south dakota
DEPARTMENT OF EDUCATION
Learning. Leadership. Service.

South Dakota Mathematics Standards

Proposed October 15, 2025

Introduction

The 2025 revision of South Dakota's Math Standards was a collaborative process designed to ensure the state's mathematics education is rigorous, relevant, and responsive to the needs of all learners. The South Dakota Department of Education (the department), in partnership with educators and experts from across the state, undertook a comprehensive review and revision process guided by educator input.

Following the revision of the South Dakota English Language Arts standards—where one of the key priorities was alignment to the Science of Reading—the Department of Education recognized the importance of establishing a clear direction for mathematics instruction as well. Unlike ELA, mathematics lacked a similarly unified framework to guide instructional alignment. This recognition led to the decision to convene a statewide Math Advisory group to help determine the direction of math education and standards in South Dakota. This group included K–12 educators and administrators from districts across the state, as well as representatives from higher education educator preparation programs.

At its first meeting the advisory team discussed the current state of math instruction in South Dakota, identified strengths and challenges, and reviewed instructional frameworks from other states and the South Dakota Literacy Framework. The work continued at the second Math Advisory meeting where the group reviewed research findings, discussed effective instructional methodologies, and examined standards from other states and organizations, including Arkansas, North Dakota, South Carolina, and the Archimedes standards. The group provided feedback that aided the department in finalizing its key priorities for the revised standards. The revision process should produce standards that use clear and concise language, contain a balance of procedural fluency and conceptual understanding. In addition, they should align across grade spans and identify essential standards.

Using the current South Dakota Math Standards as a foundation, the department applied the advisory's guidance and identified priorities to create a first draft of standards. In July, the Math Standards Review Committee—comprising members of the advisory group and additional math educators—convened to review and provide feedback on the draft standards. Working in grade-band teams, the committee engaged in a detailed review process, applying the Quality Standards Checklist. This checklist, originally developed during the English Language Arts standards revision, served as a tool to ensure the standards reflected the established priorities: improving clarity, removing or replacing vague language, incorporating critical content and skills, and balancing conceptual understanding with procedural fluency. It also emphasized the importance of horizontal and vertical alignment—making meaningful connections within and across grade levels.

As the committee worked to identify essential standards it became evident that the revised standards, shaped by the checklist and advisory recommendations, already prioritized content throughout. Additionally, this type of identification is often best addressed at the district level, where local context and instructional planning can guide prioritization. If needed, this work could be revisited by the department in the future as part of developing standards implementation support tools. In lieu of identifying essential standards, the Department is creating a supplemental progression document that

clearly outlines the development of mathematical skills across grade levels, organized by specific concepts.

The feedback provided by the advisory and revision committee was instrumental in shaping the final proposed standards. The Department carefully considered and incorporated the committee's recommendations to ensure the standards are instructionally sound, developmentally appropriate, and practical for classroom use across South Dakota.

This inclusive and iterative process reflects South Dakota's commitment to high-quality mathematics education and ensures that the revised standards are both educator-informed and student-centered.

Summary of Changes

The 2025 South Dakota Mathematics Standards introduces several important updates aimed at improving clarity, coherence, and instructional alignment across grade levels. Several significant updates were made to improve clarity and readability, ensure alignment across grade levels, and incorporate the mathematical practices within the standards. The key changes are as follows:

1. Structure and Organization
   - Domain-Based Organization: The new standards are organized by clear domains (e.g., Numbers, Arithmetic, Geometry), each with subcategories (clusters) that reflect conceptual groupings. This structure improves readability and instructional planning.
   - Standard Coding System: Each standard is now labeled with a consistent code (e.g., 3.A.1 for 3rd Grade Arithmetic), making it easier to reference and track across documents and assessments.
   - Grade-Level Clarity: Each grade's standards are presented in a self-contained section, reducing the need for cross-referencing and supporting vertical alignment.

2. Content and Balance
   - Expanded Fluency Expectations: Fluency standards are clearly labeled and include expectations for mental math, fact recall, and efficient computation strategies.
   - Conceptual Understanding and Procedural Fluency: the standards are intentionally designed to balance conceptual understanding-the "why" behind the math-with procedural fluency-the ability to apply skills efficiently and accurately. This blend ensures students develop both deep comprehension and practical competence across all grade levels.
   - Real-world Contexts: many standards now explicitly call for application in real-world scenarios, especially in measurement, data, and functions.

3. Instructional Shifts
   - Mathematical Practices Embedded: While not listed separately, the Standards for Mathematical Practice are embedded throughout, with a focus on reasoning, modeling, and problem-solving.
   - Visual and Concrete Representations: There is increased emphasis on using drawings, manipulatives and visual models to support understanding, particularly in early grades.
   - 4th Year: Fourth year math courses vary significantly across South Dakota school districts and are not included the revised standards.

4. Language
   - Simplified Terminology: Language and terminology were simplified to ensure that the standards are easily understood by educators, students, and parents.
   - Clarity of Expectations: Ambiguous or overly complex phrasing was revised to provide clear expectations and goals.
   - Streamlined Content: Redundant standards were consolidated to streamline the framework and eliminate confusion.

Standards Revision Committee

Name	Organization	Position
Nicole Bisgaard	Black Hills Special Services	Learning Specialist
Victoria Borns	Clark School District	1st Grade Teacher
Ruth Coates	Hill City School District	High School Math Teacher
Teddie Crevier	Harrisburg School District	Advanced Program Director Intern
Susan Fairchild	Watertown High School	High School Math Teacher
Zach Gors	Tri-Valley School District	Elementary Principal
Tim Heil	Lemmon School District	4th Grade Teacher
Becky Kitts	Pierre School District	K-2 Title I Teacher
Cole Knippling	Parkston School District	High School Principal
Kristyn LaBine	Douglas School District	Middle School Math Teacher
Brent Liechti	Highmore-Harrold School District	High School Math Teacher
Dr. Monte Meyerink	Northern State University	Assistant Professor of Mathematics Education
Alyssa Morrisette	Oglala Lakota School District	Middle School Math Teacher
Anne Noyes	Pierre School District	4th Grade Math Teacher
Kristen Pittmann	Agar-Blunt-Onida School District	Middle School Math Teacher
Dena Sievers	Aberdeen School District	Middle School Math Teacher
Kendra Sundall	Sioux Falls School District	K-5 Instructional Math Coach
Sarah Timmer	Mitchell School District	Curriculum Director
Megan Wilson	Sanborn Central School District	High School Math Teacher
Support Team		
Hayley Miller	Department of Education	DOE Project Lead
Kelly Royer	Department of Education	DOE Project Lead
Vera Van	Department of Education	DOE Project Lead

How to Read the Standards

The Math standards are organized into grade level and structured into clearly defined domains such as Numbers, Arithmetic, Geometry, and Measurement. Within each domain, standards are grouped by conceptual subcategories called clusters (e.g., Place Value, Operations and Properties), and each standard is labeled with a consistent code (e.g., 3.A.1).

K-5 Domain Code	**K-5 Domain Name**
N	Numbers
A	Arithmetic
M	Measurement
G	Geometry
MF	Mathematical Fluency
F	Fractions
Middle School Domain Code	**Middle School Domain Name**
NC	Number Concepts and Computations
PR	Proportional Relationships
A	Algebra
G	Geometry
M	Measurement
SP	Statistics and Probability
F	Functions
High School Domain Code	**High School Domain Name**
E	Expressions
F	Functions
LF	Linear Functions, Equations, and Inequalities
QF	Quadratic Functions and Equations
EF	Exponential Functions and Equations
SP	Statistics and Probability
RT	Right Triangles
C	Circles
GF	Geometric Figures
LA	Lines and Angles
T	Transformations
SC	Similarity and Congruency
EL	Exponential and Logarithmic Functions and Equations
TF	Trigonometric Functions and Equations
PR	Polynomial, Rational and Other Functions and Equations

Example Standard

Geometry

Shapes

K.G.1 Understand shapes in different categories may share attributes and can define a larger category.

Geometry = Domain Name, *Shapes* = Cluster Name. K.G.1 = Standards abbreviation

K = Grade Level/Course (Kindergarten), **G** = Domain name (Geometry), **1** = Standard number

High School Standards Course Abbreviations

A1 = Algebra 1, **G** = Geometry, **A2** = Algebra 2

South Dakota Standards for Mathematics

Kindergarten Mathematics Standards 1

1st Grade Mathematics Standards 3

2nd Grade Mathematics Standards 5

3rd Grade Mathematics Standards 7

4th Grade Mathematics Standards 10

5th Grade Mathematics Standards 13

6th Grade Mathematics Standards 16

7th Grade Mathematics Standards 19

8th Grade Mathematics Standards 22

Algebra 1 Mathematics Standards 25

Geometry Mathematics Standards 29

Algebra 2 Mathematics Standards 32

Kindergarten Mathematics Standards

Numbers

Names, Sequence, & Counting

K.N.1 Count to 100 by ones and tens.

K.N.2 Start counting forward from any number up to 100 and count backward from any number within 20.

K.N.3 Read, write, and identify numbers from 0 to 20.

K.N.4 Count objects using one to one correspondence.

K.N.5 Given a number within 20, identify one more.

K.N.6 Count up to 20 objects in a line, rectangular array, and circle.

K.N.7 Count up to 10 objects in a scattered arrangement.

K.N.8 Given a number(s) from 0-20, count out that many objects.

Comparison

K.N.9 Identify whether the number of objects in one group is greater than, less than, or equal to the objects of another group (up to ten).

K.N.10 Identify whether a written number is greater than, less than, or equal to another written number (0-10).

Arithmetic

Operations and Properties

K.A.1 Represent addition and subtraction within ten using objects, fingers, drawings, mental images, or verbal explanations.

K.A.2 Represent the operations of addition and subtraction using an equation.

K.A.3 Demonstrate understanding that addition is putting together, getting more, or counting on.

K.A.4 Demonstrate understanding that subtraction is taking away, taking apart, or counting back.

K.A.5 When solving word problems, identify the correct operation needed (add or subtract within ten), and solve using objects or drawings.

K.A.6 Find different ways that a whole number (1 to 10) can be broken into two parts by using a visual representation or equation.

K.A.7 Find all the ways the number 5 can be broken into two parts using visual representations or equations.

K.A.8 Break apart and put together numbers 11–19 into tens and ones, using objects, drawings, or equations.

Measurement

Measurement Concepts

K.M.1 When looking at an object describe measurable traits (length, weight, or size).

K.M.2 Compare objects using the same measurable trait.

Time and Money

K.M.4 Know that clocks measures time of day. Answer questions about time of day and duration of time. (morning, afternoon, evening, minute, hour).

K.M.5 Know the calendar measures time in days, months, weeks, years. Answer questions about time sequencing (yesterday, today, tomorrow).

K.M.6 Identify pennies and dimes by name and value.

K.M.7 Count groups of pennies and groups of dimes by their values. (coins not combined)

Data

K.M.3 Collect and sort objects into categories

Geometry

Shapes

K.G.1 Identify and sort shapes as two-dimensional or three-dimensional.

K.G.2 Describe two-dimensional shapes (circles, triangles, squares, and rectangles) using attributes (sides, vertices, square corners).

K.G.3 Identify and draw two-dimensional shapes. (circles, triangles, squares, rectangles, rhombus, and trapezoid in a variety of orientations.)

K.G.4 Identify three-dimensional shapes. (cube, cone, cylinder, or sphere.)

K.G.5 Build and draw shapes found in the real world.

K.G.6 Build simple shapes to form larger shapes.

Mathematical Fluency

K.MF.1 Fluently add within 5.

K.MF.2 Fluently subtract within 5.

K.MF.3 Recognize objects within 5 (tallies, five frame, fingers, dominoes, dice, and scattered).

1st Grade Mathematics Standards

Numbers

Names, Sequence, and Comparison

1.N.1 Count to 120 by tens.

1.N.2 Count forward and backward from any number within 120.

1.N.3 Read, write, and identify numbers from 0 to 120.

1.N.4 Compose and decompose two-digit numbers into tens and ones.

1.N.5 Represent two-digit numbers. (Drawings, ten-frames, base-ten blocks, place value chart, etc.)

1.N.6 Count objects up to 120 using groups of tens and ones.

1.N.7 Compare two two-digit numbers using symbols (<,=,>) based on the value of the tens and ones in the given numbers.

Arithmetic

Operations and Properties

1.A.1 Demonstrate understanding of addition problems using properties (commutative, associative, and additive identity) within 20.

1.A.2 Solve addition and subtraction problem within 20, using objects, drawings, number line, or equations with a symbol for the unknown number.

1.A.3 Solve addition and subtraction word problems within 20. Including problems with 3 whole addends.

1.A.4 Given a number within 100, add and subtract multiples of 10 within 100 using multiple strategies that reflect an understanding of place value.

1.A.5 Add a two digit and one digit number (with or without regrouping) using multiple strategies that reflect an understanding of place value.

1.A.6 Subtract a two digit and one digit number (with or without borrowing) using multiple strategies that reflect an understanding of place value.

1.A.7 Demonstrate understanding of inverse operations between addition and subtraction by creating equivalent equations within 20.

1.A.8 Apply the understanding of the equal sign to determine if equations involving addition or subtraction are true or false.

1.A.9 Given an equation, find an unknown value.

Measurement

Measurement Concepts

1.M.1 Order three objects by length; compare the lengths of two objects indirectly by using a third object.

1.M.2 Measure how long something is by lining up same-size units with no gaps or overlaps and count how many it takes.

Time and Money

1.M.3 Tell and write time to half-hour and hour intervals on analog and digital clocks.

1.M.4 Identify coins by name and value, including penny, nickel, dime, and quarter.

1.M.5 Find the value of combinations of U.S. coins up to one dollar using pennies and dimes and represent with ¢.

Data

1.M.6 Organize, represent, and interpret data with up to three categories.

1.M.7 Interpret and compare data represented in a picture/bar graph or tally chart.

Geometry

Shapes

1.G.1 Understand the difference between defining attributes and non-defining attributes.

1.G.2 Use defining attributes to build and draw shapes.

1.G.3 Compose and identify regular and irregular two-dimensional shapes.

1.G.4 Understand a trapezoid to be a flat shape with four sides, where at least one pair of sides go the same direction (parallel).

1.G.5 Understand a right rectangular prism is a solid shape that looks like a box with rectangular faces.

1.G.6 Partition circles and rectangles into two or four equal parts and describe the parts using the words halves and fourths.

Mathematical Fluency

1.MF.1 Fluently add within 20.

1.MF.2 Fluently subtract within 20.

1.MF.3 Recall from memory addition facts within 10.

1.MF.4 Recall from memory subtraction facts within 10.

1.MF.5 Mentally find 10 more or 10 less than a given two-digit number.

2nd Grade Mathematics Standards

Numbers

Counting

2.N.1 Count forward and backward from any number by 10s and 100s up to 1000.

2.N.2 Count forward and backward by 5s to 120.

2.N.3 Count forward and backward by 2's to 50 and determine whether the number is odd or even.

Place Value

2.N.4 Given a two-digit or three-digit number, find the distance to the next ten or hundred, and prior ten or hundred.

2.N.5 Compose and decompose three-digit numbers into hundred, tens and ones.

2.N.6 Read, write, and identify numbers up to 100 in standard form, word form, and expanded form.

2.N.7 Compare two three-digit numbers using symbols (<,=,>), based on the value of the hundreds, tens, and ones in the given numbers.

Arithmetic

Operations and Properties

2.A.1 Demonstrate understanding of addition problems using properties (commutative, associative, and additive identity) within 100.

2.A.2 Solve addition and subtraction problems within 100, using objects, drawings, open number lines, or equations with a symbol for the unknown number.

2.A.3 Solve addition and subtraction word problems within 100.

2.A.4 Add up to four two-digit numbers using multiple strategies.

2.A.5 Add and subtract up to 1000 using multiple representations and strategies.

2.A.6 Given a rectangular array, use repeated addition to find the total number of objects

Fractions

2.F.1 Partition circles and rectangles into two, three or four equal parts then count and describe the parts using the words halves, thirds, and fourths. ("one-fourth, two-fourths, three-fourths").

Measurement

Measurement Concepts

2.M.1 Explore length of an object by lining up inch-sized manipulative with no gaps or overlaps.

2.M.2 Estimate the length of an object using inches, feet, and yards.

2.M.3 Measure the length of objects using rulers and yardsticks.

2.M.4 Explore length of an object by lining up centimeter and decimeter-sized manipulatives with no gaps or overlaps.

2.M.5 Estimate the length of an object using centimeters, decimeters, and meters.

2.M.6 Measure the length of objects using centimeters, decimeters, and meters.

Time and Money

2.M.7 Tell and write time to the nearest five minutes on analog and digital clocks and use a.m. and p.m. appropriately.

2.M.8 Solve problems involving time in 5-minute intervals.

2.M.9 Find the value of combinations of U.S. coins up to $1 and bills up to $100.

Data

2.M.10 Create tables, line plots, and bar graphs to represent a given set of data with up to four categories.

2.M.11 Interpret and analyze data presented with tables, line plots, picture graphs, and bar graphs.

Geometry

Shapes

2.G.1 Recognize, identify, and describe the difference between attributes of polygons.

2.G.2 Describe the difference between attributes (number of sides & vertices, congruent & parallel sides, and right angles) of quadrilaterals (square, rectangle, rhombus, and trapezoid).

2.G.3 Identify regular and irregular two-dimensional shapes.

Mathematical Fluency

2.MF.1 Fluently add within 100.

2.MF.2 Fluently subtract within 100.

2.MF.3 Mentally calculate 10 more, 10 less, 100 more and 100 less than a given three-digit number 100-900.

3rd Grade Mathematics Standards

Numbers

Place Value

3.N.1 Use place value understanding to round whole numbers to the nearest 10 or 100.

3.N.2 Read and write whole numbers up to 10,000 using standard form, word form, and expanded form.

Arithmetic

Operations and Properties

3.A.1 Understand multiplication as putting equal groups together.

3.A.2 Understand division as splitting objects into equal groups.

3.A.3 Solve word problems using multiplication and division within 100 using drawings and equations with a symbol for the unknown number.

3.A.4 Determine the unknown whole number in a multiplication or division equation relating three whole numbers.

3.A.5 Apply properties of operations as strategies to multiply and divide.

3.A.6 Understand that multiplication and division are inverse operations.

3.A.7 Multiply and divide within 100.

3.A.8 Fluently multiply one-digit whole numbers by multiples of 10 in the range 10-90.

3.A.9 Solve two-step word problems using addition, subtraction, multiplication, and division using an equation with a symbol for the unknown quantity.

3.A.10 Demonstrate understanding of addition and multiplication problems using properties (commutative, associative, and identity).

3.A.11 Identify and explain arithmetic patterns.

Fractions

Fraction Foundation

3.F.1 Understand a fraction as parts of a whole.

3.F.2 Understand the denominator of a fraction represents the number of equal parts the whole is broken into.

3.F.3 Understand the numerator of a fraction represents the number of selected equal parts

3.F.4 Understand fractions as parts of a whole, as numbers on a number line, and as multiples of unit fractions.

3.F.5 Understand two fractions are equivalent (equal) if they represent the same quantity, or the same point on a number line.

3.F.6 Recognize and generate equivalent fractions and explain why they are equivalent.

3.F.7 Express whole number fractions and recognize fractions that are equivalent to whole numbers.

3.F.8 Compare two fractions with the same numerator or the same denominator using the symbols $<, >, =$.

Measurement

Measurement Concepts

3.M.1 Understand area to be the amount of space inside a 2-dimensional shape.

3.M.2 Understand a square unit to be a square that is 1 unit on each side and is used to measure area.

3.M.3 Understand a shape has an area of n square units if it can be covered with n unit squares without gaps or overlaps.

3.M.4 Measure areas by square unit lengths.

3.M.5 Find the area of rectangles by tiling and relate area to the corresponding operation.

3.M.6 Solve word problems involving areas of rectangles.

3.M.7 Use tiling to represent the distributive property of multiplication.

3.M.8 Understand that area can be found by adding the areas of non-overlapping rectangles and use this method to solve real-world problems.

3.M.9 Understand perimeter as the distance around a two-dimensional shape.

3.M.10 Solve real-world and mathematical problems involving perimeters of polygons.

2.M.11 Measure and estimate liquid volumes using the U.S. Customary and metric system.

3.M.12 Measure and estimate masses of objects using the U.S. Customary and metric system.

3.M.13 Solve one-step addition, subtraction, multiplication, and division word problems involving masses or volumes in the same units.

Time and Money

3.M.14 Tell and write time to the nearest minute using an analog and digital clock.

3.M.15 When solving word problems add, subtract, multiply and divide time to the minute.

3.M.16 Determine the value of a collection of U.S. coins and dollars up to $100.00 using decimal notation.

Data

3.M.17 Create tables, bar graphs, circle graphs, and line graphs to represent a given set of data.

3.M.18 Interpret and analyze one and two step data problems with tables, bar graphs, circle graphs, and line graphs.

Geometry

Shapes

3.G.1 Understand shapes in different categories may share attributes and can define a larger category.

3.G.2 Understand that a quadrilateral is any four-sided shape, and identify, describe, and know the relationships between various quadrilaterals, including trapezoids, parallelograms, rectangles, rhombuses, and squares.

3.G.3 Break apart shapes into parts with equal areas and express the area of each part as a unit fraction of the whole.

3.G.4 Determine whether a shape is a polygon or non-polygon.

3.G.5 Classify polygons based on the number of sides.

Mathematical Fluency

3.MF.1 Fluently use multiplication strategies to mentally solve multiplication facts through 12.

3.MF.2 Recall from memory multiplication facts (0-12) to include 0, 1, 2, 5, and 10.

3.MF.3 Mentally solve multiplication facts within 100 with the corresponding division facts.

3.MF.4 Fluently add and subtract multi-digit whole numbers using various strategies.

3.MF.5 Fluently multiply one-digit whole numbers by multiples of 10 in the range 10-90.

4th Grade Mathematics Standards

Numbers

Place Value

4.N.1 Recognize that a digit in a given place represents ten times what it represents in the place to its right.

4.N.2 Use place value understanding to round multi-digit whole numbers to any place.

4.N.3 Read and write whole numbers up to 1,000,000 using standard form, word form, and expanded form.

Arithmetic

Operations and Properties

4.A.1 Use multiplication equation as a comparison.

4.A.2 Solve real-world problems involving multiplicative comparison, using drawings and/or equations with a symbol for the unknown number, and distinguish between multiplicative comparison and additive comparison.

4.A.3 Multiply four-digit whole numbers by one-digit whole numbers, and multiply two two-digit whole numbers.

4.A.4 Divide whole numbers with four-digits by one-digit divisors; quotients should be with and without whole number remainders.

4.A.5 Interpret a remainder of a one-step division problem.

4.A.6 Solve multistep word problems using addition, subtraction, multiplication, and division, with whole numbers and having whole number answers, including problems in which remainders must be interpreted.

4.A.7 Find factor pairs for whole numbers to 100.

4.A.8 Recognize that a whole number (within 100) is a multiple of each of its factors.

4.A.9 Find multiples of single-digit whole numbers.

4.A.10 Determine whether a whole number from 1 to 100 is prime or composite.

4.A.11 Generate a number or shape pattern that follows a given rule, identifying apparent features of the pattern that are not explicit in the rule itself.

4.A.12 Demonstrate understanding of addition and multiplication problems using properties (commutative, associative, distributive, and identity).

4.A.13 Evaluate a numerical expression including addition, subtraction, multiplication, and division using the order of operations of whole numbers- without parenthesis and exponents.

Fractions

Operations and Properties

4.F.1 Explain why a fraction a/b is equivalent to another fraction when both the divisor and dividend are multiplied by the same number.

4.F.2 Compare fractions with different numerators and denominators, by creating common denominators or numerators, using the symbols $<, >, =$.

4.F.3 Add and subtract fractions with a common denominator.

4.F.4 Break apart fractions into sums of fractions with the same denominator and smaller numerators.

4.F.5 Add and subtract mixed numbers with like denominators using various strategies.

4.F.6 Multiply a fraction by a whole number and a whole number by a fraction.

4.F.7 Understand a fraction a/b is a multiple of $1/b$.

4.F.8 Understand a multiple of a/b is also a multiple of $1/b$.

4.F.9 Solve word problems involving multiplication of fractions by whole numbers.

4.F.10 Add two fractions with denominator of 10 and 100 by expressing the denominator of 10 as an equivalent fraction with a denominator of 100.

4.F.11 Understand a decimal number to be a number with a whole part and a fractional part separated by a decimal point.

4.F.12 Apply decimal notation for fractions with denominators 10 or 100.

4.F.13 Read, write, and describe the value of decimal numbers to the hundredths place.

4.F.14 Compare decimals to the hundredths place on a number line and by using the symbols $<, >, =$.

Measurement

Measurement Concepts

4.M.1 Measure length, weight, mass, and capacity from U.S. customary and metric systems of units.

4.M.2 Express larger units in terms of smaller units through conversions.

4.M.3 Solve word problems using addition, subtraction, multiplication, and division involving distance, intervals of time, capacity, masses, and money, using fractional and decimal values.

4.M.4 Apply the area and perimeter formulas for rectangles in real world problems.

Data

4.M.5 Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8) and solve problems using the line plot.

Geometry

Geometric Measurement

4.G.1 Understand a circle to be the set of all the points equal distance from a fixed point called the center and that an angle is a fractional part of the circle.

4.G.2 Measure angles, to the nearest degree, using a protractor and identify, describe, and draw right, acute, obtuse, and straight angles.

4.G.3 Identify, describe, and draw equilateral, scalene, right, acute, and obtuse angles and triangles.

4.G.4 Recognize when angles are broken apart the sum of the parts is equal to the angle measure of the whole.

Shapes

4.G.5 Recognize angles as geometric shapes that are formed where two rays share a common endpoint.

4.G.6 Identify, describe, and draw points, lines, segments, rays, and angles.

4.G.7 Identify, describe, and draw intersecting, parallel, and perpendicular lines.

4.G.8 Identify and describe various quadrilaterals by their properties of parallel and perpendicular lines.

4.G.9 Identify and draw lines of symmetry for two-dimensional figures.

Mathematical Fluency

4.MF.1 Recall from memory multiplication and division facts (0-12).

4.MF.2 Fluently add and subtract multi-digit whole numbers using various strategies.

5th Grade Mathematics Standards

Numbers

Place Value

5.N.1 Recognize that a digit in a given place represents ten times what it represents in the place to its right and 1/10 what it represents in the place to its left.

5.N.2 Explain patterns in the number of zeros and/or the decimal point when multiplying or dividing a number by a power of 10, using whole-number exponents to denote powers of 10.

5.N.3 Read and write decimal numbers to the thousandths place using standard form, word form and expanded form.

5.N.4 Order and compare decimal numbers to the thousandths place using the symbols $<, >, =$.

5.N.5 Apply place value understanding to round decimals to any decimal place up to the thousandths place.

Arithmetic

Operations and Properties

5.A.1 Write and evaluate numerical expressions with parentheses or brackets using the order of operations.

5.A.2 Generate two number patterns by following two different rules and make a graph using ordered pairs that match the numbers from each pattern.

5.A.3 Calculate whole number quotients of whole numbers with up to four-digit dividends and two-digit divisors.

5.A.4 Add decimals to the hundredths place using various strategies.

5.A.5 Subtract decimals to the hundredths place using various strategies.

5.A.6 Multiply decimals to the hundredths place using various strategies.

5.A.7 Divide decimals to the hundredths place using various strategies.

Fractions

Fractional Operations and Properties

5.F.1 Add and subtract fractions, unlike fractions, mixed numbers, and improper fractions.

5.F.2 Solve word problems using addition and subtraction of fractions, unlike fractions, mixed numbers, and improper fractions.

5.F.3 Interpret a fraction as division of the numerator by the denominator ($a/b = a \div b$). Solve word problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers.

5.F.4 Multiply a fraction or whole number by a fraction.

5.F.5 Divide unit fractions by whole numbers and whole numbers by unit fractions.

5.F.6 Solve real-world problems involving multiplication of fractions and mixed numbers.

5.F.7 Solve real-world problems involving the division of unit fractions by whole numbers and whole numbers by unit fractions.

Measurement

Measurement Concepts

5.M.1 Convert length, weight, mass, capacity, and time measurements from larger to smaller units and vice versa within the U.S. customary and metric measuring systems.

Data

5.M.2 Create and use a line plot to display a data set of measurements to solve real world problems involving information presented.

Geometry

Geometric Measurement

5.G.1 Understand volume to be the space inside a three-dimensional object, and that a cubic unit is a cube that is 1 unit on each side and is used to measure volume.

5.G.2 Understand a shape has a volume of cubic units if it can be filled with unit cubes without gaps or overlaps.

5.G.3 Measure volume by cubic units using cubic cm, cubic in, cubic ft or cubic units.

5.G.4 Relate volume to operations of multiplication and addition.

5.G.5 Find the volume of right rectangular prism by packing with unit cubes and relate it to multiplication.

5.G.6 Use threefold whole-number products of volume to represent the associative property of multiplication.

5.G.7 Solve real world problems by applying formulas (V=l • w • h, V=B • h) for rectangular prisms to find the volume of right rectangular prisms with whole number side lengths.

5.G.8 Find volumes of solid figures composed of two non-overlapping right rectangular prisms (with whole number side lengths) by adding the volumes.

Shapes

5.G.9 Understand attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category.

5.G.10 Classify two-dimensional figures in a hierarchy based on properties.

5.G.11 Identify and draw triangles based on their attributes (side lengths and angle measures). Understand that triangles can be classified into categories (such as equilateral, isosceles, scalene, acute, right, and obtuse), and that these categories can overlap.

Coordinate Plane System

5.G.11 Understand a coordinate plane to be a diagram for graphing two related pieces of information with two perpendicular number lines.

5.G.12 Identify the origin, x-axis, and y-axis on the coordinate plane.

5.G.13 Identify x- and y-coordinates of points on a coordinate plane.

5.G.14 Understand the x-coordinate in an ordered pair is the horizontal movement and the y-coordinate in the order pair is the vertical movement.

5.G.15 Represent real-world and mathematical problems by graphing points in the first quadrant on a coordinate plane.

Mathematical Fluency

5.MF.1 Fluently multiply multi-digit whole numbers using various strategies.

6th Grade Mathematics Standards

Numbers Concepts and Computations

Rational Numbers

6.NC.1 Understand a ratio as a comparison of two quantities.

6.NC.2 Know that the set of rational numbers includes, positive integers, negative integers, zero, fractions, mixed numbers, and decimals.

6.NC.3 Explain positive and negative integers as being opposite (inverse) values or directions from zero. Also, explain zero as its own opposite.

6.NC.4 Understand the meaning of zero in a real-world context.

6.NC.5 Understand the absolute value of rational numbers to be its distance from zero on the number line.

6.NC.6 Determine the absolute value of a rational number by finding its distance from zero on a number line in real-world situations.

Rational Number Operations

6.NC.7 Know that dividing by a fraction is equivalent to multiplying by its reciprocal (multiplicative inverse).

6.NC.8 Divide fractions by fractions.

6.NC.9 Solve word problems involving division of fractions by fractions.

6.NC.10 Compare rational numbers, using inequalities ($<, >, \leq, \geq, \neq$) and order on a number line.

Common Factors and Multiples

6.NC.11 Find the greatest common factor of two whole numbers less than or equal to 100.

6.NC.12 Find the least common multiple of two whole numbers less than or equal to 12.

6.NC.13 Use the distributive property to rewrite the sum of two whole numbers 1-100 using its greatest common factor.

Mathematical Fluency

6.NC.14 Fluently divide multi-digit numbers using various strategies.

6.NC.15 Fluently add, subtract, multiply, and divide multi-digit decimals and fractions using various strategies.

Proportional Relationships

Ratio and Rates

6.PR.1 Write ratios, rates, and unit rates. Determine the units of a unit rate.

6.PR.2 Use ratio and rate reasoning to solve real-world and mathematical problems including making ratio tables, solving unit rate problems, and using percentages.

Algebra

Expressions

6.A.1 Write and evaluate numerical expressions involving whole-number exponents.

6.A.2 Read and write expressions in real-world and mathematical problems in which letters represent numbers.

6.A.3 Use mathematical terms in identifying parts of an expression, including names of operations, terms, factors, coefficients, variables, and constants.

6.A.4 Write and evaluate expressions for given values of variables using the order of operations, including expressions with whole number exponents.

6.A.5 Identify and generate equivalent expressions by applying the associative, commutative, distributive, and identity properties.

Equations and Inequalities

6.A.6 Use substitution to determine if a given value in a specified set makes an equation or inequality true. Include the following inequality symbols: $<, >, \leq, \geq, \neq$.

6.A.7 Write and solve one-step equations in real-world and mathematical problems, involving positive rational numbers and zero.

6.A.8 Write, solve, and graph one-step inequalities in real-world and mathematical problems, involving positive rational numbers and zero.

6.A.9 Understand an equation with two variables to be a statement expressing a relationship between two unknown quantities.

6.A.10 Write an equation to express two quantities in terms of the dependent and independent variable.

6.A.11 Describe the relationship between the dependent and independent variables in an equation using tables and graphs, relating these to the equation.

Geometry

Area, Volume, and Surface Area

6.G.1 Find the area of triangles, special quadrilaterals, and polygons by composing or decomposing to solve real-world problems.

6.G.2 Find the volume of right rectangular prisms with fractional edge lengths by tiling and relate it to multiplication.

6.G.3 Draw polygons in the coordinate plane when given coordinates for the vertices.

6.G.4 Use coordinates to calculate vertical and horizontal distances between points with the same x-coordinate or the same y-coordinate to solve real-world and mathematical problems.

6.G.5 Construct nets of a rectangular prism, rectangular pyramid, triangular prism, and triangular pyramid, using the nets to find the surface area of these prisms and pyramids.

Coordinate Plane System

6.G.6 Find and graph pairs of rational numbers in all four quadrants of the coordinate plane in real-world and mathematical problems.

6.G.7 Understand that signs of a coordinate pair indicate locations in a quadrant of the coordinate plane, opposite signs indicate reflections across one or both axes.

Measurement

Conversions

6.M.1 Use ratio reasoning to convert measurement units within the U.S. customary and metric measuring systems.

Statistics and Probability

Statistical and Nonstatistical

6.SP.1 Understand statistics to be a branch of mathematics that involves the collection, representation, and analysis of quantitative data.

6.SP.2 Recognize that data collected to answer a statistical question can be analyzed by their distributions.

Numerical Data

6.SP.3 Represent numerical data on a number line, histogram, and box plot.

6.SP.4 Interpret a box plot to answer statistical questions about a data set.

Measures of Center

6.SP.5 Distinguish between a measure of center (mean, medium, and mode) and measure of variation (range).

6.SP.6 Calculate and interpret any measure of center (mean, median, and mode) of a numerical data set.

6.SP.7 Determine which measure of center (mean or median) is more appropriate to describe the center of data; justify the choice.

Measures of Variation

6.SP.8 Determine which measure of variation (range or interquartile range [IQR]) is more appropriate to describe the shape; justify the choice.

6.SP.9 Calculate and interpret the measure of variation [range and interquartile range (IQR)] of a numerical data set.

7th Grade Mathematics Standards

Numbers Concepts and Computations

Rational Numbers

7.NC.1 Model and describe additive inverse in real-world situations to show opposite quantities combine to make zero.

7.NC.2 Demonstrate in real-world contexts the distance between two rational numbers on the number line as the absolute value of their differences.

7.NC.3 Convert a rational number in fraction form to decimal form and recognize that the decimal form of a rational number terminates in zeros or eventually repeats.

7.NC.4 Understand that integers can be divided, provided the divisor is not zero.

Rational Number Operations

7.NC.5 Add and subtract rational numbers; represent those operations on a number line.

7.NC.6 Solve multi-step problems with positive and negative rational numbers in real-world and mathematical problems.

7.NC.7 Multiply and divide rational numbers in real-world and mathematical problems.

Proportional Relationships

Ratio and Rates

7.PR.1 Calculate unit rates in real-world contexts that include complex fractions.

7.PR.2 Determine the unit rate (constant of proportionality) from tables, graphs, equations, diagrams, or verbal descriptions of proportional relationships.

7.PR.3 Use proportional relationships to solve multi-step ratio and percent problems.

Constant of Proportionality

7.PR.4 Determine whether two quantities are in a proportional relationship using tables, graphs, equations, diagrams, and verbal descriptions.

7.PR.5 Explain what a point (x, y) on the graph of a proportional relationship means in terms of the situation, with special attention to the points $(0,0)$ and $(1, r)$ where r is the unit rate.

Algebra

Expressions

7.A.1 Write an equation to express two quantities in terms of the dependent and independent variables.

7.A.2 Add, subtract, factor, and expand linear expressions with rational coefficients using multiple grouping symbols.

Equations and Inequalities

7.A.3 Create, solve, and graph two-step inequalities in real-world and mathematical problems in the forms of $px + q > r$, $px + q \geq r$, $px + q < r$, and $px + q \leq r$, where p, q, and r are specific rational numbers.

Relationships between Quantities

7.A.4 Describe the relationship between the dependent and independent variables using equations, tables, and graphs.

Geometry

Area, Volume, and Surface Area

7.G.1 Identify, describe, and draw elements of circles, including center, radius, and diameter.

7.G.2 Understand pi to be the proportional relationship between the circumference and diameter of a circle.

7.G.3 Use area and circumference formulas of a circle to solve real-world and mathematical problems.

7.G.3 Solve real-world and mathematical problems involving area, volume and surface area of two- and three- dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.

Cross Sections

7.G.4 Describe the two-dimensional figure that results from slicing a three-dimensional figure including right rectangular prisms, triangular prisms, and cylinders.

Triangle and Angles

7.G.5 Draw geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle.

7.G.6 Solve multi-step problems involving supplementary, complementary, vertical, and adjacent angles to include solving for an unknown angle in a figure.

Measurement

Scale

7.M.1 Calculate the scale factor, compute the actual lengths from the scale in a drawing, and reproduce a scale drawing using another scale.

Statistics and Probability

Numerical Data

7.SP.1 Represent a set of data using a box plot, labeling quartiles, and identifying outliers.

7.SP.2 Select an appropriate measure(s) of center or variability and draw valid comparative inferences for two data sets.

Sampling and Population

7.SP.3 Understand sampling to be a selection of a smaller group (sample) from a larger group (population).

7.SP.4 Understand different ways of sampling, including convenience sampling and random sampling, and know ways to make a sample more representative.

7.SP.5 Draw conclusions, such as mean, medium, mode, and range of data, about a larger population using data from a representative sample.

7.SP.6 Understand a sample space to be the set of all possible outcomes for a situation or experiment.

Probability

7.SP.7 Understand probability as the likelihood or chance of an event occurring.

7.SP.8 Recognize that probabilities in a simple experiment can be qualitative descriptors of likelihood: impossible (0), unlikely, neither likely nor unlikely, likely, or certain (1).

7.SP.9 Calculate the probability for a single event by dividing the number of favorable outcomes by the number of total outcomes.

7.SP.10 Determine experimental probabilities in simple experiments and represent as fractions, decimals, and percents.

7.SP.11 Use theoretical probability of an event in a simple experiment to predict the number of times that an event will occur for a large number of experiments.

7.SP.12 Calculate the probability for a compound event using organized lists, tables, tree diagrams, and simulation.

8th Grade Mathematics Standards

Numbers Concepts and Computations

Rational and Irrational Numbers

8.NC.1 Understand that a real number is any number that can be represented on a number line.

8.NC.2 Know that the set of real numbers is made up of rational and irrational numbers.

8.NC.3 Understand an irrational number to be a non-terminating, non-repeating decimal that cannot be expressed as a fraction of two integers (rational number).

8.NC.4 Compare the value of irrational numbers and locate them on a number line by finding the rational approximations.

Rational Number Operations

8.NC.5 Know and apply the properties of integer exponents to generate equivalent numerical expressions.

8.NC.6 Understand the root index to be the number placed above the radical symbol indicating which root to find and know that if the root index is not specified, it is assumed to be 2.

8.NC.7 Understand a square root of a number to be the number that when multiplied by itself produces the original number.

8.NC.8 Understand the cube root of a number to be a number that when cubed produces the original number.

8.NC.9 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. Evaluate square roots of small perfect squares and cube roots of small perfect cubes.

8.NC.10 Write numbers in scientific notation using positive and negative exponents.

Functions

Proportional and Linear Relationships

8.F.1 Graph proportional relationships, interpreting the rate of change as the slope of the graph.

8.F.2 Compare two different proportional relationships represented in different ways including tables, graphs, equations, and verbal descriptions.

8.F.3 Explain how the slope of a line is the same between any two points on a non-vertical or non-horizontal line. Types of slope include: positive, negative, horizontal (zero), and vertical (undefined).

Functions

8.F.4 Understand a function to be an equation or rule that assigns to each input (independent value) exactly one output (dependent value).

8.F.5 Understand the domain as the set of inputs accepted by the function.

8.F.6 Understand the range as the set of outputs produced by the function.

8.F.7 Determine whether a relationship is a function given a table, graph, equation, or verbal description.

8.F.8 Determine whether a relationship is linear or nonlinear given a table, graph, equation, or verbal description.

8.F.9 Understand a linear function to be a relationship between two variables with a constant rate of change whose graph is a straight line on the coordinate plane and to have the equation $y = mx + b$.

8.F.10 Determine the rate of change (slope) and y-intercept (initial value) from tables, graphs, equations, and verbal descriptions of linear relationships.

8.F.11 Interpret and explain the meaning of the rate of change (slope) and y-intercept (initial value) of a linear relationship in a real-world context.

8.F.12 Analyze a graph by describing the functional relationships between two quantities.

Algebra

Equations and Inequalities

8.A.1 Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solution.

8.A.2 Solve linear equations with rational number coefficients using the distributive property and combining like terms.

8.A.3 Analyze and solve one-variable linear inequalities with rational coefficients.

System of Equations

8.A.4 Understand a system of linear equations to be a set of two or more equations.

8.A.5 Know that the solution to a system of two linear equations is an ordered pair that makes both the equations true.

8.A.6 Know that a system of two linear equations can have one solution, infinitely many solutions, or no solution.

8.A.7 Solve real-world and mathematical problems involving leading to two linear equations in one and/or two variables.

Geometry

Area, Volume, and Surface Area

8.G.1 Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.

Triangles and Angles

8.G.2 Understand properties of interior and exterior angles in triangles (triangle sum theorem, exterior angle theorem).

8.G.3 Understand and explain the relationships between angles when parallel lines are intersected by a transversal.

Pythagorean Theorem

8.G.4 Identify, describe, and draw elements of triangles including base, height, leg, and hypotenuse.

8.G.5 Know and use the Pythagorean Theorem to find unknown side lengths in right triangles.

8.G.6 Know and use the converse of the Pythagorean Theorem to determine if a triangle is a right triangle.

8.G.7 Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.

Transformation, Similarity, and Congruency

8.G.8 Understand congruent figures to be geometric objects that have exactly the same size and shape.

8.G.9 Understand similar figures to be geometric objects that have the same shape (proportional) but different sizes.

8.G.10 Understand a rigid transformation to be a change in a shape that generates a congruent shape by preserving distances between vertices.

8.G.11 Identify, draw, and describe the three types of rigid transformations: rotations, reflections, and translations.

8.G.12 Identify, draw, and describe mathematical dilations as non-rigid transformations that generate a similar shape.

8.G.13 Describe a sequence of transformations that moves and aligns one similar shape onto another.

8.G.14 Understand and explain the angle-angle criterion for determining the similarity of triangles.

Statistics and Probability

Bivariate Data

8.SP.1 Construct and interpret scatter plots using bivariate data; determine if the data displays a linear or nonlinear pattern and positive, negative, or no association.

8.SP.2 Construct a line of fit to approximately fit data displaying a linear association when presented in scatter plot.

8.SP.3 Construct and interpret a relative frequency table.

Algebra 1 Mathematics Standards

Expressions

Rational and Irrational Numbers

A1.E.1 Explain why the sum or product of two rational numbers is rational; the sum of a rational and an irrational number is irrational; and the product of a nonzero rational and an irrational number is irrational.

Polynomials, Roots, and Exponents

A1.E.2 Understand polynomials to be a sum of algebraic terms having variables, coefficients, exponents, and/or constants.

A1.E.3 Add, subtract and multiply polynomials.

A1.E.4 Understand rational exponents as a way to represent roots as powers.

A1.E.5 Simplify numerical expressions with exponents, powers, and roots, including negative and rational exponents.

A1.E.6 Simplify algebraic expressions using the laws of exponents.

Functions

Domain and Range, Function Notation

A1.F.1 Use function notation, evaluate functions, and interpret statements that use function notation in terms of a context.

Construct and Compare

A1.F.2 Determine whether a relationship is a function given a graph, an equation, or a table of values.

A1.F.3 Compare the growth pattern of exponential to linear using graphs and tables and recognize how exponential growth exceeds other functions.

A1.F.4 Differentiate between real-world scenarios that can be modeled by exponential or linear functions by determining whether the relationship has a common difference or a common ratio.

Linear Functions, Equations, and Inequalities

Create and Solve

A1.LF.1 Represent and solve real-world problems, using linear expressions, equations, and inequalities in one variable. Interpret the solution as reasonable or unreasonable in context.

A1.LF.2 Solve linear equations and linear inequalities in one variable, including those with rational number coefficients, variables on both sides of the equal or inequality sign, and literal equations, explaining the process used.

A1.LF.3 Construct linear functions from arithmetic sequences with and without context.

A1.LF.4 Write arithmetic sequences with explicit and recursive formulas.

Interpret Key Features

A1.LF.5 Identify the parts of expressions such as terms, factors, variables, constants, and coefficients.

A1.LF.6 Determine reasonable domain and range values of linear functions representing real-world situations, both continuous and discrete.

A1.LF.7 Interpret the key features of linear functions that model a relationship between two quantities in a given context.

A1.LF.8 Use different representations of a linear function, including graphs, tables, and equations.

A1.LF.9 Calculate and interpret the rate of change of a linear function represented in a table, graph, or as an equation in context of real-world and mathematical problems.

A1.LF.10 Translate between equivalent forms of equations for linear functions, including standard, point-slope, and slope intercept forms; recognize that each form reveals key features in a given context.

Systems of Equations and Inequalities

A1.LF.11 Estimate the solution of a system of linear equations by graphing the equations on a coordinate plane.

A1.LF.12 Solve a system of linear equations with integer coefficients algebraically (substitution and elimination).

A1.LF.13 Solve a system of liner equations with integer coefficients by combination (elimination).

A1.LF.14 Solve linear inequalities and systems of linear inequalities in two variables by graphing.

A1.LF.15 Explain why a solution to the equation $f(x) = g(x)$ is the *x*-coordinate where the *y*-coordinate of $f(x)$ and $g(x)$ are the same using graphs, tables, or approximations. Include cases where $f(x)$ and/or $g(x)$ are linear, quadratic, and exponential.

Statistical Relationships

A1.LF.16 Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.

A1.LF.17 Compute (using technology) and interpret the correlation coefficient of a linear fit.

A1.LF.18 Distinguish between correlation and causation.

Quadratic Functions and Equations

Create and Solve

A1.QF.1 Solve quadratic equations with real number solutions, containing one variable, including those with variables on both sides of the equal sign. Equations should be solved by: graphing, factoring, completing the square (leading coefficient is one, b value is even), quadratic formula, taking the square root.

A1.QF.2 Interpret the solutions for quadratic equations as reasonable or unreasonable in context.

A1.QF.3 Graph quadratic functions in standard and vertex form.

Interpret Key Features

A1.QF.4 Determine the domain and range of quadratic functions.

A1.QF.5 Determine reasonable domain and range values of quadratic functions representing real-world situations.

A1.QF.6 Interpret the key features of a quadratic function (direction, roots, zeros, x-intercepts, and maximum or minimum values) that models a relationship between two quantities in a given context.

Graphing and Transformations

A1.QF.7 Graph and generalize the effect of transformations on linear, absolute value, and quadratic functions including stretches, compressions, vertical, and horizontal with and without technology.

Exponential Functions and Equations

Create and Solve

A1.EF.1 Construct exponential equations from geometric sequences with and without context.

A1.EF.2 Use properties of exponents to write equivalent expressions for exponential functions.

A1.EF.3 Write geometric sequences with explicit and recursive formulas.

Interpret Key Features

A1.EF.4 Determine the domain and range of exponential functions in mathematical problems.

A1.EF.5 Determine reasonable domain and range values of exponential functions representing real-world situations.

A1.EF.6 Interpret the key features of an exponential function that models a relationship between two quantities in a given context.

Graphing

A1.EF.7 Graph exponential functions that model real-world problems (growth, decay, and compound interest), showing key attributes.

Statistical Relationships

A1.EF.8 Interpret the quantities in an exponential equation in the context of a real-world problem, including growth, decay, and compound interest.

Statistics and Probability

Numerical Data

A1.SP.1 Use box plots and histograms to determine the statistics appropriate to the shape of the data distribution; compare the center (mean and median) and spread (standard deviation and IQR) of two or more data sets.

A1.SP.2 Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points.

Bivariate Data

A1.SP.3 Summarize data from two categorical variables in a frequency table; interpret relative frequencies in the context of the data, recognizing data trends and associations.

Geometry Mathematics Standards

Right Triangles

Special Right Triangles and Pythagorean Theorem

G.RT.1 Apply the properties of special right triangles (30°—60°—90° and 45°—45°—90°) to solve real-world and mathematical problems.

G.RT.2 Prove and apply the Pythagorean Theorem and its converse.

Trigonometry Ratios

G.RT.3 Define that side ratios in right triangles are related to the angles in the triangle, leading to definitions of trigonometric ratios (sine, cosine, and tangent) for acute angles.

G.RT.4 Explain the relationship between the sine and cosine of complementary angles and use them to solve problems.

G.RT.5 Determine the sine, cosine, and tangent ratios of acute angles given the side lengths of right triangles.

G.RT.6 Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.

Circles

Circle Relationships

G.C.1 Recognize and apply relationships between angles, radii, chords, tangents, and secants including the relationship between central, inscribed, and circumscribed angles, inscribed angles on a diameter are right angles, the radius of a circle is perpendicular to the tangent where the radius intersect the circle.

G.C.2 Use the proportional relationship between the measure of an arc length of a circle and the circumference of the circle to solve problems.

G.C.3 Use the proportional relationship between the measure of the area of a sector of a circle and the area of the circle to solve problems.

Equations of Circles

G.C.4 Write the equation of a circle, given the radius and center, where the center is at the origin or another point.

G.C.5 Identify the center and radius of a circle, given the equation of a circle, where the center is at the origin or another point.

Geometric Figures

Two-Dimensional

G.GF.1 Understand a point to be a zero-dimensional object with location but no length, width, or height.

G.GF.2 Understand a line to be a one-dimensional object with length but no width or height, extending indefinitely in opposite directions.

G.GF.3 Understand a plane to be a two-dimensional object with length and width but no height, extending indefinitely in both directions.

G.GF.4 Understand a ray to be a part of a line with one endpoint that continues indefinitely in one direction.

G.GF.5 Understand a line segment to be part of a line that is bounded by two distinct end points.

G.GF.6 Understand an angle to be a geometric figure formed by two rays (sides) with the same endpoint (vertex).

G.GF.7 Understand a circle to be a two-dimensional shape that is perfectly round made up of a set of all points equidistant from a fixed point called the center.

G.GF.8 Apply theorems about triangles including isosceles triangle theorem and it converse, midsegment theorem, proportionality theorem, inequality theorem and its converse and geometric mean theorem.

G.GF.9 Apply theorems about quadrilaterals, including those involving angles, diagonals, and sides to solve problems.

G.GF.10 Apply theorems about polygons including interior angle sum and exterior angle theorems.

Three-Dimensional

G.GF.11 Find the volume and surface area of complex three-dimensional figures composed of prisms, pyramids, cones, cylinders, and spheres.

G.GF.12 Identify the three-dimensional figure generated by rotating a two-dimensional figure.

G.GF.13 Use three-dimensional geometric figures and their measures to model real-world objects and solve problems.

G.GF.14 Identify two-dimensional cross-sections of three-dimensional objects.

Geometric Probability

G.GF.15 Calculate probabilities as a proportion of area in a geometric context.

Lines and Angles

Define and Construct

G.LA.1 Make formal geometric constructions with a variety of tools and methods including congruent segments and angles, segments and angle bisectors, perpendicular lines and perpendicular bisectors of a line segment.

Coordinate Geometry

G.LA.2 Determine the point that cuts a line segment into a specified ratio on a number line and a coordinate plane, including finding the midpoint.

G.LA.3 Derive the distance and midpoint formulas and use the formulas, including the slope formula, to verify geometric relationships on a coordinate plane.

G.LA.4 Calculate the perimeter of polygons when given the vertices, including using the distance formula.

Parallel and Perpendicular Lines

G.LA.5 Prove and apply slope criteria of parallel and perpendicular lines to solve problems.

G.LA.6 Prove and apply theorems about lines and angles including vertical angles, angles formed by parallel lines cut by a transversal, and points on a perpendicular bisector.

G.LA.7 Write an equation of a line that is parallel or perpendicular to a given line and passing through a given point.

Transformations

Coordinate Plane

G.T.1 Describe rotations, reflections, and translations as functions that take points in the coordinate plane as inputs and give other points as outputs; write in prime notation.

G.T.2 Compare transformations that preserve distance and angle (rotation, reflections, and translations) to those that do not (dilations) to develop definitions of congruence and similarity.

Plane

G.T.3 Given two congruent figures, identify the sequence of transformations that maps one figure to another.

G.T.4 Apply understanding of angles, circles, perpendicular lines, parallel lines, and line segments to develop definitions for rotations, reflections, and translations.

Similarity and Congruency

Similarity

G.SC.1 Given two figures, apply the definition of similarity in terms of a dilation to identify similar figures, proportional sides, and corresponding congruent angles.

G.SC.2 Develop and apply the criteria of similarity for triangles (AA~, SAS~, and SSS~) to solve problems and prove geometric relationships.

G.SC.3 Use transformations to prove all circles are similar.

Triangle Congruency

G.SC.4 Explain, using rigid motion transformations, why two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent.

G.SC.5 Develop and apply the criteria for triangle congruence (ASA, SAS, AAS, SSS, and HL) to solve problems and prove geometric relationships.

Statistics and Probability

Conditional and Joint Probability

G.SP.1 Describe events as subsets of a sample space or as unions, intersections, or complements of other events.

G.SP.2 Determine whether two events *A* and *B* are independent.

G.SP.3 Find the conditional probability of *A* given *B* as the fraction of *B*'s outcomes that also belong to *A*, and interpret the result, including everyday language and situations.

G.SP.4 Apply the Addition Rule,$p(A \text{ or } B)$, and interpret the result.

G.SP.5 Apply the general Multiplication Rule, $p(A \text{ and } B)$, and interpret the result.

Algebra 2 Mathematics Standards

Expressions

Radical Expressions and Rational Exponents

A2.E.1 Apply the properties of exponents to translate between radical and exponential forms of expressions.

A2.E.2 Simplify and perform operations with radical expressions with and without variables; rationalizing denominators should include conjugates.

Complex Number

A2.E.3 Understand an imaginary number to be a product of any real number and the imaginary unit i where $i^2 = -1$.

A2.E.4 Understand a complex number to be a number of the form $a + bi$ where a and b are real numbers and i is the imaginary unit.

A2.E.5 Add, subtract, multiply, and divide complex numbers.

Functions

Compositions

A2.F.1 Compose functions and evaluate their composition.

Graph and Key Features

A2.F.2 Graph rational functions, identifying zeros and asymptotes (vertical and horizontal) when suitable factorizations are available and showing end behavior, with or without the appropriate technology.

A2.F.3 Compare properties of graphs, tables, equations, and verbal descriptions of two functions.

A2.F.4 Calculate and interpret the average rate of change of a function, both symbolically and from a table over a specified interval. Estimate the rate of change from a graph.

Transformations

A2.F.5 Given a graph explain the effects of the transformation from the parent function including square roots, cubic, rational, and absolute value.

A2.F.6 Describe the transformation of functions in the coordinate plane including translation, reflection, and dilation.

Inverses

A2.F.7 Explain how restricting the domain of a function allows for the creation of its inverse.

A2.F.8 Write and graph the inverse of a given function; understand that the graph of an inverse function is a reflection of the function over the line $y = x$.

A2.F.9 Verify if two functions are inverses of each other using composition of functions.

A2.F.10 Using ordered pairs, determine the inverse of a function given a graph or table.

Linear Functions, Equations and Inequalities

Arithmetic Sequences

A2.LF.1 Write and use arithmetic sequences recursively and explicitly to model situations; translate between the two forms when given a graph, a description of the relationship, or two input-output pairs.

Matrices

A2.LF.2 Multiply a matrix by a scalar.

A2.LF.3 Add and subtract matrices.

Systems of Equations

A2.LF.4 Solve systems of linear equations in three variables.

Quadratic Functions, Equations, and Inequalities

Create and Solve

A2.QF.1 Solve quadratic equations with complex number solutions.

A2.QF.2 Represent and solve real-world problems using quadratic inequalities.

Graph and Key Features

A2.QF.3 Use the discriminant to determine the number and type of solutions of a quadratic equation.

A2.QF.4 Sketch the graph of a quadratic function given a verbal description and show key features.

System of Equations

A2.QF.5 Solve a system of equations consisting of a linear equation and a nonlinear equation in two variables algebraically or graphically (with or without technology).

Exponential and Logarithmic Functions and Equations

Create and Solve

A2.EL.1 Use the properties of exponents to find equivalent expressions and to solve equations, including those involving rational exponents.

A2.EL.2 Interpret the solution of a logarithmic equation as reasonable or unreasonable in context.

Logarithms

A2.EL.3 Translate between logarithmic and exponential forms of an equation.

A2.EL.4 Use properties of logarithms to simplify and evaluate logarithmic expressions, with or without technology.

A2.EL.5 Use the inverse relationship between exponents and logarithms to solve problems.

Trigonometric Functions and Equations

Create and Solve

A2.TF.1 Select a trigonometric function that models real-world contexts.

A2.TF.2 Develop the Pythagorean identity, $\sin^2(\theta) + \cos^2(\theta) = 1$.

A2.TF.3 Apply the Pythagorean identity to find the remaining trigonometric functions when given $\sin(\theta)$, $\cos(\theta)$, or $\tan(\theta)$ and the quadrant of the angle.

Graphs and Key Features

A2.TF.4 Graph trigonometric functions (sine and cosine) showing period, midline, and amplitude.

Unit Circle

A2.TF.5 Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle.

A2.TF.6 Explain how the unit circle can be used to model sine, cosine, tangent, secant, cosecant, and cotangent for all real numbers.

Polynomial, Rational, and Other Functions and Equations

Create and Solve

A2.PR.1 Construct a possible polynomial given a graph.

A2.PR.2 Create equations and inequalities with one variable and use them to solve problems, including absolute value functions.

A2.PR.3 Solve formulas for a specific variable.

A2.PR.4 Solve rational and radical equations containing one variable specifying extraneous solutions.

Graph and Key Features

A2.PR.5 Use zeros and an understanding of multiplicity to sketch a graph of a polynomial function with a degree of 3 or higher.

A2.PR.6 Interpret the key features of polynomial functions that model a relationship between two quantities in a given context; translate between different representations of the function, especially graphs, tables, and equations.

A2.PR.7 Determine the domain and range of polynomial and rational functions in mathematical problems.

A2.PR.8 Graph polynomial functions, identifying zeros when suitable factorizations are available and showing end behavior, with or without the appropriate technology.

Factor Polynomials

A2.PR.9 Know and use the remainder and factor theorem to find solutions to polynomial equations of degree > 2.

A2.PR.10 Use polynomial identities (sum and difference of cubes) to factor polynomials.

Rational Expressions

A2.PR.11 Divide polynomial expressions using factorization, long division, and synthetic division, with and without a remainder.

Systems of Equations

A2.PR.12 Explain why a solution to the equation $f(x) = g(x)$ is the *x*-coordinate where the *y*-coordinate of $f(x)$ and $g(x)$ are the same using graphs, tables, or approximations, include

cases where $f(x)$ and/or $g(x)$ are linear, polynomial, exponential, or rational and where at least one of the functions is not linear.

Statistics and Probability

Statistical Experiments and Studies

A2.SP.1 Represent and use mathematical models for bivariate data sets to answer questions, draw conclusions, and make decisions.

A2.SP.2 Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate.

A2.SP.3 Distinguish between sample surveys, experiments, and observational studies and explain the purpose of randomization in statistical studies.

A2.SP.4 Use data from a random sample to make inferences about a population.

A2.SP.5 Compare theoretical and experimental probabilities using simulations.

A2.SP.6 Read and explain, in context, the validity of data from outside reports by identifying the variables as quantitative or categorical and describing how the data was collected.

A2.SP.7 Indicate any potential biases or flaws and identifying inferences the author of the report made from sample data.