Arizona Mathematics Standards
Eighth Grade

ARIZONA DEPARTMENT OF EDUCATION

Adopted December 2016

Arizona Mathematics Standards 8th Grade

The Arizona Department of Education (ADE) requests input and feedback from educators and the public regarding the identification of Essential Standards. These Essential Standards will receive heightened emphasis and reporting within their standards groups, or "clusters" through the annual Arizona Academic Standards Assessment (AASA) exam, beginning in the 2025-2026 school year.

BACKGROUND

Beginning in November 2024, ADE organized an effort to identify Essential Standards for the annual AASA exams for grades three through eight. ADE took this action in response to feedback from district leaders that additional focus, direction and feedback were needed to optimize student performance and the annual state exams. This document conveys the results of that effort for public input.

WHAT ARE ESSENTIAL STANDARDS?

Essential Standards are individual standards selected to receive a greater proportion of questions on the AASA exams. The AASA exams, administered for grades three through eight, are developed based on a Standards Blueprint that groups individual standards into clusters and identifies an allocation of questions for each cluster. The identified Essential Standards will receive the maximum allowable number of questions allowed by the standards blueprint. **Note that ALL standards will continue to be included in the test design of the annual state exams.**

THE PROCESS

ADE issued a call to educators in October 2024 to assemble teams of ELA and Math reviewers for each grade. Reviewers collaboratively identified standards most essential for student progress based on foundational knowledge and progression. Twelve reports were generated: six for Math and six for English Language Arts.

REPORTING

The AASA exam results will be reported in a new format in which essential standards will be represented. Beginning with the 2025-2026 school year identified essential standards, from the existing State Board of Education-approved standards for math, in grades three through eight will have a higher proportion of items on the statewide assessment, keeping within the current blueprint adopted by the State Board of Education.

ALL STANDARDS WILL BE ASSESSED

The identified Essential Standards are targeted for emphasis, indicating that there could be a higher proportion of questions on those standards in the AASA. The state assessment will retain the same length and duration. **ALL STANDARDS** remain valid and subject to inclusion in each year's AASA.

Eighth Grade: Overview

1. **Develop understanding of irrational numbers.**
2. **Develop understanding of expressions and equations, including solving linear equations, linear inequalities, and systems of linear equations.**
3. **Develop understanding of the concept of a function and use functions to describe quantitative relationships, including modeling an association in bivariate data with a linear equation.**

a. Students use their understanding of multiplication and apply properties to develop understanding of radicals and integer exponents. They use their knowledge of rational numbers to develop understanding of irrational numbers.

b. Students recognize equations for proportions (y/x =m or y = mx) as special linear equations (y = mx + b) understanding that the constant of proportionality (m) is the slope, and the graphs are lines through the origin. They understand that the slope (m) of a line is a constant rate of change, so that if the input or x-coordinate changes by an amount A, the output or y-coordinate changes by the amount m – A.

c. Students fluently solve linear equations and linear inequalities in one variable. They solve systems of two linear equations in two variables to analyze situations and solve problems. Students understand when they use properties of equality and logical equivalence, they maintain the solutions of the original equation.

d. Students grasp the concept of a function as a rule that assigns to each input exactly one output. They can translate among representations and partial representations of functions (noting that tabular and graphical representations may be partial representations), and they describe how aspects of the function are reflected in the different representations.

e. Students use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. For scatter plots that suggest linear association, students informally fit a straight line and assess the model fit by judging the closeness of the data points to the line.

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.

Content Emphasis of Arizona Mathematics Standards:

The content emphasis provides planning guidance regarding the major and supporting clusters found within the standards. The Major and Supporting Clusters align with the Blueprint for AASA. Please consider the following designations when planning an instructional scope for the academic year.

Arizona considers **Major Clusters** 🔴 as groups of related standards that require greater emphasis than some of the other standards due to the depth of the ideas and the time it takes to master these groups of related standards.

Arizona considers **Supporting Clusters** 🔺 as groups of related standards that support standards within the major cluster in and across grade levels. Supporting clusters also encompass pre-requisite and extension of grade level content.

Arizona is suggesting instructional time encompass a range of at least 65%-75% for Major Clusters and a range of 25%-35% for Supporting Cluster instruction. See [introduction](#), page 12 for more information.

Arizona Mathematics Standards 8th Grade

The Number System (NS)

🔴 Understand that there are irrational numbers, and approximate them using rational numbers.

Expressions and Equations (EE)

🔴 Work with radicals and integer exponents.

🔴 Understand the connections between proportional relationships, lines, and linear equations.

🔴 Analyze and solve linear equations, inequalities, and pairs of simultaneous linear equations.

Functions (F)

🔴 Define, evaluate, and compare functions.

🔴 Use functions to model relationships between quantities.

Geometry (G)

🔺 Understand congruence and similarity.

🔺 Understand and apply the Pythagorean Theorem.

🔺 Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres.

Statistics and Probability (SP)

🔺 Investigate patterns of association in bivariate data.

🔺 Investigate chance processes and develop, use, and evaluate probability models.

Standards for Mathematical Practices (MP)

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

ESSENTIAL STANDARDS

Essential Standards are individual standards selected to receive a greater proportion of questions on the AASA exams. The AASA exams, administered in grades three through eight, are developed based on a standards blueprint approved by the State Board of Education that includes individual standards grouped into clusters and identifies an allocation of questions for each cluster. The identified Essential Standards will receive the maximum number of questions allowed by the standards blueprint. **Note that ALL standards will continue to be included in the test design of the annual state exams.**

ALL STANDARDS WILL BE ASSESSED

The identified Essential Standards are targeted for emphasis, indicating that these standards will have a higher proportion on the AASA when possible. The state assessment will retain the same length and duration. **ALL STANDARDS** remain valid and subject to inclusion in each year's AASA.

REPORTING

The AASA exam results will include a new report in which Essential Standards will be represented. Beginning with the 2025-2026 school year identified Essential Standards, from the existing State Board of Education-approved standards for math, in grades three through eight will have a higher proportion of items on the statewide assessment, keeping within the current blueprint adopted by the State Board of Education. Each given year an Essential Standard Cluster, identified on the table, may or may not be reported, depending upon the final form.

Reporting Cluster Table

Grade 8

Expressions and Equations	Functions	Geometry	Statistics and Probability and The Number System
Work with radicals and integer exponents.*	Define, evaluate, and compare functions.*	Understand congruence and similarity.	Understand that there are irrational numbers, and approximate them using rational numbers.*
Understand the connections between proportional relationships, lines, and linear equations.*	Use functions to model relationships between quantities.*	Understand and apply the Pythagorean Theorem.	Investigate patterns of association in bivariate data.
Analyze and solve linear equations, inequalities, and pairs of simultaneous linear equations.*		Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres.	Investigate chance processes and develop, use, and evaluate probability models.

*Reported cluster

The Number System (NS)

	Understand That There are Irrational Numbers and Approximate Them Using Rational Numbers
8.NS.A.1	Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion. Know that numbers whose decimal expansions do not terminate in zeros or in a repeating sequence of fixed digits are called irrational.
8.NS.A.2	Use rational approximations of irrational numbers to compare the size of irrational numbers. Locate them approximately on a number line diagram, and estimate their values.
8.NS.A.3	Understand that given any two distinct **rational** numbers, $a < b$, there exist a rational number c and an irrational number d such that $a < c < b$ and $a < d < b$. Given any two distinct **irrational** numbers, $a < b$, there exist a rational number c and an irrational number d such that $a < c < b$ and $a < d < b$.

Expressions and Equations (EE)

	Work with Radicals and Integer Exponents
*8.EE.A.1	Understand and apply the properties of integer exponents to generate equivalent numerical expressions.
8.EE.A.2	Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number. Know that $\sqrt{2}$ is irrational. a. Evaluate square roots of perfect squares less than or equal to 225. b. Evaluate cube roots of perfect cubes less than or equal to 1000.
8.EE.A.3	Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and express how many times larger or smaller one is than the other.
8.EE.A.4	Perform operations with numbers expressed in scientific notation including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities.

Arizona Mathematics Standards 8th Grade

Understand the Connections Between Proportional Relationships, Lines, and Linear Equations	
8.EE.B.5	Graph proportional relationships interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. *For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.*
*8.EE.B.6	Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane. Derive the equation $y = mx$ for a line through the origin and the equation $y = mx + b$ for a line intercepting the vertical axis at $(0, b)$.

Analyze and Solve Linear Equations, Inequalities, and Pairs of Simultaneous Linear Equations	
*8.EE.C.7	Fluently solve linear equations and inequalities in one variable. a. Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solution. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form $x = a$, $a = a$, or $a = b$ results (where a and b are different numbers). b. Solve linear equations and inequalities with rational number coefficients, including solutions that require expanding expressions using the distributive property and collecting like terms.
*8.EE.C.8	Analyze and solve pairs of simultaneous linear equations. a. Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously. b. Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations including cases of no solution and infinite number of solutions. Solve simple cases by inspection. c. Solve mathematical problems and problems in real-world context leading to two linear equations in two variables.

Function (F)

Define, Evaluate, and Compare Functions	
*8.F.A.1	Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output. (Function notation is not required in Grade 8.)
8.F.A.2	Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change.*
*8.F.A.3	Interpret the equation $y = mx + b$ as defining a linear function whose graph is a straight line; give examples of functions that are not linear. *For example, the function $A = s^2$ giving the area of a square as a function of its side length in not linear because its graph contains the points (1,1), (2,4), and (3,9) which are not on a straight line.*

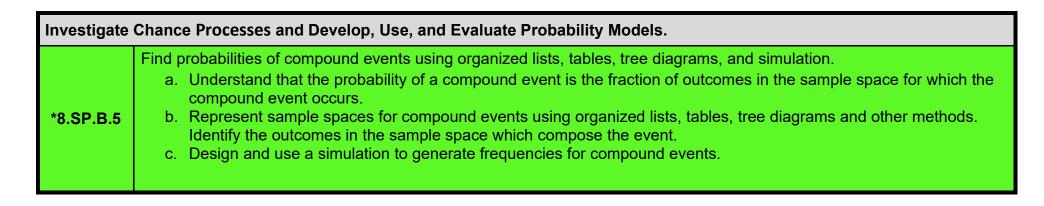| Use Functions to Model Relationships Between Quantities	
*8.F.B.4	Given a description of a situation, generate a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or a graph. Track how the values of the two quantities change together. Interpret the rate of change and initial value of a linear function in terms of the situation it models, its graph, or its table of values.
*8.F.B.5	Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.

Geometry (G)

Understand Congruence and Similarity	
8.G.A.1	Verify experimentally the properties of rotations, reflections, and translations. Properties include: lines are taken to lines, line segments are taken to line segments of the same length, angles are taken to angles of the same measure, parallel lines are taken to parallel lines.
*8.G.A.2	Understand that a two-dimensional figure is congruent to another if one can be obtained from the other by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that demonstrates congruence.
*8.G.A.3	Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.
*8.G.A.4	Understand that a two-dimensional figure is similar to another if, and only if, one can be obtained from the other by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that demonstrates similarity.
8.G.A.5	Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. *For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so.*

Understand and Apply the Pythagorean Theorem	
8.G.B.6	Understand the Pythagorean Theorem and its converse.
8.G.B.7	Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world context and mathematical problems in two and three dimensions.
8.G.B.8	Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.

Solve Real-World and Mathematical Problems Involving Volume of Cylinders, Cones, and Spheres	
8.G.C.9	Understand and use formulas for volumes of cones, cylinders and spheres and use them to solve real-world context and mathematical problems.

Statistics and Probability (SP)

Investigate Patterns of Association in Bivariate Data	
8.SP.A.1	Construct and interpret scatter plots for bivariate measurement data to investigate and describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.
8.SP.A.2	Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line.
8.SP.A.3	Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept.
8.SP.A.4	Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables.

Investigate Chance Processes and Develop, Use, and Evaluate Probability Models.	
*8.SP.B.5	Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation. a. Understand that the probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs. b. Represent sample spaces for compound events using organized lists, tables, tree diagrams and other methods. Identify the outcomes in the sample space which compose the event. c. Design and use a simulation to generate frequencies for compound events.

Arizona Mathematics Standards 8th Grade

Standards for Mathematical Practice	
8.MP.1	**Make sense of problems and persevere in solving them** Mathematically proficient students explain to themselves the meaning of a problem, look for entry points to begin work on the problem, and plan and choose a solution pathway. While engaging in productive struggle to solve a problem, they continually ask themselves, "Does this make sense?" to monitor and evaluate their progress and change course if necessary. Once they have a solution, they look back at the problem to determine if the solution is reasonable and accurate. Mathematically proficient students check their solutions to problems using different methods, approaches, or representations. They also compare and understand different representations of problems and different solution pathways, both their own and those of others.
8.MP.2	**Reason abstractly and quantitatively** Mathematically proficient students make sense of quantities and their relationships in problem situations. Students can contextualize and decontextualize problems involving quantitative relationships. They contextualize quantities, operations, and expressions by describing a corresponding situation. They decontextualize a situation by representing it symbolically. As they manipulate the symbols, they can pause as needed to access the meaning of the numbers, the units, and the operations that the symbols represent. Mathematically proficient students know and flexibly use different properties of operations, numbers, and geometric objects and when appropriate they interpret their solution in terms of the context.
8.MP.3	**Construct viable arguments and critique the reasoning of others** Mathematically proficient students construct mathematical arguments (explain the reasoning underlying a strategy, solution, or conjecture) using concrete, pictorial, or symbolic referents. Arguments may also rely on definitions, assumptions, previously established results, properties, or structures. Mathematically proficient students make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. Mathematically proficient students present their arguments in the form of representations, actions on those representations, and explanations in words (oral or written). Students critique others by affirming or questioning the reasoning of others. They can listen to or read the reasoning of others, decide whether it makes sense, ask questions to clarify or improve the reasoning, and validate or build on it. Mathematically proficient students can communicate their arguments, compare them to others, and reconsider their own arguments in response to the critiques of others.
8.MP.4	**Model with mathematics** Mathematically proficient students apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. When given a problem in a contextual situation, they identify the mathematical elements of a situation and create a mathematical model that represents those mathematical elements and the relationships among them. Mathematically proficient students use their model to analyze the relationships and draw conclusions. They interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

Arizona Mathematics Standards 8th Grade

8.MP.5	**Use appropriate tools strategically** Mathematically proficient students consider available tools when solving a mathematical problem. They choose tools that are relevant and useful to the problem at hand. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful; recognizing both the insight to be gained and their limitations. Students deepen their understanding of mathematical concepts when using tools to visualize, explore, compare, communicate, make and test predictions, and understand the thinking of others.
8.MP.6	**Attend to precision** Mathematically proficient students clearly communicate to others using appropriate mathematical terminology, and craft explanations that convey their reasoning. When making mathematical arguments about a solution, strategy, or conjecture, they describe mathematical relationships and connect their words clearly to their representations. Mathematically proficient students understand meanings of symbols used in mathematics, calculate accurately and efficiently, label quantities appropriately, and record their work clearly and concisely.
8.MP.7	**Look for and make use of structure** Mathematically proficient students use structure and patterns to assist in making connections among mathematical ideas or concepts when making sense of mathematics. Students recognize and apply general mathematical rules to complex situations. They are able to compose and decompose mathematical ideas and notations into familiar relationships. Mathematically proficient students manage their own progress, stepping back for an overview and shifting perspective when needed.
8.MP.8	**Look for and express regularity in repeated reasoning** Mathematically proficient students look for and describe regularities as they solve multiple related problems. They formulate conjectures about what they notice and communicate observations with precision. While solving problems, students maintain oversight of the process and continually evaluate the reasonableness of their results. This informs and strengthens their understanding of the structure of mathematics which leads to fluency.