

## Seventh Grade Algebra Quarter 1

**Month:** August, September, October

**Domain(s):**

- Ratios and Proportional Relationships
- The Number System
- Statistics and Probability

**Cluster(s):**

- Analyze proportional relationships and use them to solve real-world and mathematical problems
- Apply and extend previous understandings of operations with fractions to add subtract, multiply, and divide rational numbers
- Use random sampling to draw inferences about a population
- Draw informal comparative inferences about two populations

**Standard(s):**

**7.RP.1:** Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. For example, if a person walks  $\frac{1}{2}$  mile in each  $\frac{1}{4}$  hour, compute the unit rate as the complex fraction  $\frac{1/2}{1/4}$  miles per hour, equivalently 2 miles per hour.

**7.RP.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.3:** Use proportional relationships to solve multistep ratio and percent problems. Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error.

**7.NS.1:** Apply and extend previous understandings of addition and subtraction to add and subtract 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. For example, a hydrogen atom has 0 charge because its two constituents are oppositely charged.
- 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 contexts.
- 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 contexts.
- d. Apply properties of operations as strategies to add and subtract rational numbers.

**7.NS.2:** Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.

- a. Understand that multiplication is extended from fractions to rational numbers by requiring that operations continue to
- b. 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 contexts.
- c. Understand that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-
- d. 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 contexts.
- e. Apply properties of operations as strategies to multiply and divide rational numbers.
- f. Convert a rational number to a decimal using long division; know that the decimal form of a rational number terminates in 0s or eventually repeats.

**7.NS.3:** Solve real-world and mathematical problems involving the four operations with rational numbers

**7.SP.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.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.

**7.SP.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.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.

**Targeted Skills:**

- Compute unit rates from two value, tables, and graphs
- Solve problems using proportions
- Solve proportion problems using similar figures
- Solve percent equations
- Find the percent change
- Solve problems involving mark-up and discount
- Solve problems including simple interest and compound interest
- Identify Properties of Real Numbers
- Add/Subtract Integers
- Multiply/Divide Integers

- Add/Subtract Rational Numbers
- Multiply/Divide Rational Numbers
- Use order of operations
- Convert between fractions, decimals, and percents
- Solve word problems involving the four basic operations
- Find measures of central tendencies (mean, median, mode, and range)

<b>Key Vocabulary:</b> ratio	proportion	unit rate	similarity	percent change	mark-up
discount	Simple Interest Formula	Compound Interest Formula		Commutative Property	
Associative Property	Additive and Multiplicative Identity			Additive and Multiplicative Inverse	
Distributive Property	mean	median		mode	range, and outlier

## Seventh Grade Algebra Quarter 2

**Month:** October, November, December

**Domain(s):**

- Expressions and Equations

**Cluster(s):**

- Use properties of operations to generate equivalent expressions.
- Solve real-life and mathematical problems using numerical and algebraic expressions and equations.

**Standard(s):**

**7.EE.1:** Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.

**7.EE.2:** Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related. For example,  $a + 0.05a = 1.05a$  means that “increase by 5%” is the same as “multiply by 1.05.”

**7.EE.3:** Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. For example: If a woman making \$25 an hour gets a 10% raise, she will make an additional  $\frac{1}{10}$  of her salary an hour, or \$2.50, for a new salary of \$27.50. If you want to place a towel bar  $9\frac{3}{4}$  inches long in the center of a door that is  $27\frac{1}{2}$  inches wide, you will need to place the bar about 9 inches from each edge; this estimate can be used as a check on the exact computation.

**7.EE.4:** Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.

- 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. For example, the perimeter of a rectangle is 54 cm. Its length is 6 cm. What is its width?

b. Solve word problems leading to inequalities of the form  $px + q > r$  or  $px + q < r$ , where  $p$ ,  $q$ , and  $r$  are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem. For example: As a salesperson, you are paid \$50 per week plus \$3 per sale. This week you want your pay to be at least \$100. Write an inequality for the number of sales you need to make, and describe the solutions.

**Targeted Skills:**

- Model equations from word problems
- Solve one-step equations
- Solve two-step equations
- Solve multi-step equations with combining like terms and distributive property
- Solve equations with variables on both sides
- Solve equations with rational coefficients
- Model inequalities
- Solve one-step inequalities and graph
- Solve two-step inequalities and graph
- Solve multi-step inequalities with combining like terms and distributive property and graph
- Solve inequalities with variables on both sides and graph
- Solve inequalities with rational coefficients and graph
- Solve compound inequalities and graph

**Key Vocabulary:**

model	equation	like terms	inequality	interval notation	infinity
coefficient	compound	inequality			

## Seventh Grade Algebra Quarter 3

**Month:** December, January, February, March

**Domain(s):**

- Geometry
- Statistics and Probability

**Cluster(s):**

- Draw, construct, and describe geometrical figures and describe the relationships between them.
- Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.
- Investigate chance processes and develop, use, and evaluate probability models.

**Standard(s):**

**7.G.1:** Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.

**7.G.2:** Draw (freehand, with ruler and protractor, and with technology) 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.3:** Describe the two-dimensional figures that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids.

**7.G.4:** Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle.

**7.G.5:** Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure.

**7.G.6:** 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.

**7.SP.8:** Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation.

- a. Understand that, just as with simple events, the probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs.
- b. Represent sample spaces for compound events using methods such as organized lists, tables and tree diagrams. For an event described in everyday language (e.g., “rolling double sixes”), identify the outcomes in the sample space which compose the event.
- c. Design and use a simulation to generate frequencies for compound events. For example, use random digits as a simulation tool to approximate the answer to the question: If 40% of donors have type A blood, what is the probability that it will take at least 4 donors to find one with type A blood?

**Targeted Skills:**

- Use scale drawings to solve problems
- Construct various shapes given criteria
- Find circumference and areas of circles
- Identify types of angles and angle pairs
- Use angle pairs to solve problems
- Find area of triangles, quadrilaterals, and trapezoids
- Find the surface area of cubes and right prisms
- Find the volume of cubes and right prisms
- Find probability independent and dependent events
- Solve permutation problems
- Solve combination problems

**Key Vocabulary:**

scale drawing	construction	angle bisector	segment bisector	midpoint	circumference	pi
area	surface area	volume, congruent	isosceles, equilateral	scalene	acute	
obtuse	right	vertical angles	adjacent angles	complementary angles		
supplementary angles		corresponding angles	alternate interior angles			
alternate exterior angles		independent event	dependent event	permutation	combination	

## Seventh Grade Algebra Quarter 4

<b>Month:</b> March, April, May, June
<b>Domain(s):</b> <ul style="list-style-type: none"><li>• Statistics and Probability</li></ul>
<b>Cluster(s):</b> <ul style="list-style-type: none"><li>• Use random sampling to draw inferences about a population</li><li>• Draw informal comparative inferences about two populations</li><li>• Investigate chance processes and develop, use, and evaluate probability models.</li></ul>
<b>Standard(s):</b> <p><b>7.SP.1:</b> 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.</p> <p><b>7.SP.2:</b> 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.</p> <p><b>7.SP.3:</b> 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.</p> <p><b>7.SP.4:</b> 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.</p> <p><b>7.SP.5:</b> Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event</p>

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.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.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?

**7.SP.8:** Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation.

a. Understand that, just as with simple events, the probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs.

b. Represent sample spaces for compound events using methods such as organized lists, tables and tree diagrams. For an event described in everyday language (e.g., “rolling double sixes”), identify the outcomes in the sample space which compose the event.

c. Design and use a simulation to generate frequencies for compound events. For example, use random digits as a simulation tool to approximate the answer to the question: If 40% of donors have type A blood, what is the probability that it will take at least 4 donors to find one with type A blood?

**Targeted Skills:**

- Find measures of central tendencies (mean, median, mode, and range)
- Display data in frequency tables
- Display data in line plots
- Make box-and-whisker plots

- Analyze box-and-whisker plots
- Use tree diagrams and counting principals to find the number of possible outcomes
- Find theoretical probability by counting outcomes
- Calculate probabilities of independent events
- Calculate probabilities of dependent events
- Use permutations
- Use combinations
- Find experimental probability
- Use simulations
- Choose sample for a survey of population
- Make estimates about populations

**Key Vocabulary:**

mean	median	mode	range	outlier,box-and-whisker plot	counting principal
frequency table		line plot	population	quartile	random sample
simulation		event	experimental probability	theoretical probability	sample space
independent event		dependent event		permutation, combination	