilaterals, including squares, rectangles, trapezoids, rhombuses, parallelograms and kites. Recognize quadrilaterals in various contexts.</p>
<p>Sample Problems or Classroom Activities</p> <p style="text-align: center; color: red; font-weight: bold; font-size: 1.5em;">FORTHCOMING</p>	



Geometry and Measurement

4.GM.2 Apply mathematical actions and processes to transformations and use symmetry to analyze mathematical situations.

Mathematical Actions and Processes	Mathematical Benchmark
<p>Develop a Deep and Flexible Conceptual Understanding</p> <p>Develop Accurate and Appropriate Procedural Fluency</p> <p>Develop Strategies for Problem Solving</p> <p>Develop Mathematical Reasoning</p> <p>Develop a Productive Mathematical Disposition</p> <p>Develop the Ability to Make Conjectures, Model, and Generalize</p> <p>Develop the Ability to Communicate Mathematically</p>	<p>4.GM.2.1 Predict and describe the results of translation (sliding), reflection (flipping) and rotation (turning) 2-dimensional shapes.</p> <p>4.GM.2.2 Identify and describe the line(s) of symmetry in 2-dimensional shapes.</p>
<p>Sample Problems or Classroom Activities</p> <p style="text-align: center;">FORTHCOMING</p>	



Geometry and Measurement

4.GM.3 Apply mathematical actions and processes to understand angle and area as measurable attributes of real world and mathematical objects. Use various tools to measure angles and areas.

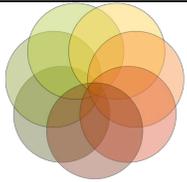
Mathematical Actions and Processes	Mathematical Benchmark
<p>Develop a Deep and Flexible Conceptual Understanding</p> <p>Develop Accurate and Appropriate Procedural Fluency</p> <p>Develop Strategies for Problem Solving</p> <p>Develop Mathematical Reasoning</p> <p>Develop a Productive Mathematical Disposition</p> <p>Develop the Ability to Make Conjectures, Model, and Generalize</p> <p>Develop the Ability to Communicate Mathematically</p>	<p>4.GM.3.1 Measure angles in geometric figures and real world objects with a protractor or angle ruler.</p> <p>4.GM.3.2 Find the area of a two-dimensional figure by counting the total number of same size square units that cover a shape without gaps or overlaps.</p> <p>4.GM.3.3 Develop and use formulas to determine the area of rectangles. Justify why length and width are multiplied to find the area of a rectangle by breaking the rectangle into one unit by one unit squares and viewing these as grouped into rows and columns.</p> <p>4.GM.3.4 Find the area of polygons that can be decomposed into rectangles.</p> <p>4.GM.3.5 Choose an appropriate instrument (e.g., ruler, yard/meter stick, tape measure) and measure the length of an object to the nearest whole centimeter or quarter-inch. Clarification: Anything smaller than a centimeter should be measured in millimeters.</p> <p>4.GM.3.6 Solve problems that deal with measurements of length, when to use liquid volumes, when to use mass, temperatures above zero and money using addition, subtraction, multiplication, or division as appropriate (customary and metric). Clarification: Focus should be on why and when to use the tools in addition to how to use the tools.</p> <p>4.GM.3.7 Determine elapsed time. Solve problems</p>

	involving the conversion of one measure of time to another.
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Sample Problems or Classroom Activities

FORTHCOMING

DRAFT



Data and Probability

4.D.1 Apply mathematical actions and processes to solve problems by collecting, organizing, displaying, and interpreting data.

Mathematical Actions and Processes	Mathematical Benchmark
<p>Develop a Deep and Flexible Conceptual Understanding</p> <p>Develop Accurate and Appropriate Procedural Fluency</p> <p>Develop Strategies for Problem Solving</p> <p>Develop Mathematical Reasoning</p> <p>Develop a Productive Mathematical Disposition</p> <p>Develop the Ability to Make Conjectures, Model, and Generalize</p> <p>Develop the Ability to Communicate Mathematically</p>	<p>4.D.1.1 Represent data on a frequency table or dot plot marked with whole numbers and fractions using appropriate titles, labels and units.</p> <p>4.D.1.2 Use tables, bar graphs, timelines and Venn diagrams to display data sets. The data may include benchmark fractions or decimals ($\frac{1}{4}$, $\frac{1}{3}$, $\frac{1}{2}$, $\frac{2}{3}$, $\frac{3}{4}$, 0.25, 0.50, 0.75).</p> <p>4.D.1.3 Solve one- and two-step problems using data in whole number, decimal, and and/or fraction form in a frequency table and dot plot.</p>
<p>Sample Problems or Classroom Activities</p> <p style="text-align: center;">FORTHCOMING</p>	