2016 Revision of the Arizona Mathematics Standards - Overview

The purpose of this document is to outline changes in the 2016 Revision of the Arizona Mathematics Standards document and to highlight how the changes have solved the concerns that have been expressed related to the Common Core State Standards (CCSS). Arizona thanks the educators, parents and community members for their full participation throughout this process. The new standards represent standards which will improve educational outcomes for all Arizona students.

Issue One: Elementary students are not expected to memorize math facts.

- **Expectations for math fluency have been strengthened and clarified.** Fluency is defined as *efficiently, accurately, flexibly, and appropriately*. Students are able to choose flexibly among methods and strategies to solve contextual and mathematical problems, they understand and are able to explain their approaches, and they are able to produce accurate answers efficiently. "Math facts" are used to support the full range of fluency expectations and form the basis for students answering with efficiency.

- **Specific reference to automatic recall has been added to the introduction and glossary.** "Please see standards 2.OA.B.2 and 3.OA.C.7 for standards related to addition and subtraction of within 20 and multiplication within 100. Both of these standards show mastery involves "from memory" as an outcome. By the end of 2nd and 3rd grade, these procedural fluency standards should be automatic recall by students."

- **Fluency expectations now extend through high school mathematics.** Table 3 in both the Introduction and the Glossary provides the standard or standards at each grade level that contribute to fluency from Kindergarten through Algebra 2.

Fluency Expectations Across All Grade Levels.

Grade	Coding	Fluency Expectations
K	**K.OA.A.5**	Fluently add and subtract through 5.
1	**1.OA.C.5**	Fluently add and subtract through 10.
2	**2.OA.B.2**	Fluently add and subtract through 20. By the end of 2nd grade, know from memory all sums of two one-digit numbers.
3	**3.NBT.A.3** **3.OA.C.7**	Fluently add and subtract through 100. Fluently multiply and divide through 100. By the end of 3rd grade, know from memory all multiplication products through 10 x 10 and division quotients when both the quotient and divisor are less than or equal to 10.
4	**4.NBT.B.4**	Fluently add and subtract multi-digit whole numbers using a standard algorithm.
5	**5.NBT.B.5**	Fluently multiply multi-digit whole numbers using a standard algorithm.
6	**6.NS.B.2** **6.NS.B.3** **6.EE.A.2**	Fluently divide multi-digit numbers using a standard algorithm. Fluently add, subtract, multiply, and divide multi-digit decimals using a standard algorithm for each operation. Write, read, and evaluate algebraic expressions.

7	**7.NS.A.1.d** **7.NS.A.2.c** **7.EE.B.4.a**	Apply properties of operations as strategies to add and subtract rational numbers. Apply properties of operations as strategies to multiply and divide rational numbers. Fluently solve one-variable equations of the form $px + q = r$ and $p(x + q) = r$
8	**8.EE.C.7**	Fluently solve linear equations and inequalities in one variable.
Algebra 1	**A1.F-IF.C.7** **A1.A-SSE.A.2**	Graph functions expressed symbolically and show key features of the graph. Use structure to identify ways to rewrite numerical and polynomial expressions.
Geometry	**G.G-SRT.B.5** **G.G-GPE.B** **G.SRT.C.8**	Use congruence and similarity criteria to prove relationships in geometric figures and solve problems utilizing a real-world context. Use coordinates to prove geometric theorems algebraically. Use trigonometric ratios (including inverse trigonometric ratios) and the Pythagorean Theorem to find unknown measurements in right triangles utilizing real-world context.
Algebra 2	**A2.A-SSE.A.2** **A2.F-BF.B** **A2.A-REI.B.4**	Use the structure of an expression to identify ways to rewrite it. Build new functions from existing functions. Fluently solve quadratic equations in one variable.

Issue Two: The mathematical practices eliminate focus on content knowledge.

- **The Mathematical Practices** are processes by which students build complex knowledge and proficiency throughout their educational experience. These practices help to foster mathematical understanding, and what students need to know and be able to do regarding math content. They are not instructional practices; rather, they are processes that students can utilize when engaging with math content. It is expected that the processes for each grade level be carried out in a developmentally appropriate manner so that all students are able to progress through the mathematics continuum.

- **The Standards for Mathematical Practice complement the content standards** so that students increasingly engage with the subject matter as they grow in mathematical maturity and expertise throughout the elementary, middle, and high school years. Developmental appropriateness is determined by the teacher during instructional planning and delivery. For example, first grade may have 25 students with 15 different content, social, and emotional developmental levels. Therefore, it is not appropriate to establish blanket or standardized developmental levels within the Mathematical Practice/Process Standards.

- **The Standards for Mathematical Practices are aligned to college-ready expectations.** The ACT and SAT include reference to the Math Practices/Process Standards in their technical manuals.

Standards for Math Practice	ACT: "The test requires students to use their mathematical reasoning skills to solve practical problems in mathematics." (p. 6)	SAT: "The test covers all mathematical practices, with an emphasis on problem solving, modeling, using appropriate tools strategically, and looking for and making use of structure to do algebra." (p. 134)

ACT: ACT® Technical Manual found here:
https://www.act.org/content/dam/act/unsecured/documents/ACT_Technical_Manual.pdf
SAT: Test Specifications for the Redesigned SAT® found here:
https://collegereadiness.collegeboard.org/pdf/test-specifications-redesigned-sat-1.pdf

- **Specific Mathematical Practice descriptors were added** to ensure consistent expectations across all grade levels. Each mathematical practice should reflect the developmental level of the specific grade level.

Issue Three: The Mathematics CCSS do not prepare students for college or career.

- **The Department is moving forward with the development of standards beyond Algebra II.** Unlike the creators of CCSS, Arizonan's recognize that more mathematics instruction will better prepare our students for life after high school and guidance on mathematics courses after Algebra II is essential. The 2016 revised Arizona Mathematics Standards takes an important first step by differentiating between Algebra I and Algebra II expectations rather than lumping these standards together into one course. Now that Algebra II standards, with the assistance of higher education professionals, has been clearly defined, work can begin on the creation of standards beyond Algebra II.

Issue Four: Kindergarten CCSS are not developmentally appropriate

- **The revised Arizona standards clearly state and describe what students should know and be able to do in each domain.** Based on technical feedback, revisions were made to clarify standards. In many instances specifics or variances in strategies were removed to ensure clarity and appropriateness. Examples of this can be seen in "*Represent addition and subtraction concretely"* or *"Solve addition and subtraction word problems and add and subtract within 10"*. Public comment specifically addressed that the use or development of an equation in the primary grades should not be required. The workgroup agreed with these public comments and addressed this area in Kindergarten (critical areas) and in First Grade with the inclusion of "and/or" when referencing the creation of equations by students.

Issue Five: The CCSS dictate curriculum and instruction

- **The revised Arizona standards do not dictate curriculum or pedagogy**. In kindergarten through eighth grade, the standards are organized by grade level and then by domains *(clusters of standards that address "big ideas" and support connections of topics across the grades*), clusters *(groups of related standards inside domains)*, and the standards *(what students should know, understand, and be able to do)*. Similarly, the high school standards are organized by conceptual

category, domain, cluster, and the standards**.** The numbering of standards within a grade level does not imply an instructional sequence nor does the numerical coding imply vertical alignment from one grade to the next.

- **During the initial phases of revision, the working group members decided to remove most examples from the standards in order to ensure there was not dictation of curriculum or instruction.** Drs. Milgram, Wurman, and Carlson, along with Achieve provided feedback that the examples should be reinstated. The Math Work group reviewed each request for reinstating the standard specific examples and made individual choices to reinstate or to include in support documents at the request of Technical Reviewers. As a result, examples were reinstated in 34 standards.

Summary of Mathematics Content Standards Revisions:

Kindergarten: 9 of 23 of the original CCSS have been revised (39%).

1st Grade: 9 of 22 of the original CCSS have been revised (41%).

2nd Grade: 8 of 26 of the original CCSS have been revised (31%).

3rd Grade: 8 of 27 of the original CCSS have been revised (30%).

4th Grade: 8 of 29 of the original CCSS have been revised (28%).

5th Grade: 13 of 27 of the original CCSS have been revised (44%).

6th Grade: 10 of 29 of the original CCSS have been revised (34%).

7th Grade: 11 of 23 of the original CCSS have been revised (48%).

8th Grade: 19 of 30 of the original CCSS have been revised (63%).

Algebra I: 23 of 46 of the original CCSS have been revised (50%).

Geometry: 16 of 39 of the original CCSS have been revised (41%).

Algebra II: 25 of 48 of the original CCSS have been revised (52%).

Plus Standards: 12 of 54 of the original CCSS have been revised (22%).

Overall Total: 171 of 423 of the original CCSS have been revised (40%).

Summary of edits to new narratives for the Standards for Mathematical Practice:

Overall Total: 2 of 8 of the new narratives have been revised (25%).