Scope and Sequence: A Pathway to Learning

Principles and Proportional Reasoning in Algebra

7th grade

Introduction

This scope and sequence is a product of collaborative efforts from secondary department heads and their respective departments and the Office of Learning and Instruction at the Amphitheater district offices. This document aims to provide a framework for each secondary math course, to include 6th grade, 7th grade, 8th grade, Algebra 1, Geometry, and Algebra 2 that does the following:

- Prioritizes standards that have a high impact on student learning.
- Identifies supporting standards for those priorities.
- Creates equity of learning between sites.
- Provides an easy-to-follow framework for personalized learning.

The team started by establishing a set of priority standards and connected them with our Tier 1 curriculum. Within each topic/unit there are one or more essential questions and/or tasks, key vocabulary, and key concepts. Together, all these components create the Scope and Sequence. This information serves as a bare minimum for what should be covered within each topic/unit. As the content expert, teachers then have the freedom to add to and plan units around the framework provided by this document.

The **7th grade** Arizona Mathematics Standards, as outlined within the state documentation, focuses attention on **a)** developing competency of division of whole numbers and fractions and extending the notion of number to the system of rational numbers; **b)** developing understanding of ratio and rate and using multiplicative reasoning to solve ratio and rate problems, and **c)** developing understanding of expressions, equations, and inequalities.

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. The Standards for Mathematical Practice should be addressed in every topic/unit.

Standards for Mathematical Practice (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.

Framework for Success

One of the major goals of this scope and sequence is to provide a definitive framework for teachers to design their units around. By emphasizing priority standards, homogenizing *some* key concepts and vocabulary, and providing a topic wide emphasis (essential questions), teachers can then focus on creating rigorous, engaging, and creative units while ensuring what one student is learning at one school will be similar to another student at a different school. This framework does not prescribe activities for each topic or have scripted lessons. Instead, it frees up teachers to focus more on the "how" of teaching instead of the "what". Each classroom has learners with different needs, so it is of the utmost importance that teachers focus on meeting those learners where they are but still maintain some equity across sites.

Flexible Document

As teachers work with the document throughout the school year, there will inevitably be feedback for improvements, additions, and/or refinement, and that feedback will be crucial for all parties to continue to make decisions that are focused on student learning. This is a version of a scope and sequence and may change or evolve to meet the needs of teachers and the district. However, this scope and sequence represents a starting point for future editions and provides a foundation going forward.

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Topic/Unit	Suggested Time Frame:	
Topic 1: Integers and Rational Numbers	**Quarter # 1**	**9 weeks**

Priority Cluster and Standard(s):	Supporting Standards:
7.NS.A: Apply and extend previous understanding of operations with fractions to add, subtract, multiply, and divide rational numbers except division by zero. ● **7.NS.A.1:** Add and subtract integers and other rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram. ○ a. Describe situations in which opposite quantities combine to make 0. ○ b. Understand $p + q$ as the number located a distance $\|q\|$ from p, in the positive or negative direction depending on whether q is positive or negative. Show that a number and its opposite have a sum of 0 (are additive inverses). Interpret sums of rational numbers by describing real-world context. ○ c. Understand subtraction of rational numbers as adding the additive inverse, $p – q = p + (–q)$. Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world context. ○ d. Apply properties of operations as strategies to add and subtract rational numbers. ● **7.NS.A.2:** Multiply and divide integers and other rational numbers. ○ a. Understand that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as $(–1)(–1) = 1$ and the rules for multiplying signed numbers. Interpret products of rational numbers by describing real-world context. ○ b. Understand that integers can be divided, provided that the divisor is not zero, and every quotient of	● **7.NS.A.3:** Solve mathematical problems and problems in real-world context involving the four operations with rational numbers. Computations with rational numbers extend the rules for manipulating fractions to complex fractions where $a/b \div c/d$ when $a,b,c,$ and d are all integers and b,c, and $d \neq 0$.

integers (with non-zero divisor) is a rational number. If p and q are integers, then $-(p/q) = (-p)/q = p/(-q)$. Interpret quotients of rational numbers by describing real-world context. ○ c. Apply properties of operations as strategies to multiply and divide rational numbers. ○ d. Convert a rational number to decimal form using long division; know that the decimal form of a rational number terminates in 0's or eventually repeats.	

Essential Question(s):

How can the properties of operations be used to solve problems involving integers and rational numbers?
How do operations with integers relate to the same operations with rational numbers?
How can you determine the correct operations to use to solve problems?

Key Concept(s):	Key Vocabulary:
I can… ● Relate integers, their opposites,and their absolute values. ● IRecognize rational numbers and write them in decimal form. ● Add and subtract integers. ● Add and subtract rational numbers. ● Multiply and divide integers. ● Multiply and divide rational numbers. ● Solve problems with rational numbers.	● Integers ● Rational numbers ● Absolute value ● Additive inverse ● Complex fraction ● Multiplicative inverse ● Reciprocal ● Repeating decimal ● Terminating decimal

Topic/Unit	Suggested Time Frame:	
Topic 2: Analyze and Use Proportional Relationships	**End of Quarter 1 into Quarter 2**	**13 Days**

Priority Cluster and Standard(s):	Supporting Standards:
7.RP.A.: Analyze proportional relationships and use them to solve mathematical problems and problems in real-world context. ● **7.RP.A.1:** Compute unit rates associated with ratios involving both simple and complex fractions, including ratios of quantities measured in like or different units. ● **7.RP.A.2:** Recognize and represent proportional relationships between quantities. ○ a. Decide whether two quantities are in a proportional relationship (e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin). ○ b. Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships. ○ c. Represent proportional relationships by equations. *For example, if total cost t is proportional to the number n of items purchased at a constant price p, the relationship between the total cost and the number of items can be expressed as $t = pn$.* ○ d. 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. ● **7.RP.A.3:** Use proportional relationships to solve multi-step ratio and percent problems (e.g., simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error).	

Essential Question(s):
How can you recognize and represent proportional relationships and use them to solve problems?

Key Concept(s):	Key Vocabulary:
I can… ● Use ratio concepts and reasoning to solve multi-step problems. ● Find unit rates with ratios of fractions. ● Use unit rates to solve multi-step problems. ● Test for equivalent ratios to decide whether quantities are in a proportional relationship. ● Use the constant of proportionality to write equations that represent proportional relationships. ● Use equations to solve problems involving proportional relationships. ● Use a graph to recognize proportionality. ● Identify the constant of proportionality from a graph. ● Interpret a point on a graph of a proportional relationship. ● Explain whether a situation represents a proportional relationship. ● Use proportional representations to solve problems.	● Proportion ● Constant of proportionality ● Proportional relationship ● Term ● Ratio ● Rate

Topic/Unit	Suggested Time Frame:	
Topic 3: Analyze and Solve Percent Problems	**Quarter 2**	**13 Days**

Priority Cluster and Standard(s):	Supporting Standards:
7.RP.A.: Analyze proportional relationships and use them to solve mathematical problems and problems in real-world context. ● **7.RP.A.2:** Recognize and represent proportional relationships between quantities. ○ c. Represent proportional relationships by equations. *For example, if total cost t is proportional to the number n of items purchased at a constant price p, the relationship between the total cost and the number of items can be expressed as t = pn.* ● **7.RP.A.3:** Use proportional relationships to solve multi-step ratio and percent problems (e.g., simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error).	

Essential Question(s):

How can percents show proportional relationships between quantities and be used to solve problems?

Key Concept(s):	Key Vocabulary:
I can… ● Understand, find, and analyze percents of numbers. ● Write a proportion to model a percent situation. ● Use a percent proportion to find an unknown part, whole or percent. ● Represent proportional relationships using percents. ● Use the percent equation to represent and solve percent problems. ● Calculate percent change and percent error. ● Understand the percent equation and how it leads to the percent change formula. ● Understand and calculate percent markups and markdowns. ● Understand what simple interest is and how it is calculated. ● Solve problems involving simple interest.	● percent ● Interest raate ● Markdown ● Markup ● Percent change ● Percent equation ● Percent error ● Percent markdown ● Percent markup ● Principal ● Simple interest

Topic/Unit	Suggested Time Frame:	
Topic 4: Generate Equivalent Expressions	**Quarter 3**	**16 Days**

Priority Cluster and Standard(s):	Supporting Standards:
7.EE.A: Use properties of operations to generate equivalent expressions. ● **7.EE.A.1:** Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients. ● **7.EE.A.2:** Rewrite an expression in different forms, and understand the relationship between the different forms and their meanings in a problem context. *For example, a + 0.05a = 1.05a means that "increase by 5%" is the same as "multiply by 1.05."* **7.EE.B: Solve mathematical problems and problems in real-world context using numerical and algebraic expressions and equations.** ● **7.EE.B.3: Solve multi-step mathematical problems and problems** in real-world context posed with positive and negative rational numbers in any form. Convert between forms as appropriate and assess the reasonableness of answers. *For example, If a woman making $25 an hour gets a 10% raise, she will make an additional 1/10 of her salary an hour, or $2.50, for a new salary of $27.50 per hour.* ● **7.EE.B.4:** Use variables to represent quantities in mathematical problems and problems in real-world context, and construct simple equations and inequalities to solve problems. ○ a. Solve word problems leading to equations of the form $px+q = r$ and $p(x+q) = r$, where p, q, and r are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach.	

Essential Question(s):

How can properties of operations help to generate equivalent expressions that can be used in solving problems?

Key Concept(s):	Key Vocabulary:
I can… ● Write and evaluate algebraic expressions. ● Write equivalent expressions by using properties and by combining like terms. ● Identify equivalent expressions. ● Identify and combine like terms. ● Simplify expressions using like terms. ● Apply the Distributive Property to expand linear equations. ● Use area models to solidify my understanding of the Distributive Property. ● Find common factors of linear expressions using the Distributive Property. ● Recognize factoring is the opposite of expanding expressions. ● Add expressions that represent real world situations. ● Subtract expressions using properties of operations. ● Use an equivalent expression to find new information.	● Variable ● Coefficient ● Expression ● Evaluate ● Like Terms ● Substitute ● Factor ● Term ● Distributive Property ● Order of Operations ● Simplify ● Expand

Topic/Unit	Suggested Time Frame:	
Topic 5: Solve Problems Using Equations and Inequalities	**Quarter 3**	**15 Days**

Priority Cluster and Standard(s):	Supporting Standards:
7.EE.B: Solve mathematical problems and problems in real-world context using numerical and algebraic expressions and equations. ● **7.EE.B.3: Solve multi-step mathematical problems and problems** in real-world context posed with positive and negative rational numbers in any form. Convert between forms as appropriate and assess the reasonableness of answers. *For example, If a woman making $25 an hour gets a 10% raise, she will make an additional 1/10 of her salary an hour, or $2.50, for a new salary of $27.50 per hour.* ● **7.EE.B.4:** Use variables to represent quantities in mathematical problems and problems in real-world context, and construct simple equations and inequalities to solve problems. ○ a. Solve word problems leading to equations of the form $px+q = r$ and $p(x+q) = r$, where p, q, and r are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach. ○ b. Solve word problems leading to inequalities of the form $px+q > r$ or $px+q < r$, where p, q, and r are rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem.	

Essential Question(s):

How can you solve real-world and mathematical problems with numerical and algebraic equations and inequalities?

Key Concept(s):	Key Vocabulary:
I can… ● Represent a problems with a two-step equation. ● Interpret the quantities in an equation. ● Solve a problem with a two-step equation. ● Use the Distributive Property to solve equations. ● Solve inequalities using addition or subtraction. ● Graph the solution of inequalities on a number line. ● Solve inequalities using multiplication or division. ● Write and solve two-step inequalities. ● Solve inequalities that require multiple steps.	● Isolate the variable ● Inequality ● Property of equality ● Inverse operations ● Distributive Property

Topic/Unit	Suggested Time Frame:	
Topic 8: Solve Problems Involving Geometry	**Quarter 4**	**18 Days**

Priority Cluster and Standard(s):	Supporting Standards:
7.G.B: Solve mathematical problems and problems in real-world context involving angle measure, area, surface area, and volume. ● **7.G.B.4:** Understand and use the formulas for the area and circumference of a circle to solve problems; give an informal derivation of the relationship between the circumference and area of a circle.	

Essential Question(s):

How can geometry be used to solve problems?

Key Concept(s):	Key Vocabulary:
I can… ● Use a scale drawing as a representation of actual lengths and area. ● Use a scale key to find missing measures. ● Draw a geometric figure with given conditions. ● Draw triangles when given information about their side lengths and angle measures. ● Find the measure of angles using angle relationships. ● Solve problems involving angle relationships. ● Solve problems involving radius, diameter, and circumference of circles. ● Find the area of a circle. ● Use the area of a circle to find the radius and diameter. ● Solve problems involving the area of a circle. ● Determine what the cross section looks like when a 3D figure is sliced. ● Find the surface area of a 2-dimensional composite shapes. ● Find the surface area of 3-dimension composite shapes. ● Calculate the volume of various 3-dimensional figures composed of prisms. ● Solve problems involving the volume of 3-dimensional figures.	● Adjacent angles ● Circumference ● Radius ● Diameter ● Complementary angles ● Composite figure ● Cross section ● Scale drawing ● Supplementary angles ● Vertical angles ● Prism

Topic/Unit	Suggested Time Frame:	
Topic 6: Use Sampling to Draw Inferences About Populations	**Quarter 4**	**10 Days**

Priority Cluster and Standard(s):	Supporting Standards:
7.SP.B: Draw informal comparative inferences about two populations. ● **7.SP.B.3:** Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities, measuring the difference between the centers by expressing it as a multiple of a measure of variability. *For example, the mean height of players on the basketball team is 10 cm greater than the mean height of players on the soccer team, about twice the variability (mean absolute deviation) on either team; on a dot plot, the separation between the two distributions of heights is noticeable.* ● **7.SP.B.4:** Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations. *For example, decide whether the words in a chapter of a seventh-grade science book are generally longer than the words in a chapter of a fourth-grade science book.*	**7.SP.A:** Use random sampling to draw inferences about a population. ● **7.SP.A.1:** Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences. ● **7.SP.A.2:** Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions. *For example, estimate the mean word length in a book by randomly sampling words from the book; predict the winner of a school election based on randomly sampled survey data. Gauge how far off the estimate or prediction might be.*

Essential Question(s):

How can sampling be used to draw inferences about one or more populations?

Key Concept(s):	Key Vocabulary:
I can… ● Understand the difference between a population and a sample ● Establish whether a sample is representative of a population ● Generate random samples that represent the entire populations ● Make inferences about a populations from a sample data set ● Make estimates about a population based on a sample set and assess whether the inferences are valid ● Draw comparative inferences about two populations using median and interquartile range (IQR) ● Compare populations using the mean, median, mode, range, interquartlie range, and mean absolute deviation.	● Inference ● Population ● Random sample ● Representative sample ● Sample ● Valid inference ● Center ● Data distribution ● Variability ● Statistical question ● Interquartile range ● Median ● Mode ● Range ● Mean Absolute Deviation (MAD)

Topic/Unit	Suggested Time Frame:	
Topic 7: Probability	**Quarter #3**	**16 Days**

Priority Cluster and Standard(s):	Supporting Standards:
	7.SP.C: Investigate chance processes and develop, use and evaluate probability models. ● **7.SP.C.5:** Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event. ● **7.SP.C.6:** Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency, and predict the approximate relative frequency given the probability. *For example, when rolling a number cube 600 times, predict that a 3 or 6 would be rolled roughly 200 times, but probably not exactly 200 times.* ● **7.SP.C.7:** Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies. If the agreement is not good, explain possible sources of the discrepancy. ○ a. Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events. *For example, if a student is selected at random from a class, find the probability that Jane will be selected and the probability that a girl will be selected.* ○ b. Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process. *For example, find the approximate probability that a spinning penny will land heads up or that a tossed paper cup will land open-end down. Do the outcomes for the spinning penny appear to be equally likely based on the observed frequencies?*

Essential Question(s):
How can you investigate chance processes and develop, use, and evaluate probability models?

Key Concept(s):	Key Vocabulary:
I can… ● Use probability to describe the likelihood that an event will here. ● Relate probability to mathematical fairness. ● Determine the theoretical probability of an event. ● Compare theoretical and experimental probability. ● Determine the experimental probability of an event. ● Develop a probability model. ● Use a probability model to evaluate a situation. ● Use a probability model to make an estimate. ● Find all possible outcomes of a compound event. ● Organize data about a compound event. ● Find the probability of a compound event. ● Simulate a compound event to approximate its probability.	● Compound event ● Event ● Experimental probability ● Outcome ● Probability ● Probability model ● Relative frequency ● Sample space ● Simulation ● Theoretical probability ● Frequency ● Compound event ● Tree diagram