

# Arizona's College and Career Ready Standards

## General Overview of Arizona's College and Career Ready Standards for Mathematics

Teachers today must prepare students for a world of possibilities that may not currently exist. The workforce of tomorrow must be flexible, motivated, and be able to draw from a deep and vast skill set. Arizona's College and Career Ready Standards in mathematics provide a consistent, clear understanding of what students are expected to learn, so teachers and parents know what how to support them. The standards are focused, coherent, and relevant to the real world, describing the knowledge and skills that students need for success in college and careers. By setting high expectations with a commitment to succeed with all students, we are positioning our future workforce to be internationally competitive.

## Arizona's College and Career Ready Standards - Mathematics

**Arizona's College and Career Ready Standards** are the result of a state-led effort coordinated by the National Governors Association (NGA) and the Council of Chief State School Officers (CCSSO) to meet the needs of our future workforce. Governors and state commissioners of education from 48 states, 2 territories and the District of Columbia were committed to developing college and career ready state standards in English language arts and mathematics for grades K-12. In 2010, Arizona adopted Arizona's College and Career Ready Standards to ensure a more seamless education especially for those students who move around Arizona and move across the 46 states.

Arizona's College and Career Ready Standards in mathematics are

- research and evidence based,
- aligned with college and work expectations,
- rigorous, and
- Internationally benchmarked.

These standards are written to show a K-12 progression of skills and emphasize problem-solving, quantitative reasoning, and modeling with the following key advances:

- K-5: Focus on number and operations
- K-7: Graded ramp up to algebra, through fractions, ratios, and proportional reasoning
- 6-8: Rich hands-on work with ratios, geometry, statistics, and probability
- High School: Rigorous algebra, geometry, modeling, statistics and probability

**In K-8** (Kindergarten, Elementary, and Middle School) each *grade* contains work on several *domains*, as described in the table below. For example: In Grade 1, the content includes Operations and Algebraic Thinking, Number and Operations in Base Ten, Measurement and Data, and Geometry.

Grade	K	1	2	3	4	5	6	7	8	HS Conceptual Categories
Domains	Counting & Cardinality						Ratios & Proportional Relationships		Functions	Functions
	Operations and Algebraic Thinking						Expression and Equations			Algebra
	Number and Operations in Base Ten						The Number System			Number & Quantity
				Fractions						
	Measurement and Data						Statistics and Probability			Statistics & Probability
	Geometry						Geometry			Geometry
Contemporary Mathematics										

**In High School**, to accommodate the variation among states, the standards are arranged in *conceptual categories*, such as Algebra or Functions. In each conceptual category there are *domains*, such as Creating Equations and Interpreting Functions.

Conceptual Category	Number & Quantity	Algebra	Functions	Geometry	Statistics & Probability	Contemporary Mathematics (AZ Addition)
Domains	The Real Number System	Seeing Structure in Expressions	Interpreting Functions	Congruence	Interpreting Categorical & Quantitative Data	
				Circles		
	Quantities	Arithmetic with Polynomials & Rational Expressions	Building Functions	Similarity, Right Triangles, & Trigonometry	Making Inferences & Justifying Conclusions	
	The Complex Number System	Creating Equations	Linear, Quadratic, & Exponential Models	Expressing Geometric Properties with Equations	Conditional Probability & the Rules of Probability	
				Geometric Measurement & Dimension		
	Vector & Matrix Quantities	Reasoning with Equations & Inequalities	Trigonometric Functions	Modeling with Geometry	Using Probability to Make Decisions	Discrete Mathematics

**The Standards for Mathematical Practice** describe characteristics and traits that mathematics educators at all levels should seek to develop in their students. These practices rest on important “processes and proficiencies” with longstanding importance in mathematics education. The first of these are the NCTM process standards of problem solving, reasoning and proof, communication, representation, and connections. The second are the strands of mathematical proficiency specified in the National Research Council’s report *Adding It Up*: adaptive reasoning, strategic competence, conceptual understanding (comprehension of mathematical concepts, operations and relations), procedural fluency (skill in carrying out procedure flexibly, accurately, efficiently and appropriately), and productive disposition (habitual inclination to see mathematics as sensible, useful, and worthwhile, coupled with a belief in diligence and one’s own efficacy).

<b>Overarching Habits of Mind of a Productive Mathematical Thinker</b>  MP.1 Make sense of problems and persevere in solving them. MP.6 Attend to precision.	<b>Reasoning and Explaining</b>  MP. 2 Reason abstractly and quantitatively. MP. 3 Construct viable arguments and critique the reasoning of others.
	<b>Modeling and Using Tools</b>  MP. 4 Model with mathematics. MP. 5 Use appropriate tools strategically.
	<b>Seeing Structure and Generalizing</b>  MP. 7 Look for and make use of structure. MP. 8 Look for and express regularity in repeated reasoning.

## College and Career Ready Shifts for Mathematics

In order for students to be successful, educators must effectively implement the new changes to the standards. There are three key shifts associated with Arizona's College and Career Ready Standards in mathematics.

**Focus** — The goal is to focus strongly where the standards focus. The curriculum significantly narrows and deepens the way time and energy are spent in the mathematics classroom. The standards focus deeply on the major work of each grade so that students can gain strong foundations: solid conceptual understanding, a high degree of procedural skill and fluency, and the ability to apply the mathematics they know to solve problems inside and outside the mathematics classroom.

**Coherence** — Coherence is connecting ideas across grades, and linking to major topics within grades. The standards are designed around coherent progressions from grade to grade. Students build new understanding onto foundations built in previous years. Each standard is not a new event, but an extension of previous learning. Instead of allowing additional or supporting topics to detract from the focus of the grade, these topics can serve the grade-level focus.

**Rigor** — In major topics, conceptual understanding, procedural skill and fluency, and application are pursued with equal intensity.

- Emphasis is placed on conceptual understanding of key concepts, such as place value and ratios. Teachers support students' ability to access concepts from a number of perspectives so that students are able to see math as more than a set of mnemonics or discrete procedures.
- Students build speed and accuracy in calculation. Teachers structure class time and/or homework time for students to practice core functions, such as single-digit multiplication, so that they have access to more complex concepts and procedures.
- Students use math flexibly for applications. Teachers provide opportunities for students to apply math in context. Teachers in content areas outside of math, particularly science, ensure that students are using math to make meaning of and access content.