**Arizona Mathematics**

# Grade 7

Adopted 2016

**Ratio and Proportion**

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.1
2. Recognize and represent proportional relationships between quantities. 7.RP.A.2
   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). 7.RP.A.2.A
   b. Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships. 7.RP.A.2.B
   c. Represent proportional relationships by equations. 7.RP.A.2.C
   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.2.D
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). 7.RP.A.3

## The Number System

**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. 7.NS.A.1
   a. Describe situations in which opposite quantities combine to make 0. 7.NS.A.1.A
   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. 7.NS.A.1.B
   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. 7.NS.A.1.C
   d. Apply properties of operations as strategies to add and subtract rational numbers. 7.NS.A.1.D
2. Multiply and divide integers and other rational numbers. 7.NS.A.2
   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. 7.NS.A.2.A
   b. Understand that integers can be divided, provided that the divisor is not zero, and every quotient of 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. 7.NS.A.2.B
   c. Apply properties of operations as strategies to multiply and divide rational numbers. 7.NS.A.2.C
   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. 7.NS.A.2.D
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 ÷ c/d when a, b, c, and d are all integers and b, c, and d ≠ 0. 7.NS.A.3

## Expressions and Equations

**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.1
2. Rewrite an expression in different forms, and understand the relationship between the different forms and their meanings in a problem context. 7.EE.A.2

**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. 7.EE.B.3
4. Use variables to represent quantities in mathematical problems and problems in real-world context, and construct simple equations and inequalities to solve problems. 7.EE.B.4
   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. 7.EE.B.4.A
   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. 7.EE.B.4.B

## Geometry

**A. Draw, construct, and describe geometrical figures, and describe the relationships between them.** 7.G.A

1. Solve problems involving scale drawings of geometric figures, such as computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale. 7.G.A.1
2. Draw geometric shapes with given conditions using a variety of methods. 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.A.2
3. Describe the two-dimensional figures that result from slicing three-dimensional figures. 7.G.A.3

**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. 7.G.B.4
5. Use facts about supplementary, complementary, vertical, and adjacent angles in multi-step problems to write and solve simple equations for an unknown angle in a figure. 7.G.B.5
6. Solve mathematical problems and problems in a real-world context involving area, of two-dimensional objects composed of triangles, quadrilaterals, and other polygons. Solve mathematical problems and problems in real-world context involving volume and surface area of three-dimensional objects composed of cubes and right prisms. 7.G.B.6

## Statistics and Probability

**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.1
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. 7.SP.A.2

**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. 7.SP.B.3
4. Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations. 7.SP.B.4

**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.5
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. 7.SP.C.6
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. 7.SP.C.7
    a. Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events. 7.SP.C.7.A
    b. Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process. 7.SP.C.7.B

## Standards for Mathematical Practice

1. **Make sense of problems and persevere in solving them.** 7.MP.1
2. **Reason abstractly and quantitatively.** 7.MP.2
3. **Construct viable arguments and critique the reasoning of others.** 7.MP.3
4. **Model with mathematics.** 7.MP.4

5. **Use appropriate tools strategically.** `7.MP.5`

6. **Attend to precision.** `7.MP.6`

7. **Look for and make use of structure.** `7.MP.7`

8. **Look for and express regularity in repeated reasoning.** `7.MP.8`