

Reading the Oklahoma Academic Standards for Mathematics

Standards Overview

The Oklahoma Academic Standards for Mathematics are developed around four main content strands: Numbers and Operations, Algebraic Reasoning and Algebra, Geometry and Measurement, and Data and Probability. These four strands organize the content standards throughout PK-7 and Pre-Algebra. The standards for Algebra I, Algebra II, Geometry, Precalculus, and Statistics & Probability are also fundamentally organized around these strands. The Oklahoma Mathematical Actions and Processes (MAPs) are the skills and abilities students should develop and be engaged in throughout their PK-12 mathematics education. Among these are the ability to problem solve, communicate, and reason about mathematics, which will help students be ready for the mathematics expectations of college and the skills desired by many employers. While the MAPs and content standards work together to create clear, concise, and rigorous mathematics standards and expectations for Oklahoma students with the aim of helping them be college and career ready, it is not intended that each Mathematical Action and Process will be utilized or developed with each content standards that involve explaining a particular concept may be best accomplished by also engaging students in communicating mathematically, whereas standards that focus in the early grades on fluency with operations may align well with the Mathematical Action and Process focused on procedural fluency.

The Four Content Strands of the Oklahoma Academic Standards for Mathematics

Numbers and Operations Strand: A focus on numbers and operations is the cornerstone of a strong mathematics program. Developing students' fluency with numbers and operations throughout their PK-12 mathematics experience requires a balance and connection between conceptual understanding and computational proficiency and efficiency. This strand focuses 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. An emphasis is placed on the development of estimation, so students can determine the reasonableness of solutions and answers. Further, it requires that students should be able to compute with proficiency and efficiency.



The Four Content Strands of the Oklahoma Academic Standards for Mathematics: continued

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 understand quantitative relationships, and analyzing change in various contexts. These understandings are critical for success in college-level mathematics and fundamental for many real-world problems and situations students will face in their future careers. High school algebra, precalculus, and trigonometry standards use, apply, and extend these concepts.

Geometry and Measurement Strand: A focus on geometry should enable students to analyze characteristics of two- and threedimensional 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. This strand provides focus around the notion that geometry and measurement help students understand and represent ideas and solve problems they will encounter in their daily lives. The high school geometry standards use, apply, and extend these concepts.

Data and Probability Strand: An increased emphasis on understanding data should span all grade levels. Making sense of data and probability has become a part of our daily lives, supporting the importance of this strand throughout a student's PK-12 mathematics experience. A focus on data and probability should enable all students to formulate questions that can be addressed with data, and to collect, organize, and display relevant data to answer them. Students should 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. High school statistics and probability standards use, apply, and extend these concepts.



Standards vs. Objectives

The Oklahoma Academic Standards for Mathematics (OAS-M) consist of a set of standards and objectives (see page 9). The objectives serve as "stepping stones" for students to gain proficiency in the corresponding overarching standard. Each objective is the equivalent of at least one mathematical competency that students should know and be able to do if they can demonstrate proficiency in the standard. Objectives can and should be bundled to provide multiple opportunities and methods for students to learn and connect the standards and Mathematical Actions and Processes.

Mathematical Actions and Processes

The Mathematical Actions and Processes (MAPs) simultaneously reflect the holistic nature of mathematics as a discipline in which patterns and relationships among quantities, numbers, and space are studied and as a form of literacy such that all students are supported in accessing and understanding mathematics for life, for the workplace, for the scientific and technical community, and as a part of cultural heritage. The seven MAPS leverage both the NCTM Process Standards and the Five Mathematical Proficiencies to capture the mathematical experience of Oklahoma students as they pursue mathematical literacy. The gradient blocks at the top of each set of standards reminds educators to engage students in the Mathematical Actions and Processes together with content standards.





Mathematical Actions and 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. Students will develop an understanding of how and when to apply and use the mathematics they know to solve problems.

Develop Accurate and Appropriate Procedural Fluency

Focus on the efficiency, flexibility, and accuracy in which students approach and solve problems. Students will learn and develop efficient procedures and algorithms for computations and repeated processes which includes developing fluency in operations with numbers and expressions. Students will have opportunities to justify both informal and commonly used strategies to support their choices of appropriate procedures. As they progress, students will strengthen their understanding and skill through application and practice.

Develop Strategies for Problem Solving

Analyze the parts of complex mathematical tasks and identify entry points to begin the search for a solution. Students 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 realworld 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. Students 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. Students 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. Students will create, identify, and extend patterns as a strategy for solving and making sense of problems.

Develop the Ability to Communicate Mathematically

Students 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.



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Comparison of the standards for Mathematics (5th Grade (5))							
MATH ACTIONS Develop a Deep and Flexible Conceptual Understanding	d Develop Accurate and Appropriate Procedural Fluency		S 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 Communicate
STANDARDS			N	umber & Operations	; (N)		
5.N. 1 Read, write, represent, and compare fractions and decimals; recognize and write equivalent fractions; convert between fractions and decimals; use fractions and decimals in real-world and mathematical situations.		5.N.1.1 Represent decimal fractions (e.g., 1/10, 1/100) usin STRANDS 10 by 10 grids, base-ten blocks, meter stick) and showing the rational number relationship among fractions, decimals and whole numbers.					
		5.N.1.2 Read, write, and represent decimals using place value to describe decimal numbers including fractional numbers as small as thousandths and whole numbers up to seven digits.					
		5.N.1.3 Compare and order fractions and decimals, including mixed numbers and fractions less than one, and locate on a number line.					
.N.2 Divide multi-digit nu olve real-world and mathe	mbers and	OBJECT	IVES	g various mathematical mo	odels.		
oroblems using arithmetic.		5.N.2.2 Divi algor	ide multi-digit numbers, by o rithms.	ne- and two-digit divisors	, based on knowledge of place	value, including but not limi	ted to standard
		5.N.2.3 Rec meaningful f	ognize that remainders can b form of a remainder based o	be represented in a variety n the context of the proble	v of ways, including a whole nu em.	mber, fraction, or decimal. D	etermine the most
	-	5.N.2.4 Corvarious strater reasonablen	nstruct mathematical models egies, including the inverse r ness of results.	to solve multi-digit whole elationships between ope	numbers problems requiring a trations, the use of technology	addition, subtraction, multipli , and the context of the probl	cation, and division usi em to assess the
5.N.3 Add and subtract fractions with ike and unlike denominators, mixed		5.N.3.1 Estimate sums and differences of fractions with like and unlike denominators, mixed numbers, and decimals to assess the reasonableness of the results.					
umbers and decimals to s vorld and mathematical pr	oive real- oblems.	5.N.3.2 Illustrate addition and subtraction of fractions with like and unlike denominators, mixed numbers, and decimals using a variety of mathematica models (e.g., fraction strips, area models, number lines, fraction rods).					
		5.N.3.3 Add and subtract fractions with like and unlike denominators, mixed numbers, and decimals, involving money, measurement, geometry, and ousing various mathematical models including but not limited to standard algorithms.					
	-	5.N.3.4 Applying mental math and knowledge of place value (no computations), find 0.1 more than a number and 0.1 less than a number; find 0.01 r than a number and 0.01 less than a number; find 0.001 more than a number and 0.001 less than a number through the thousandths place.					