COURSE: Mathematics **LEVEL**: Grade 7 **UNIT/FOCUS**: Variables, Expressions, & Operations

Desired Results

Related standard(s):

7.NS.1.A
7.NS.1.B
7.NS.1.C
7.NS.1.D
7.NS.2.A
7.NS.2.B
7.NS.2.C
7.NS.2.D
7.NS.3
7.EE.4.a

Transfer

Students will be able to independently use their learning to…

- Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.
- Solve real-life and mathematical problems using numerical and algebraic expressions and equations.
- Make sense of problems and persevere in solving them.
- Reason abstractly and quantitatively.
- Construct viable arguments and critique the reasoning of others.
- Model with mathematics.
- Use appropriate tools strategically.
- Attend to precision.
- Look for and make use of structure.
- Look for and express regularity in repeated reasoning.

Meaning

Enduring Understandings (EUs)	Essential Questions (EQs)
Students will understand that…	*Students will keep considering…*
• The use and manipulation of symbols and expressions provide a variety or representations for solving problems and expressing mathematical concepts, relationships, and reasoning. • Understandings of number – "how many" or "how much" – and number types extend applications of arithmetic properties, operations, and number systems and guide the use of computational strategies and algorithms. • Measurement attributes, processes, and tools, help us to quantify, compare, and solve problems involving objects, situations, and events. • Patterns, relations, and functions are used to represent and analyze change in various contexts, make predictions and generalizations, and provide models and explanations for real-world problems. • Visualizations, spatial reasoning, and properties of two- and three- dimensional figures can be used to analyze, represent, and model geometric concepts and relationships. • Questions are posed and investigated by collecting data or retrieving existing data, and representing, analyzing, and interpreting data. Investigations, inferences, and predictions are used to make critical and informed decisions.	• How are symbols and expressions utilized as representations in mathematics? • In what ways can a quantity be represented? • In what ways is measurement useful? • How can I use patterns, relations, and functions? • How are geometric concepts and relations conceptualized? • What roles can data play in the decision making process?

Grade Level Benchmarks

Knowledge	Skills
Students will know…	*Students will be able to…*
• A variable is a letter or symbol used to represent a value that can change. • A constant is a value that does not change. • A numerical expression may contain only constants and operations. • An algebraic expression may contain variables, constants, and operations. • The absolute value of a number is its distance from zero on a number line. • Two numbers are opposites if their sum is 0. • If number and its opposite are the same distance from zero, then they have the same absolute value. • A number and its opposite are additive inverses. • Two numbers are reciprocals if their product is 1. • A number and its reciprocal are called multiplicative inverses. • A power is an expression written with an *exponent* and a *base* or the value of such an expression. • A number that is multiplied by itself to form a product is called a square root of that product. • The operations of squaring and finding a square root are inverse operations. • The radical symbol, $\sqrt{}$, is used to represent square roots. • Positive real numbers have two square roots. • A perfect square is a number whose positive square root is a *whole number*. • All numbers that can be represented on the number line are called real numbers and can be classified according to their characteristics. • Natural numbers are the counting numbers. • Whole numbers are the natural numbers and zero. • Integers are whole numbers and their opposites. • Rational numbers can be expressed in the form a/b, where a and b are both integers and $b \neq 0$. • Terminating decimals are rational numbers in decimal form that have a finite number of digits. • Repeating decimals are rational numbers in decimal form that have a block of one or more digits that repeats continuously. • Irrational numbers cannot be expressed in the form a/b. They include square roots of whole numbers that are not perfect squares and non-terminating decimals that do not repeat. • When a numerical or algebraic expression contains more than one operation symbol, the order of operations tells you which operation to perform first.	• Translate between words and algebra. • Evaluate algebraic expressions. • Add, subtract, multiply, and divide real numbers. • Evaluate expressions containing exponents. • Evaluate expressions containing square roots. • Classify numbers within the real number system • Use the order of operations to simplify expressions. • Use the Commutative, Associative, and Distributive Properties to simplify expressions. • Combine like terms.

	• The Commutative and Associative Properties of Addition and Multiplication allow you to rearrange an expression to simplify it. • The Distributive Property is used with addition to simplify expressions. • The terms of an expression are the parts to be added or subtracted. • Like terms are terms that contain the same variables raised to the same powers. • A coefficient is a number multiplied by a variable. • Like terms can have different coefficients. • A variable written without a coefficient has a coefficient of 1.	

TASKS from CCSS for *Variables, Expressions, and Operations*

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 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.
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 contexts.
c. Apply properties of operations as strategies to multiply and divide rational numbers.
d. 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.1

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 + pq = 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?

COURSE: Mathematics **LEVEL**: Grade 7 **UNIT/FOCUS**: Equations

Desired Results

Related standard(s):

7.RP.1
7.RP.2.A
7.RP.2.B
7.RP.2.C
7.RP.2.D
7.EE.1
7.EE.2
7.EE.3

Transfer

Students will be able to independently use their learning to…

- Analyze proportional relationships and use them to solve real-world and mathematical problems.
- Use properties of operations to generate equivalent expressions.
- Solve real-life and mathematical problems using numerical and algebraic expressions and equations.
- Make sense of problems and persevere in solving them.
- Reason abstractly and quantitatively.
- Construct viable arguments and critique the reasoning of others.
- Model with mathematics.
- Use appropriate tools strategically.
- Attend to precision.
- Look for and make use of structure.
- Look for and express regularity in repeated reasoning.

Meaning

Enduring Understandings (EUs)	Essential Questions (EQs)
Students will understand that…	*Students will keep considering…*
• The use and manipulation of symbols and expressions provide a variety or representations for solving problems and expressing mathematical concepts, relationships, and reasoning. • Understandings of number – "how many" or "how much" – and number types extend applications of arithmetic properties, operations, and number systems and guide the use of computational strategies and algorithms. • Measurement attributes, processes, and tools, help us to quantify, compare, and solve problems involving objects, situations, and events.	• How are symbols and expressions utilized as representations in mathematics? • In what ways can a quantity be represented? • In what ways is measurement useful? • How can I use patterns, relations, and functions? • How are geometric concepts and relations conceptualized? • What roles can data play in the decision making process?

	• Patterns, relations, and functions are used to represent and analyze change in various contexts, make predictions and generalizations, and provide models and explanations for real-world problems. • Visualizations, spatial reasoning, and properties of two- and three- dimensional figures can be used to analyze, represent, and model geometric concepts and relationships. • Questions are posed and investigated by collecting data or retrieving existing data, and representing, analyzing, and interpreting data. Investigations, inferences, and predictions are used to make critical and informed decisions.	

Grade Level Benchmarks	
Knowledge	Skills
Students will know… • An equation is a mathematical statement that two expressions are equal. • A solution of an equation is a value of the variable that makes the equation true. • An identity is an equation that is true for all values of the variable. • An equation that is an identity has infinitely many solutions. • A contradiction is an equation that is not true for any value of the variable. • A formula is an equation that states a rule for a relationship among quantities. • A literal equation is an equation with two or more variables. • A ratio is a comparison of two quantities by division. • A statement that two ratios are equivalent is called a proportion. • A rate is a ratio of two quantities with different units. • Rates are usually written as *unit rate.* • A unit rate is a rate with a second quantity of 1 unit. • A rate in which the two quantities are equal but use different units, is called a conversion factor. • A scale is a ratio between two sets of measurements. • A scale drawing or scale model uses a scale to represent an object as smaller or larger than the actual object. • Similar figures have exactly the same shape but not necessarily the same size. • Corresponding sides of two figures are in the same relative position, and corresponding. • Angles are in the same relative position. • You can solve a proportion involving similar triangles to find a length that is not easily measured using indirect measurement. • If every dimension of a figure is multiplied by the same number, the result is a similar figure. • A percent is a ratio that compares a number to 100. • A commission is money paid to a person or a company for making a sale. • Interest is the amount of money charged for borrowing money, or the amount of money earned when saving or investing money. • Principal is the amount borrowed or invested.	*Students will be able to…* • Solve one-step equations in one variable by using addition or subtraction • Solve one-step equations in one variable by using multiplication or division • Solve equations in one variable that contain more than one operation • Solve equations in one variable that contain variable terms on both sides • Solve a formula for a given variable • Solve an equation in two or more variables for one of the variables • Write and use ratios, rates, and unit rates. Write and solve proportions • Use proportions to solve problems involving geometric figures. Use proportions and similar figures to measure objects indirectly • Solve problems involving percents • Use common applications of percents • Estimate with percents • Find percent increase and decrease

	• Simple interest is interest paid only on the principal. • A tip is an amount of money added to a bill for service. • It is usually a percent of the bill before *sales tax* is added. • Sales tax is a percent of an item's cost. • A percent change is an increase or decrease given as a percent of the original amount. • Percent increase describes an amount that has grown and percent decrease describes an amount that has been reduced.	

TASKS from CCSS for *Equations*

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 1/2 mile in each 1/4 hour, compute the unit rate as the complex fraction 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.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 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 3/4 inches long in the center of a door that is 27 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.

COURSE: Mathematics **LEVEL**: Grade 7 **UNIT/FOCUS**: Inequalities

Desired Results

Related standard(s):

7.EE.4.b

Transfer

Students will be able to independently use their learning to…

- Solve real-life and mathematical problems using numerical and algebraic expressions and equations.
- Make sense of problems and persevere in solving them.
- Reason abstractly and quantitatively.
- Construct viable arguments and critique the reasoning of others.
- Model with mathematics.
- Use appropriate tools strategically.
- Attend to precision.
- Look for and make use of structure.
- Look for and express regularity in repeated reasoning.

Meaning

Enduring Understandings (EUs)	Essential Questions (EQs)
Students will understand that…	*Students will keep considering…*
• The use and manipulation of symbols and expressions provide a variety or representations for solving problems and expressing mathematical concepts, relationships, and reasoning. • Understandings of number – "how many" or "how much" – and number types extend applications of arithmetic properties, operations, and number systems and guide the use of computational strategies and algorithms. • Measurement attributes, processes, and tools, help us to quantify, compare, and solve problems involving objects, situations, and events.	• How are symbols and expressions utilized as representations in mathematics? • In what ways can a quantity be represented? • In what ways is measurement useful? • How can I use patterns, relations, and functions? • How are geometric concepts and relations conceptualized? • What roles can data play in the decision making process?

	• Patterns, relations, and functions are used to represent and analyze change in various contexts, make predictions and generalizations, and provide models and explanations for real-world problems. • Visualizations, spatial reasoning, and properties of two- and three- dimensional figures can be used to analyze, represent, and model geometric concepts and relationships. • Questions are posed and investigated by collecting data or retrieving existing data, and representing, analyzing, and interpreting data. Investigations, inferences, and predictions are used to make critical and informed decisions.	

Grade Level Benchmarks	
Knowledge	Skills
• An inequality is a statement that two quantities are not equal. • A solution of an inequality is any value that makes the inequality true. • You can add the same number to both sides of an inequality, and the statement will still be true. • You can subtract the same number from both sides of an inequality, and the statement will still be true. • You can multiply both sides of an inequality by the same *positive* number, and the statement will still be true. • You can divide both sides of an inequality by the same *positive* number, and the statement will still be true. • If you multiply or divide both sides of an inequality by a negative number, the resulting inequality is not a true statement. • Inequalities that contain more than one operation require more than one step to solve. • To solve more complicated inequalities, you may first need to simplify the expressions on one or both sides by using the order of operations, combining like terms, or using the Distributive Property. • When solving an inequality, if you get a statement that is always true, the original inequality is an identity, and all real numbers are solution. • When solving an inequality, if you get a false statement, the original inequality is a contradiction, and it has no solutions. • When two simple inequalities are combined into one statement by the words AND or OR, the result is called a compound inequality. • You can graph the solutions of a compound inequality involving AND by using the idea of an overlapping region, which is called the intersection, which shows the numbers that are solutions of both inequalities. • You can graph the solutions of a compound inequality involving OR by using the idea of combining regions, which is called the union, which shows the numbers that are solutions of either inequality.	• Identify solutions of inequalities in one variable. • Write and graph inequalities in one variable. • Solve one-step inequalities by using addition. • Solve one-step inequalities by using subtraction. • Solve one-step inequalities by using multiplication. • Solve one-step inequalities by using division. • Solve inequalities that contain more than one operation. • Solve inequalities that contain variable terms on both sides. • Solve compound inequalities in one variable. • Graph solution sets of compound inequalities in one variable.

	• Every solution of a compound inequality involving AND must be a solution of both parts of the compound inequality. • If no numbers are solutions of *both* simple inequalities, then the compound inequality has no solutions. • The solutions of a compound inequality involving OR are not always two separate sets of numbers. • There may be numbers that are solutions of both parts of the compound inequality.	

TASKS from CCSS for *Inequalities*

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.

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.

COURSE: Mathematics **LEVEL**: Grade 7 **UNIT/FOCUS**: Data Analysis and Probability

Desired Results		
Related standard(s): 7.SP.1 7.SP.2 7.SP.3 7.SP.4 7.SP.5 7.SP.6 7.SP.7.a 7.SP.7.b 7.SP.8.a 7.SP.8.b 7.SP.8.c 8.SP.1 8.SP.2 8.SP.3 8.SP.4	**Transfer**	
	Students will be able to independently use their learning to… • Use random sampling to draw inferences about a population. • Draw informal comparative inferences about two populations. • Investigate chance processes and develop, use, and evaluate probability models. • Investigate patterns of association in bivariate data. • Make sense of problems and persevere in solving them. • Reason abstractly and quantitatively. • Construct viable arguments and critique the reasoning of others. • Model with mathematics. • Use appropriate tools strategically. • Attend to precision. • Look for and make use of structure. • Look for and express regularity in repeated reasoning.	
	Meaning	
	Enduring Understandings (EUs)	Essential Questions (EQs)

	Students will understand that… • The use and manipulation of symbols and expressions provide a variety or representations for solving problems and expressing mathematical concepts, relationships, and reasoning. • Understandings of number – "how many" or "how much" – and number types extend applications of arithmetic properties, operations, and number systems and guide the use of computational strategies and algorithms. • Measurement attributes, processes, and tools, help us to quantify, compare, and solve problems involving objects, situations, and events. • Patterns, relations, and functions are used to represent and analyze change in various contexts, make predictions and generalizations, and provide models and explanations for real-world problems. • Visualizations, spatial reasoning, and properties of two- and three- dimensional figures can be used to analyze, represent, and model geometric concepts and relationships. • Questions are posed and investigated by collecting data or retrieving existing data, and representing, analyzing, and interpreting data. Investigations, inferences, and predictions are used to make critical and informed decisions.	*Students will keep considering…* • How are symbols and expressions utilized as representations in mathematics? • In what ways can a quantity be represented? • In what ways is measurement useful? • How can I use patterns, relations, and functions? • How are geometric concepts and relations conceptualized? • What roles can data play in the decision making process?
	Grade Level Benchmarks	
	Knowledge	Skills
	• *Bar graphs, line graphs*, and *circle graphs* can be used to present data in a visual way. • A bar graph displays data with vertical or horizontal bars. • A double-bar graph can be used to compare two data sets. • A line graph displays data using line segments. • A double-line graph can be used to compare how two related data sets change over time. • A circle graph shows parts of a whole. • A stem-and-leaf plot arranges data by dividing each data value into two parts. • The frequency of a data value is the number of times it occurs. A frequency table shows the frequency of each data value. • A histogram is a bar graph used to display the frequency of data divided into equal intervals. • Cumulative frequency shows the frequency of all data values less than or equal to a given value. • A *measure of central tendency* describes how data clusters around a value. • The mean is the sum of the values in the set divided by the number of values in the set. • The median is the middle value when the values are in numerical order, or the mean of the two middle values if there are an even number of values. • The mode is the value or values that occur most often. • The range of a set of data is the difference between the least and greatest values in the set. • A value that is very different from the other values in the set is called an outlier. • Quartiles divide a data set into four equal parts. • A quartile contains one fourth of the values in the set.	• Organize data in tables and graphs. • Choose a table or graph to display data. • Create stem-and-leaf plots. • Create frequency tables and histograms. • Describe the central tendency of a data set. • Create box-and-whisker plots. • Recognize misleading graphs. • Recognize misleading statistics. • Determine the experimental probability of an event. • Use experimental probability to make predictions. • Determine the theoretical probability of an event. • Convert between probabilities and odds. • Find the probability of independent events. • Find the probability of dependent events. • Solve problems involving permutations. • Solve problems involving combinations.

	• The interquartile range (IQR) is the difference between the upper and lower quartiles and represents the middle half of the data. • A box-and-whisker plot can be used to show how the values in a data set are distributed. • Graphs can be used to influence what people believe. • A circle graph compares each category of a data set to the whole. • In a random sample , all members of the group being surveyed have an equal chance of being selected. • An experiment is an activity involving chance. • Each repetition or observation of an experiment is a trial, and each possible result is an outcome. • The sample space of an experiment is the set of all possible outcomes. • An event is an outcome or set of outcomes in an experiment. • Probability is the measure of how likely an event is to occur. • The experimental probability of an event is the ratio of the number of times the event occurs to the number of trials. • The theoretical probability of an event is the ratio of the number of ways the event can occur to the total number of equally likely outcomes. • The complement of an event is all the outcomes in the sample space that are not included in the event. • Odds are another way to express the likelihood of an event. • Events are independent events if the occurrence of one event does not affect the probability of the other. • Events are dependent events if the occurrence of one event does affect the probability of the other. • A compound event consists of two or more simple events. • A combination is a grouping of outcomes in which the order does not matter. • A permutation is an arrangement of outcomes in which the order does matter. • The factorial of a number is the product of the number and all the natural numbers less than the number.	

TASKS from CCSS for *Data Analysis and Probability*

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.
Draw informal comparative inferences about two populations.

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

7.SP.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.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?

8.SP.1. Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.

8.SP.2. Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line.

8.SP.3. Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. For example, in a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height.

8.SP.4. Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables. For example, collect data from students in your class on whether or not they have a curfew on school nights and whether or not they have assigned chores at home. Is there evidence that those who have a curfew also tend to have chores?

COURSE: Mathematics **LEVEL**: Grade 7 **UNIT/FOCUS**: Functions

Desired Results

Related standard(s):

A-CED.1
A-CED.2
A-CED.4
A-REI.3

Transfer

Students will be able to independently use their learning to…

- Create equations that describe numbers or relationships.
- Solve equations and inequalities in one variable.
- Make sense of problems and persevere in solving them.
- Reason abstractly and quantitatively.
- Construct viable arguments and critique the reasoning of others.
- Model with mathematics.
- Use appropriate tools strategically.
- Attend to precision.
- Look for and make use of structure.
- Look for and express regularity in repeated reasoning.

Meaning

Enduring Understandings (EUs)	Essential Questions (EQs)

	Students will understand that…	*Students will keep considering…*
	• The use and manipulation of symbols and expressions provide a variety or representations for solving problems and expressing mathematical concepts, relationships, and reasoning. • Understandings of number – "how many" or "how much" – and number types extend applications of arithmetic properties, operations, and number systems and guide the use of computational strategies and algorithms. • Measurement attributes, processes, and tools, help us to quantify, compare, and solve problems involving objects, situations, and events. • Patterns, relations, and functions are used to represent and analyze change in various contexts, make predictions and generalizations, and provide models and explanations for real-world problems. • Visualizations, spatial reasoning, and properties of two- and three- dimensional figures can be used to analyze, represent, and model geometric concepts and relationships. • Questions are posed and investigated by collecting data or retrieving existing data, and representing, analyzing, and interpreting data. Investigations, inferences, and predictions are used to make critical and informed decisions.	• How are symbols and expressions utilized as representations in mathematics? • In what ways can a quantity be represented? • In what ways is measurement useful? • How can I use patterns, relations, and functions? • How are geometric concepts and relations conceptualized? • What roles can data play in the decision making process?

Grade Level Benchmarks	
Knowledge	Skills
• Some graphs are connected lines or curves called continuous graphs. • Some graphs are only distinct points and called discrete graphs. • Relationships can also be represented by a set of ordered pairs called a relation. • The domain of a relation is the set of first coordinates (or x-values) of the ordered pairs. • The range of a relation is the set of second coordinates (or y-values) of the ordered pairs. • A function is a special type of relation that pairs each domain value with exactly one range value. • The *vertical-line test* can be used to visually determine whether a graphed relation is a function. • The input of a function is the independent variable. • The output of a function is the dependent variable. • An algebraic expression that defines a function is a function rule. • If x is the independent variable and y is the dependent variable, then function notation for y is $f(x)$, read "f of x," where f names the function. • If the domain of a function is all real numbers, any number can be used as an input value. • Scatter plots and trend lines are used in statistics to make predictions.	• Match simple graphs with situations. • Graph a relationship. • Identify functions. • Find the domain and range of relations and functions. • Identify independent and dependent variables. • Write an equation in function notation and evaluate a function for given input values. • Graph functions given a limited domain. • Graph functions given a domain of all real numbers. • Create and interpret scatter plots. • Use trend lines to make predictions. • Recognize and extend an arithmetic sequence. • Find a given term of an arithmetic sequence.

	• A scatter plot is a graph with points plotted to show a possible relationship between two sets of data. • A correlation describes a relationship between two data sets. • Sets of data values can have a positive, a negative, or no correlation. • A trend line helps show the correlation between data sets more clearly. • You can use a graphing calculator to graph a trend line on a scatter plot. • A sequence is a list of numbers that often forms a pattern. • When the terms of a sequence differ by the same nonzero number d, the sequence is an arithmetic sequence.	

TASKS from CCSS for *Functions*

A-CED.1. Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions.

A-CED.2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

A-CED.4. Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm's law V = IR to highlight resistance R.

A-REI.3. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.

COURSE: Mathematics **LEVEL**: Grade 7 **UNIT/FOCUS**: Linear Equations & Functions

Desired Results	
Related Standards:	**Transfer**
	Students will be able to independently use their learning to…
8.EE.5 8.EE.6 8.EE.7.a 8.EE.7.b 8.F.1 8.F.2 8.F.3 8.F.4 8.F.5 A-SSE.1a A-CED.1	• Create models using the connections between proportional relationships, lines, and linear equations. • Analyze and solve linear equations and pairs of simultaneous linear equations. • Define, evaluate, and compare functions. • Use functions to model relationships between quantities. • Interpret the structure of expressions. • Create equations that describe numbers or relationships. • Explain the reasoning used to solve equations. • Solve equations and inequalities in one variable. • Make sense of problems and persevere in solving them. • Reason abstractly and quantitatively. • Construct viable arguments and critique the reasoning of others. • Model with mathematics.

A-REI.1
A-REI.3

- Use appropriate tools strategically.
- Attend to precision.
- Look for and make use of structure.
- Look for and express regularity in repeated reasoning.

Meaning

Enduring Understandings (EUs)	Essential Questions (EQs)
Students will understand that… • The use and manipulation of symbols and expressions provide a variety or representations for solving problems and expressing mathematical concepts, relationships, and reasoning. • Understandings of number – "how many" or "how much" – and number types extend applications of arithmetic properties, operations, and number systems and guide the use of computational strategies and algorithms. • Measurement attributes, processes, and tools, help us to quantify, compare, and solve problems involving objects, situations, and events. • Patterns, relations, and functions are used to represent and analyze change in various contexts, make predictions and generalizations, and provide models and explanations for real-world problems. • Visualizations, spatial reasoning, and properties of two- and three- dimensional figures can be used to analyze, represent, and model geometric concepts and relationships. • Questions are posed and investigated by collecting data or retrieving existing data, and representing, analyzing, and interpreting data. Investigations, inferences, and predictions are used to make critical and informed decisions.	*Students will keep considering…* • How are symbols and expressions utilized as representations in mathematics? • In what ways can a quantity be represented? • In what ways is measurement useful? • How can I use patterns, relations, and functions? • How are geometric concepts and relations conceptualized? • What roles can data play in the decision making process?

Grade Level Benchmarks

Knowledge	Skills
Students will know… • A function is a relationship between input and output values. • Slope is the ratio of vertical change of a line to its horizontal change (rise over run). • There are four types of slope: positive, negative, zero, and undefined. • Slopes of perpendicular lines are negative reciprocals. • Equations for parallel lines have the same slope and different y-intercepts. • Two or more points lie on a line if their slopes are the same. • Slope intercept form is $y = mx + b$ (m is slope; b is y-intercept). • General linear/standard form is $Ax + By = C$; where negative A/B is the slope; and C/B is the y-intercept. • Point slope form is $y - y_1 = m(x - x_1)$; here m is the slope; and (x_1, y_1) is your given point. • Even though no line passes through all data points, an equation can be written to describe the trend. • Inequalities have infinitely many solutions. • If an inequality has a $<$ or $>$ sign, the line would be dotted. • If an inequality has a $\leq$ or $\geq$ sign, the line would be solid. • Points on a dotted line are not solutions.	*Students will be able to…* • Calculate rate of change. • Calculate slope through two given points. • Use definition and properties of slope. • Graph a line given point slope. • Graph a line given two points. • Graph a line given intercepts. • Graph a line using a graphing calculator. • Write an equation for a line given point slope. • Write an equation for a line given two points. • Write an equation for a line given intercepts. • Calculate line of best-fit. • Graph linear inequalities with two variables. • Write linear inequalities from a graph. • Use slope to determine if lines are parallel or perpendicular.

	• Points on a solid line are solutions. • Graphs are shaded according to the sign above the y-intercept or below the y-intercept.	

TASKS from CCSS for *Linear Equations & Functions*

8.EE.5 Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.

8.EE.6 Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation y = mx for a line through the origin and the equation $y = mx + b$ for a line intercepting the vertical axis at b.

8.EE.7. Solve linear equations in one variable.

a. Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form x = a, a = a, or a = b results (where a and b are different numbers).

b. Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.

8.F.1 Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output.

8.F.2. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change.

8.F.3. Interpret the equation y = mx + b as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. For example, the function A = s2 giving the area of a square as a function of its side length is not linear because its graph contains the points (1,1), (2,4) and (3,9), which are not on a straight line.

8.F.4. Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.

8.F.5. Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.

A-SSE.1. Interpret expressions that represent a quantity in terms of its context.
a. Interpret parts of an expression, such as terms, factors, and coefficients.

A-CED.1. Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions.

A-REI.1. Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.

A-REI.3. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.

COURSE: Mathematics **LEVEL**: Grade 7 **UNIT/FOCUS**: Geometric Figures

Desired Results

Related standard(s):

7.G.1
7.G.2
7.G.3
7.G.4
7.G.5
7.G.6

8.G.1.a
8.G.1.b

Transfer

Students will be able to independently use their learning to…

- 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.
- Model congruence and similarity using physical models, transparencies, or geometry software.
- Apply the Pythagorean Theorem.
- Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres.
- Make sense of problems and persevere in solving them.
- Reason abstractly and quantitatively.
- Construct viable arguments and critique the reasoning of others.
- Model with mathematics.
- Use appropriate tools strategically.

8.G.1.c
8.G.2
8.G.3
8.G.4
8.G.5
8.G.6
8.G.7
8.G.8
8.G.9

- Attend to precision.
- Look for and make use of structure.
- Look for and express regularity in repeated reasoning.

Meaning

Enduring Understandings (EUs)	Essential Questions (EQs)
Students will understand that…	*Students will keep considering…*
• The use and manipulation of symbols and expressions provide a variety or representations for solving problems and expressing mathematical concepts, relationships, and reasoning. • Understandings of number – "how many" or "how much" – and number types extend applications of arithmetic properties, operations, and number systems and guide the use of computational strategies and algorithms. • Measurement attributes, processes, and tools, help us to quantify, compare, and solve problems involving objects, situations, and events. • Patterns, relations, and functions are used to represent and analyze change in various contexts, make predictions and generalizations, and provide models and explanations for real-world problems. • Visualizations, spatial reasoning, and properties of two- and three- dimensional figures can be used to analyze, represent, and model geometric concepts and relationships. • Questions are posed and investigated by collecting data or retrieving existing data, and representing, analyzing, and interpreting data. Investigations, inferences, and predictions are used to make critical and informed decisions.	• How are symbols and expressions utilized as representations in mathematics? • In what ways can a quantity be represented? • In what ways is measurement useful? • How can I use patterns, relations, and functions? • How are geometric concepts and relations conceptualized? • What roles can data play in the decision making process?

Grade Level Benchmarks

Knowledge	Skills
• There is a relationship between a point, a line, and a plane. • The distance formula can be used to find distance between points in the coordinate plane. • A scale drawing is used to represent the relationships between measures in an object. • The scale factor shows a relationship between two geometric figures. • The intersection of a plane and a 3-D solid is called a cross section. • The radius, diameter, area, and circumference of a circle are mathematically related. • Points, angles, and lines, can be rotated, dilated, reflected, or translated. • Congruent figures are similar, but similar figures are not necessarily congruent. • Lines, angles, and shapes can be described as congruent. • There is a relationship between the interior and exterior angles in a triangle.	• Determine the distance between two points in the coordinate plane, using the Pythagorean Theorem. • Determine the area of a triangle, square, or rectangle in the coordinate plane (with or without given side lengths.) • Determine the scale factor for two geometric figures. • Use a scale drawing to determine actual lengths. • Create a scale drawing using actual lengths. • Draw (using various tools) triangles with given conditions, such as side length and angle measure. • Given certain conditions, determine how many triangles can be drawn. • Describe the 2-D figures that result from slicing 3-D figures. • Apply the circumference and area of a circle in real life situations.

	• Angles can be described as supplementary, complementary, vertical, or adjacent. • A line which intersects two parallel lines is called a transversal. • The Pythagorean Theorem can be used to determine distance. • Formulas for the volume of cones, cylinders, and spheres.	• Use knowledge about relationships between angles to determine the measure of unknown angles in a figure. • Use the surface area and volume of 3-D objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms, in order to solve real-world problems. • Verify the properties of translations in the coordinate plane. • Verify that when a 2-D figure is translated, its image is congruent. • Describe the effect of various translations on 2-D figures, in terms of coordinates. • Determine if two, 2-D figures are similar by describing the sequence of translations which relates them. • Relate the interior and exterior angles in a triangle. • Determine the relationship between angles created when parallel lines are cut by a transversal. • Determine if two triangles are similar using the angle-angle criterion. • Use the Pythagorean Theorem to determine the length of an unknown side in a right triangle. • Apply the Pythagorean Theorem in two and three dimensions. • Determine the volume of cones, cylinders, and spheres.

TASKS from CCSS for *Geometric Figures*

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.

8.G.1. Verify experimentally the properties of rotations, reflections, and translations:

a. Lines are taken to lines, and line segments to line segments of the same length.

b. Angles are taken to angles of the same measure.

c. Parallel lines are taken to parallel lines.

8.G.2. Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them.

8.G.3. Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.

8.G.4. Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them.

8.G.5. Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so.

8.G.6. Explain a proof of the Pythagorean Theorem and its converse.

8.G.7. Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.

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

8.G.9. Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.