7th Grade Math - General and Resource Room

Course Essential Questions:

- What examples of proportional relationships exist in real-life and how do we use them to solve problems?
- How do the properties of operations apply when using fractions, decimals, and percents?
- What relationships exist between figures that are similar and how do we use this when creating scale drawings?
- How do three-dimensional drawings relate to two-dimensional drawings?
- How is data gathered from a sample distribution used to make inferences about the population?

Unit 1A: Rational Numbers - Integers

Essential Questions:	Essential Understandings:
- How do I apply the properties of operations to solve problems? - What the rules for adding, subtracting, multiplying, and dividing integers? - How can we represent addition and subtraction of integers on a number line? - How do I use integers to represent real-life situations?	- Properties of operations can be used to switch the order and group numbers so problems are easier to solve. (Adding and Subtracting rules): Same signs add and keep; different signs subtract. Keep the sign of the greater number, then you'll be exact. (Multiplying and Dividing rules): Two negatives equal positive; one negative means negative answer - Number lines show addition when you move to the right and subtraction when you move to the left - Key words (owe, borrow, lost, below) signal negative integers and (gain) signal positive integers

Curriculum Standards:

CC.7.NS.1. (DOK 1,2) 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.

CC.7.NS.2. (DOK 1,2) 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.

CC.7.NS.3. (DOK 1,2) Solve real-world and mathematical problems involving the four operations with rational numbers.

Knowledge/Content I Know …	Skills/Processes I Can …
- Integers are positive and negative whole numbers - Additive inverses are any number and it's opposite where the sum is zero - Absolute value is a number's distance from zero - Absolute value is used to show the distance between two rational numbers when finding their difference - the properties of operations (commutative and associative and additive identity) - that additive inverse means opposite - a number and its opposite have a sum of 0 - the rules for adding signed numbers - that subtraction is the same as adding the additive inverse - how to find the difference of 2 numbers - how to find the absolute value of a number - the rules for multiplying and dividing signed numbers	- describe situations in which opposite quantities combine to make 0 - show that a number and its opposite have a sum of 0 - interpret sums of rational numbers by describing real-world contexts - apply the rule for adding signed numbers - understand subtraction of rational numbers as adding the additive inverse (p - q = p + -q) - show that the distance between 2 rational numbers on the number line is the absolute value of their difference and apply the principle in real-world contexts - apply properties of operations as strategies to add and subtract rational numbers - apply the rules for multiplying and dividing signed numbers - apply properties of operations as strategies to add and subtract rational numbers - apply properties of operations to multiply and divide rational numbers

Unit 1B: Rational Numbers - Decimals

Essential Questions:	Essential Understandings:
● How do I apply the properties of operations to solve problems? ● What the rules for adding, subtracting, multiplying, and dividing integers? ● How can we represent addition and subtraction of integers on a number line? ● How do I use integers to represent real-life situations?	● Properties of operations can be used to switch the order and group numbers so problems are easier to solve. ● (Adding and Subtracting rules): Same signs add and keep; different signs subtract. Keep the sign of the greater number, then you'll be exact. ● (Multiplying and Dividing rules): Two negatives equal positive; one negative means negative answer ● Number lines show addition when you move to the right and subtraction when you move to the left ● Key words (owe, borrow, lost, below) signal negative integers and (gain) signal positive integers

Curriculum Standards:

CC.7.NS.1. (DOK 1,2) 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.

CC.7.NS.2. (DOK 1,2) 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.

CC.7.NS.3. (DOK 1,2) Solve real-world and mathematical problems involving the four operations with rational numbers.

Knowledge/Content	Skills/Processes

I Know …	I Can …
- Integers are positive and negative whole numbers - Additive inverses are any number and it's opposite where the sum is zero - Absolute value is a number's distance from zero - Absolute value is used to show the distance between two rational numbers when finding their difference - the properties of operations (commutative and associative and additive identity) - that additive inverse means opposite - a number and its opposite have a sum of 0 - the rules for adding signed numbers - that subtraction is the same as adding the additive inverse - how to find the difference of 2 numbers - how to find the absolute value of a number - the rules for multiplying and dividing signed numbers	- describe situations in which opposite quantities combine to make 0 - show that a number and its opposite have a sum of 0 - interpret sums of rational numbers by describing real-world contexts - apply the rule for adding signed numbers - understand subtraction of rational numbers as adding the additive inverse (p - q = p + -q) - show that the distance between 2 rational numbers on the number line is the absolute value of their difference and apply the principle in real-world contexts - apply properties of operations as strategies to add and subtract rational numbers - apply the rules for multiplying and dividing signed numbers - apply properties of operations as strategies to add and subtract rational numbers - apply properties of operations to multiply and divide rational numbers

Unit 1C: Rational Numbers - Fractions

Essential Questions:	Essential Understandings:
- How do I apply the properties of operations to solve problems with fractions? - What are the rules for adding, subtracting, multiplying, and dividing fractions when they are positive and negative? - How do I represent addition and subtraction of fractions on a number line? - How do I show that the distance between two rational numbers is the absolute value of their difference?	(Adding and Subtracting rules): Same signs add and keep; different signs subtract. Keep the sign of the greater number, then you'll be exact. (Multiplying and Dividing rules): Two negatives equal positive; one negative means negative answer - Absolute value is used to show the distance between two rational numbers when finding their difference - Properties of operations can be used to switch the order and group numbers so problems are easier to solve.

Curriculum Standards:

CC.7.NS.1. (DOK 1,2) 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.

CC.7.NS.2. (DOK 1,2) 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.

 CC.7.NS.3. (DOK 1,2) Solve real-world and mathematical problems involving the four operations with rational numbers.

Knowledge/Content I Know …	Skills/Processes I Can …
that an additive inverse means opposite of a number	describe situations in which opposite quantities

- the rules for adding/subtracting, multiplying, and dividing fractions
- how to find the absolute value of a number and that absolute value is the distance from 0
- commutative property means that you can change the order of numbers in an addition or multiplication problem and it doesn't change the answer
- associative property means that you can change how numbers are grouped in addition and multiplication problems and it doesn't change the answer
- that in a fraction, the numerator is being divided by the denominator and which number goes where when setting up a long division problem
- how to carry out long division
- that decimals that end are terminating and decimals that repeat are repeating
- Number lines show addition when you move to the right and subtraction when you move to the left
- Key words (owe, borrow, lost, below) signal negative integers and (gain) signal positive integers
- Long division method of converting fractions to decimals.
- Terminating decimals end and repeating decimals repeat a pattern of numbers and do not stop
- Fractions show the division of two integers

- combine to make 0
- show that a number and its opposite have a sum of 0
- interpret sums of rational numbers by describing real-world contexts
- understand subtraction of rational numbers as adding the additive inverse (p - q = p + -q)
- show that the distance between 2 rational numbers on the number line is the absolute value of their difference and apply the principle in real-world contexts
- apply properties of operations as strategies to add and subtract rational numbers
- apply the rules for multiplying and dividing signed numbers
- apply properties of operations to multiply and divide rational numbers
- convert a rational number to a decimal using long division
- show that the decimal form of a rational number terminates in 0's or eventually repeats
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Unit 2A: Expressions	
Essential Questions:	**Essential Understandings:**
- What is a variable? - What are expressions? - What are coefficients and constants? - How do I combine like terms? - What is the distributive property and how do I apply it? - How do I find the greatest common factor and apply it to factor expressions?	- Expressions are made of variables, numbers, and operation symbols to model a relationship that exists between quantities. - To factor an expression identify the greatest common factor of each term and write the expression as the product of this and the resulting quotient.

Curriculum Standards:

CC.7.EE.1. (DOK 1,2) Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational
  coefficients.

CC.7.EE.2. (DOK 1,2) 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."

CC.7.EE.3. (DOK 1,2) 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.

CC.7.EE.4. (DOK 1,2) 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

Knowledge/Content I Know …	Skills/Processes I Can …
- how to combine like terms - how to find the greatest common factor - how to apply the distributive property - how to add, subtract, multiply, and divide rational	- rewrite expressions in different forms - apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients

- numbers
- what an expression is
- what a variable is
- What a constant is
- Variables are letters that represent unknown numbers
- Expressions are math problems without an equal sign
- Coefficients are numbers attached (being multiplied) to a variable. Constants are numbers without a variable.
- Use rational number rules for adding and subtracting to combine like terms.
- Distributive property multiplies a number outside of parenthesis with everything inside of parenthesis
- The GCF is used to simplify an expression

- Combine like terms
- Find the greatest common factor
- Add, subtract, multiply, and divide rational numbers
- Simplify expressions
- Identify different parts of an expression

Unit 2B: Equations

Essential Questions:	Essential Understandings:
- How do I solve an equation? - How do I write an equation to solve a word problem? - What inverse operations should I use? - How do I know if I've found the correct solution to an equation? - How do I apply the distributive property?	- Equations are solved by using inverse operations to isolate the variable. - Word problem breakdown strategy is used to help identify the unknown which will become the variable in an equation; identifying clue words will help with the operations that should be contained in the equation. - The inverse operation of addition is subtraction; of subtraction is addition; of multiplication is division; and of division is multiplication. - To check, just replace the variable with your solution and calculate to see if it is a true statement. - To apply distributive property, multiply the number outside of the parentheses by each term inside the parentheses.

Curriculum Standards:

CC.7.EE.1. (DOK 1,2) Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational
  coefficients.

CC.7.EE.2. (DOK 1,2) 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."

CC.7.EE.3. (DOK 1,2,3) 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.

CC.7.EE.4. (DOK 1,2,3) 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

Knowledge/Content I Know …	Skills/Processes I Can …
● that a variable is used in place of an unknown quantity in a problem ● to use word problem breakdown to identify important elements of a word problem ● how to use inverse operations to undo operations in an equation ● how to check to see if a number is a solution to an equation ● to apply distributive property	● 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, by using variables to represent quantities in a real-world or mathematical problem ● identify the sequence of operations used to solve an equation

Unit: Inequalities - Unit 2C

Essential Questions:	Essential Understandings:
● What is an inequality and how do you solve it? ● How do you graph an inequality? ● How do you write an inequality from a word problem and interpret the solution?	● An inequality is a comparison relationship where one of the quantities is less, more, and/or equal to the other. ● Solutions to inequalities are part of a solution set that is represented visually on a number line using a ray to represent all possible solutions. ● To write an inequality we look for keywords like less than, more than, at least, at most to write the inequality as a model to find the solutions.

Curriculum Standards:

CC.7.EE.4. (DOK 1,2,3) 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

Knowledge/Content I Know …	Skills/Processes I Can …
● that a variable is used in the place of an unknown quantity in an inequality ● how to use word problem breakdown to identify important elements of a word problem ● how to use inverse operations to undo operations in an inequality ● that dividing by a negative number while solving an inequality results in reversing the direction of the inequality symbol ● how to check to see whether a number is a member of a solution set of an inequality ● An inequality is a mathematical sentence built from expressions using one or more of the symbols <, >, ≤, or ≥. ● Inequality are solved using inverse operations. ● Inequalities are graphed on a number line	● 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 ● interpret the solution set of the inequality in the context of the problem

<, > represent open circles and ≤, or ≥ represent closed circles - Use word problem breakdown to identify important elements of a word problem and use that to generate an inequality - what an open circle and closed circle represent on a graph - how a check step and solution connect back to the original inequality to make it true	

Unit 3A: Proportional Thinking

Essential Questions:	Essential Understandings:
● How do I calculate unit rate? ● How can I tell if a table contains proportional data? ● How do I find the constant of proportionality in a table? ● How do I explain the meaning of a point on a graph of a proportional relationship?	● To calculate unit rate, divide the numerator by the denominator so that you know how much per 1 unit of measure. ● A table that contains proportional data will have a constant ratio (the same result when dividing one number by the other); this is the constant of proportionality. ● A point on the graph of a proportional relationship can be interpreted by connecting the x and y values of the point to the labels of the graph.

Curriculum Standards:

CC.7.RP.1. (DOK 1,2) 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.

CC.7.RP.2. (DOK 1,2) 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 .

CC.7.RP.3. (DOK 1,2) 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

Knowledge/Content I Know …	Skills/Processes I Can …
● that a unit rate is a ratio with a denominator of 1 that compares quantities with different units of measurement ● that dividing by a fraction is the same as multiplying by the multiplicative inverse ● how to calculate a unit rate by dividing the quantity in the numerator by the quantity in the denominator ● if there is a constant ratio found in the data of a table, then the data is proportional ● if the graph of data forms a straight line that goes	● compute unit rates that involve fractions ● determine whether two quantities are proportional in tables and graphs. ● identify the constant of proportionality in tables, graphs, and equations. ● represent proportional relationships in equations. ● explain what a point on the graph of a proportional relationship means. ● find the constant of proportionality in a graph. (find the point (1, k)--k is the constant of proportionality).

- through the origin (0,0), then the data is proportional
- the constant of proportionality in a table is the constant ratio formed by the data
- the constant of proportionality in a graph is the k in the point (1,k)
- the constant of proportionality in an equation in the form
- Y = kx is the k
- that points on graphs come from the numbers on the x and y-axes and that I can interpret this information using the labels on each axis of the graph
- The graph of a proportional relationship is a straight line through the origin.
- If an equation is written in the form y = kx, k is the constant of proportionality.
- Constant ratio = constant of proportionality = unit rate

Unit 3B: Percents

Essential Questions:	Essential Understandings:
● How do I calculate with percents? ● How can I solve percent problems another way? ● How do I find the percent of change?	● To calculate with a percent, change the percent into a decimal by moving the decimal point two places to the left and then multiply by the original amount. ● Percent problems can also be solved by starting with 100% and then adding or subtracting the percent, depending on the situation. You can then multiply after changing the new percent to a decimal. (Example, if a shirt is on sale for 25% off, you are actually paying 100% - 25% = 75%. Multiply the price of the shirt by .75 to get the sale price. ● Percent of change, either increase or decrease, can be calculated by creating a proportion (change/original = percent over 100) and then solving it.

Curriculum Standards:

CC.7.RP.3. (DOK 1,2) 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

Knowledge/Content I Know …	Skills/Processes I Can …
● Vocabulary terms such as tips, taxes, markups, bonuses, commissions, and increases are added to the original amount ● Vocabulary terms such as discounts, sales, markdowns, and reductions are subtracted from the original amount ● Before calculating with a percent, it must be changed to a decimal by moving the decimal point two places to the left ● The difference between amount of increase and percent of increase ● There are different methods of calculating the same percent problem ● The formula for percent of change is amount of change divided by original amount (a proportion can be written: change/original = percent over 100)	● Solve percent increase/decrease problems by writing and solving an equation from a proportion ● Write multi-step percent problems from real-world scenarios ● Calculate answers to multi-step percent problems

Unit 4: Statistics and Probability	
Essential Questions:	**Essential Understandings:**
- Why is a random sample of a population important? - How can I use data from a sample to make an estimate about the entire population? - How can I assess the visual overlap of two sets of data? - How can I make inferences about two populations? - How can I determine the likelihood of an event occurring?	- Random samples are representative of a population and lead to valid inferences about the entire population. - Writing a proportion using the data from the sample and entire population and then solving it can lead to an estimate about the population. - Visual overlap of two sets of data can be assessed by comparing the mean absolute deviation. - Measures of center and variability from samples can be used to make informal inferences about two populations. - The likelihood of an event occurring increases the closer the probability gets to 1.

Curriculum Standards:

CC.7.SP.1. (DOK 2) 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.

CC.7.SP.2. (DOK 2,3) 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.

CC.7.SP.3. (DOK 2,3) 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.

CC.7.SP.4. (DOK 2,3) 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.

CC.7.SP.5. (DOK 1) 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.

CC.7.SP.6. (DOK 2,3) 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.

CC.7.SP.7. (DOK 2,3) 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?

CC.7.SP.8. (DOK 1,2,3) 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?

Knowledge/Content I Know …	Skills/Processes I Can …
- Population is the entire group being studied. - Part of the population being surveyed is a sample. - Random sampling leads to an unbiased sample. - To make a valid inference, you need an unbiased sample. - How to write a proportion from a sampling situation to make an estimate about the whole population - How to find the missing number in a proportion by using the concept of cross products being equal - How to calculate mean, median, mode, and range from a set of data - That the mean absolute deviation is the average distance that each data point is away from the mean. - That the interquartile range is the difference between the upper quartile and the lower quartile of a set of data and shows how 50% of the data is spread. - Probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Closer to 1=likely to occur, close to 0= unlikely. - Predictions from experiments are not exact. - A compound event is when more than event is occurring. - Organized lists, tables, and tree diagrams can be used to display the sample spaces of compound events.	- gain information about a population by examining a sample of it - understand that random sampling tends to produce representative samples and support valid inferences - use data from a random sample to draw inferences about a population with an unknown characteristic of interest - Use proportions to make estimates about a population - Find and compare the mean absolute deviation (MAD) between two numerical data distributions - Find and compare the interquartile range (IQR) between two numerical data sets. - Use measures of center and measures of variability to draw inferences about two populations. - Find the probability of a chance event. - Determine how likely an event is to occur. - Approximate the probability of a chance event by collecting data on it. - Predict the approximate relative frequency of an event given the probability from an experiment. - Develop a uniform probability model. - Use a probability model to determine probabilities of events. - Develop a probability model (may not be uniform) by running an experiment. - Find the probability of a compound event. - Represent the sample spaces for compound events in various methods. - Design and use a simulation to generate frequencies for compound events.

Unit 5: Geometry

Essential Questions:	Essential Understandings:
- How is a scale drawing/model created? - How do I draw a triangle from three measurements of angles or sides? - What shape will be the result of slicing a three dimensional figure? - How do I calculate area and circumference of a circle? - How are the circumference and area of a circle related? - How do I use the relationship between special pairs of angles to solve problems? - How do I find area and volume measurements of geometrical figures?	- Scale is used to create a scale drawing/model of an actual figure - A triangle can be formed if a combination of any three measurements (side lengths or angle measurements) is known. - When a three-dimensional shape is sliced, the shape of the two-dimensional cross-section depends on the type of slice made (horizontal, vertical, or angled) - The ratio of a circle's circumference to its diameter is known as π (pi). - Area is the number of square units in a figure. - Surface area is the sum of the area of each face of a three-dimensional figure. - Volume is the measure of the interior space of a three-dimensional figure using cubic units

Curriculum Standards:

CC.7.G.1. (DOK 1,2) 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.

CC.7.G.2. (DOK 1,2) 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 .

CC.7.G.3. (DOK 1,2) Describe the two-dimensional figures that result from slicing three dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids. Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.

CC.7.G.4. (DOK 1,2) 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.

CC.7.G.5. (DOK 1,2) 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.

CC.7.G.3. (DOK 1,2) 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.

Knowledge/Content I Know …	Skills/Processes I Can …
- How to use proportions to find unknown dimensions of actual or model geometric figures - The conditions (of angles or sides) that determine a unique triangle, more than one triangle, or no triangle - When three-dimensional figures are sliced, they form a two dimensional figure - Formulas for calculating area and circumference of circles. - The relationship between circumference and area of a	- Calculate the scale between two similar figures - Solve problems using scale drawings of geometric figures - Reproduce a scale drawing at different scales - Draw geometric shapes with given conditions - Use a ruler, and protractor - Construct triangles from three measures of sides or angles - Notice conditions that determine a unique triangle,

- circle
- Pi (π) is the ratio of circumference to diameter
- Supplementary angles total 180° and complementary angles total 90°
- Vertical angles are pairs of angles formed by a pair of intersecting lines. Vertical angles have congruent measures and are opposite each other in position
- Adjacent angles are a pair of angles that have the same vertex and a common side, but no common interior points.
- Formulas for calculating area, surface area, and volume of two- and three-dimensional figures composed of triangles, quadrilaterals, polygons, cubes, and right prisms
- A proportion is used to find unknown measurements by comparing actual measurements to model measurements set equal to a known scale of the two.
- Scale is the same as a unit rate. It is a number that shows the size relationship between two similar figures
- Formulas for circles include: Area = πr^2, Circumference = πd
- If one measure of two supplementary angles is known, the other can be found by subtracting the known measure from 180.
- If one measure of two complementary angles is known, the other can be found by subtracting the known measure from 90.
- If one measure of two vertical angles is known, the other measure will be congruent to the known measure.

- more than one triangle, or no triangle
- Identify and describe the two-dimensional figures that result from slicing three-dimensional figures
- Identify special pairs of angles in order to use the known facts about their relationship to solve problems
- Solve real-world and mathematical problems involving angle measure, area, surface area, and volume
- find an unknown dimension of a geometrical figure
- calculate scale between a real object and a representative model