Lake Mills School District

Year at a Glance Scope and Sequence for Math

Overarching Goal of the Curricular Area: Students will be able to use mathematical skills by problem solving, critiquing, analyzing, and reasoning the world around them for a variety of lifelong situations.

Kindergarten

Unit Theme	Unit Goal	Enduring Understandings for the Unit	Essential Questions for the Unit
Counting and Cardinality	Students will know number names and count sequence. Students will be able to count to tell the number of objects. Students will be able to compare numbers.	Students will understand that counting represents how different numbers relate to one another.	How can I, when counting a set of objects, pair each object with one and only one number name? How can I write a numeral to represent a number of objects from 0-20? How can I tell which of two numbers (less than 10) is larger?
Operations and Algebraic Thinking	Students will understand addition as putting together and adding to, and understand subtraction as taking apart and taking from.	Students will understand when to join numbers together (addition) and when to take numbers apart (subtraction).	How can I use a variety of strategies to represent addition and subtraction? How can I use objects or drawings to solve addition and subtraction problems? How can I find different combinations of numbers that make 10?
Number and Operations in Base Ten	Students will be able to work with numbers 11-19 to gain foundations for place value.	Students will understand that teen numbers (11-19) are composed of a group of ten ones and additional ones.	How can I show the composition or decomposition of numbers 11-19 using objects or drawings?
Measurement and Data	Students will be able to describe and compare measurable attributes. Students will be able to classify objects and count the number of objects in each category.	Students will understand that objects can be compared using different attributes (length/height and weight). Students will understand that objects can be sorted into different categories and then counted within the categories.	How can I sort objects by their common attributes? How can I use different objects to measure and compare length and height? How can I use a pan-balance to measure and compare weights?
Geometry	Students will be able to identify and describe shapes (squares, circles, triangles, rectangles, hexagons, cubes, cones, cylinders and spheres). Students will be able to analyze, compare, create, and compose shapes.	Students will understand the relative positions of objects in their environment (above, below, beside, behind, in front of, next to). Students will understand that shapes can be classified as either two-dimensional or three-dimensional. Students will understand that they can compare and model shapes according to their specific attributes.	How can I describe shapes using their name (square, triangle, etc.) or other words such as sides, corners, and other attributes? How can I describe the difference between two-dimensional and three-dimensional shapes? How can I create new shapes by combining simple shapes?

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Grade 1

Unit Theme	Unit Goal	Enduring Understandings for the Unit	Essential Questions for the Unit
Counting	Students will be able to relate counting to addition and subtraction. Students will be able to add and subtract within 20 demonstrating fluency. Students will be able to compare two-digit numbers based on the meanings of the tens and ones digit.	Students will understand that counting represents how different numbers relate to one another.	How can I find a new number by counting up and back a number of spaces from a given number? How can I use addition and subtraction to solve simple number stories within 10? How can I tell which of two numbers (less than 15) is larger?
Addition	Students will be able to use addition and subtraction within 20 to solve a variety of word problems. Students will be able to relate counting to addition and subtraction. Students will be able to read, write, represent, and count to 120 starting at any number less than 120.	Students will understand that addition equations are part of the foundation of solving problems and more complex computations.	How can I solve and interpret number models for change to more and change to less stories within 10? How can I find and use an effective counting strategy to find the sum of two numbers? How can I count and represent a number of objects with a written numeral within 20?
Number Stories	Students will be able to use addition and subtraction to model and solve number stories. Students will be able to connect counting to addition and subtraction.	Students will understand that number stories are real life problems can be solved using math. Students will understand that they can problem solve by using models to work through their thinking.	How can I solve parts and total number stories within 10? How can use a number line or number grid to solve addition and subtraction problems? How can I find the unknown number between two numbers?

Length and Addition Facts	Students will be able to measure lengths using nonstandard units. Students will be able to use addition and subtraction within 20 to solve a variety of word problems.	Students will understand that length can be estimated and measured. Students will understand that addition equations are part of the foundation of solving problems and more complex computations.	How can I find the length of an object using nonstandard units? How can I order different objects by length? How can I solve and write number models for number stories within 10?
Place Value and Comparison	Students will be able to use place value to compare and add two-digit numbers. Students will be able to understand that the two digits of a two-digit number represent amounts of tens and ones? Students will be able to compare two two-digit numbers based on meanings of the tens and ones digit.	Students will understand that place value can help them solve addition and subtraction problems. Students will understand that comparison can be used to distinguish the similarities and differences between numbers and objects.	How can I identify the two-digit number represented by base-10 blocks? How can I effectively compare numbers to determine which are greater than, less than, or equal to? How can I add a two-digit and a one-digit using tools?
Addition Fact Strategies	Students will be able to apply properties of operations as strategies to add and subtract. Students will be able to add and subtract within 20 with fluency using a variety of strategies. Students will be able to use the two digits of a two-digit number to represent amounts of tens and ones.	Students will understand that addition equations are part of the foundation of solving problems and more complex computations.	How can I apply the commutative and associative properties of addition to solve problems? How can I use doubles facts and combinations of 10 to solve addition and subtraction facts within 20? How can I find equivalent names for numbers? How can I tell the value of each digit in a two-digit number?
Subtraction Fact Strategies and Attributes of Shapes	Students will be able to apply properties of operations as strategies to add and subtract. Students will be able to use subtraction to solve for an unknown-addend problem. Students will be able to explore the defining and nondefining attributes of 2-dimensional shapes.	Students will understand that addition and subtraction equations are part of the foundation of solving problems and more complex computations. Students will understand that the attributes of shapes provides a foundation for recognizing, analyzing and drawing more complex shapes.	How can I use addition to find the difference between two numbers? How can I find an unknown by relating two numbers and describing their relationship with a number sentence? How can I use a variety of strategies to solve subtraction facts? How can I distinguish the defining and nondefining attributes of shapes?

Geometry	Students will be able to explore the defining and non-defining attributes of 2-dimensional shapes. Students will be able to compose and decompose composite shapes. Students will be able to mentally find 10 more or 10 less than a two-digit number. Students will be able to tell and write time in hours and half-hours using analog and digital clocks.	Students will understand that geometry involves measurement and data analysis as the basis of understanding geometric shapes, composition and problem solving.	How can I determine the defining attributes of two and three dimensional shapes? How can I make composite shapes from two-dimensional shapes? How can I partition shapes into two or four equal shares and name the shares? How can I explain finding 10 more or 10 less than a two-digit number? How can I use an analog or digital clock to tell time to the half hour?
Two-digit Addition and Subtraction	Students will be able to add and subtract using two-digit and one-digit numbers within 100. Students will be able to understand that the two-digits of a two-digit number represent amounts of tens and ones. Students will be able to subtract multiples of 10 in the range of 10-90.	Students will understand that addition and subtraction equations are part of the foundation of solving problems and more complex computations.	How can I identify the number of tens and ones in a two-digit number? How can I find the value of a digit in a given number? How can I explain and model my strategies for subtracting multiples of 10? How can I explain and model my strategies for adding within 100?

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Grade 2

Unit Theme	Unit Goals	Enduring Understandings for the Unit	Essential Questions for the Unit
Tools and Counting	Students will be able to relate counting to addition and subtraction. Students will be able to use math tools to help them solve mathematical concepts.	Students will understand that there are a variety of tools they can use to count with. Students will understand that counting represents how different numbers relate to one another.	What are different ways to count? What are efficient ways to count?
Fact Strategies	Students will be able to internalize strategies to solve 1-digit by 1-digit additions problems.	Students will understand that real life problems can be solved using math. Students will understand that there is more than one way to solve a problem.	What strategies can I use to solve doubles facts and combinations-of-10 addition facts? How can I write an addition number story that matches a picture?
More Fact Strategies	Students will be able to internalize strategies for solving subtraction facts. Students will be able to develop fluency with addition and subtraction within 20.	Students will understand that there is more than one way to solve a problem. Students will understand that fact fluency is essential for solving more complex equations.	What strategies can I use to add and subtract within 20 to solve 1-step word problems? How can I use math tools to add or subtract within 100?
Place Value and Measurement	Students will be able to extend their understanding of place value by developing strategies for fluently adding and subtracting multi-digit numbers. Students will be able to use standard tools and units for	Students will understand that their knowledge of place value can help them solve addition and subtraction problems. Students will understand that measurement can be done with different tools and different units.	How can I use place value to help me determine the value of a digit? How can I use place value to add and subtract 2 digit numbers? What tools should I use to measure in inches and centimeters? How can I use digital and analog clocks to tell time to the nearest half hour?

	measuring length and time.		
Addition and Subtraction	Students will be able to apply strategies for mentally adding and subtracting 10s and 100s.	Students will understand that addition and subtraction equations are part of the foundation of solving problems and more complex computations.	How can I mentally add or subtract 10 or 100 to any 2- or 3-digit number?
Whole Number Operations and Number Stories	Students will be able to collect and display data on different types of graphs. Students will be able record their own invented strategies for addition. Students will be able to solve number stories using multiple strategy models.	Students will understand that they can problem solve by using models to work through their thinking. Students will understand that graphing is another way to understand data.	How can I draw a picture graph using a tally chart? What strategies can I use to add 2 digit and 3 digit numbers? What models can I use to solve addition and subtraction problems?
Whole Number Operations, Measurement, and Data	Students will be able to explore addition and subtraction strategies and use them to add three or more numbers. Students will be able to use units of yards and meters to measure distances.	Students will understand that addition and subtraction equations are part of the foundation of solving problems and more complex computations. Students will understand that measurement can be done with different tools and different units.	What strategies can I use to add and subtract 2 or 3 digit numbers? How can you select appropriate measuring tools and measure the length of an object or distance to the nearest inch, foot, or centimeter?
Geometry and Arrays	Students will be able to explore 2- and 3-dimensional shapes and their attributes. Students will be able to partition rectangles into rows and columns of same-size squares. Students will be able to explore strategies for determining the total number of objects in equal groups and rectangular arrays.	Students will understand that the attributes of shapes provide a foundation for recognizing, analyzing and drawing more complex shapes. Students will understand that addition facts can help solve multiplication problems. Students will understand that arrays are in groups/rows and can be added together to get a sum.	What attributes can I use to identify shapes? What is a real life situation that you would need to use partitioning? When would you use an array or equal groups to solve a problem in life?

Equal Shares and Whole Number Operations	Students will be able to partition shapes into equal shares and apply these ideas to further explore length measurement. Students will be able to use subtraction strategies based on place value.	Students will understand that whole objects can be partitioned into smaller, equal parts. Students will understand that their knowledge of place value can help them solve addition and subtraction problems.	How can I choose a tool to use to partition different shapes? How can place value properties help you solve a subtraction problem?

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Grade 3

Unit Theme	Unit Goal	Enduring Understandings for the Unit	Essential Questions for the Unit
Organization: Tools, Time, and Multiplication	Students will be able to use a variety of math tools to solve addition, subtraction, and multiplication problems. Students will be able to calculate elapsed time.	Students will understand that there are a variety of tools they can use to solve math problems. Students will understand that elapsed time is a skill needed for time management.	What tools can you use to help solve math problems? How do you determine what tool do you think would be best? What do you think the most efficient way to figure out elapsed time is? Why is time important? How can you represent multiplication?
Number Stories	Students will be able to solve one-step and two-step number stories involving addition, subtraction, multiplication, and division. Students will be able to represent their thinking by using various representation models.	Students will understand that real life problems can be solved using math. Students will understand that they can problem solve by using models to work through their thinking.	How do you determine what strategy you will use to solve a number story? How can you represent your mathematical thinking?
Operations: Multiplication and Place Value	Students will be able to use place value to solve addition and subtraction problems. Students will be able to represent multiplication to solve multiplication problems.	Students will understand that their knowledge of place value can help them solve addition and subtraction problems. Students will understand that multiplication is a more efficient way to do repetitive addition.	Why is place value important in completing addition and subtraction problems? How is multiplication represented in our classroom? In the world?
Measurement and Geometry	Students will be able to measure using a ruler. Students will be able to determine area and perimeter of a rectangle	Students will understand that measurement can be done using different tools and are represented by different units. Students will understand that precision is essential when measuring.	How can you make sure you are being precise when using a ruler? What are some real life examples of needing to find area and perimeter?

Fractions and Multiplication Strategies	Students will be able to represent fractions. Students will be able to represent multiplication to solve multiplication problems.	Students will understand that fractions represent a part of a whole. Students will understand that multiplication is a more efficient way to do repetitive addition.	What strategies can you use to compare fractions? How can you represent multiplication?
More Operations	Students will be able to solve multistep number stories. Students will be able to represent their solution in more than one way.	Students will understand that there is often more than one way to solve a problem. Students will understand that real life problems can be solved using math.	How can you compare strategies to see which is more efficient and appropriate? How can you increase your fact automaticity? Why is this important?
Fractions	Students will be able to represent fractions in a variety of ways. Students will be able to measure liquid volumes.	Students will understand that fractions represent a part of a whole. Students will understand that measurement can be done using different tools and are represented by different units.	If you needed to measure volume at home, how would you measure it? When can fractions help you solve a problem in real life?
Multiplication and Division	Students will be able to precisely measure by using units down to ¼. Students will be able to recognize and identify factors. Students will be able to share money equally.	Students will understand that precision is essential when measuring. Students will understand that factors are directly related to the product. Students will understand the value of money.	How does what we measure influence how we measure? Why is it important to know the factors of numbers? Why is it important to learn about sharing money?
Multi-digit Operations	Students will be able to solve multi-digit multiplication problems.	Students will understand that multi-digit multiplication can be broken down into smaller more manageable steps.	How can unknown multiplication facts be found by breaking them into known facts?

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Grade 4

Unit Theme	Unit Goal	Enduring Understandings for the Unit	Essential Questions for the Unit
Place Value and Multi-digit Addition and Subtraction	Students will be able to independently identify place value concepts for multi-digit whole numbers. Students will be able to add and subtract multi-digit whole numbers.	Students will understand that accurately adding and subtracting numbers relies on understanding place value.	How does the position of a digit in a number affect its value? How can place value properties aid computation? What are different models of and models for addition and subtraction? What are efficient methods for finding sums and differences for multi-digit numbers?
Basic Multiplication and Geometry	Students will be able to use various applications for multiplication. Students will be able to classify shapes by properties. Students will be able to develop formulas for finding the area of a rectangle.	Students will understand that multiplication is a more efficient way to do repeated addition. Students will understand that formulas provide an efficient way to find area.	What are different models of/for multiplication? What are efficient methods for finding products?
Fractions and Decimals	Students will be able to compare and represent fractions of same-size whole numbers. Students will be able to compare and represent decimals.	Students will understand that fractions represent parts of a whole. Students will understand that decimals represent parts of a whole.	How can fractions be modeled, compared, and ordered? How are common fractions, decimals, and percents alike and different?
Multi-digit Multiplication	Students will be able to apply basic multiplication principles to complete multi-digit multiplication problems. Students will be able to use multiplication to find area of rectangles.	Students will understand that multi-digit multiplication can be broken down into smaller, more manageable steps. Students will understand that formulas provide an efficient way to find area.	What are efficient methods for finding products? How can unknown multiplication facts be found by breaking them apart into known facts?

Fraction and Mixed-Number Computation and Measurement	Students will be able to add and subtract fractions and mixed numbers. Students will be able to recognize that the degree is the standard unit of measure for angles.	Students will understand that adding and subtracting fractions require a common denominator. Students will understand that measuring angles requires a standard tool.	How can the same fractional amount be named using symbols in different ways? How can fractions be compared and ordered?
Division and Angles	Students will be able to explore the relationship between multiplication and division. Students will be able to use tools to measure and construct angles.	Students will understand that multiplication and division are related facts. Students will understand that measuring and constructing angles requires a standard tool.	What are different models of/for models for division? When would you use division when you are among friends? What are efficient methods for finding quotients? How can unknown division facts be found by thinking about a related multiplication fact?
Multiplication of Fractions by a Whole Number and Measurement	Students will be able to multiply a fraction by a whole number. Students will be able to convert units of measure.	Students will understand that when a fraction is multiplied by a whole number, the product is less than the initial whole number factor. Students will understand that measurement can be done with different tools and different units.	What is the purpose of standard units of measurement? How do units within a system relate to each other? What are the customary and metric units for measuring length, capacity, and weight/mass, and how are they related?
Fraction Operations and Applications	Students will be able to apply knowledge of fractions, number concepts, patterns, and geometry to real-world scenarios.	Students will understand that math can be applied to every area of life.	What is a real life scenario where you would use fractions, number concepts, patterns or geometry? What can happen if you choose the wrong operations to solve real world problems?

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Grade 5

Unit Theme	Unit Goal	Enduring Understandings for the Unit	Essential Questions for the Unit
Operations and Algebraic Thinking	Students will be able to write and interpret numerical expressions. Students will be able to analyze patterns and relationships.	Students will understand that the order of operations affects the value of the answer. Students will understand that patterns can be put together to generate new patterns.	Why is there an order to follow to compute answers? How do operations affect numbers? How do patterns make understanding easier? How does finding patterns help to solve problems?
Number and Operations in Base Ten	Students will be able to understand the place value system. Students will be able to perform operations with multi-digit whole numbers and with decimals to the hundredths.	Students will understand that each place in the place value system is limited to a single digit. Students will understand that the same relationship exists between two adjacent places in the place value system. Students will understand that placement of a number into a place in the place value system has a significant effect on its value. Students will understand that a variety of different strategies can be used to compute multi-digit numbers.	How does the location of a number in the place value system affect the value of the number? How is place value used to round numbers? What is the significance of the decimal point? How are products and quotients related? How do we solve problems with whole numbers and decimals? What types of strategies can be used to compute with multi-digit numbers?
Number and Operations – Fractions	Students will be able to use equivalent fractions as a strategy to add and subtract fractions. Students will be able to apply and extend previous understandings of multiplication and division to multiply and divide fractions.	Students will understand that fractions must have common denominators in order to be added or subtracted. Students will understand that a fraction is division of the numerator by the denominator. ($a/b=a \div b$) Students will understand that when multiplying a whole number by a fraction less than one, the product will be smaller than the whole number. Students will understand that when multiplying a whole number by a fraction greater than one, the product will be larger than whole number.	When do we use addition or subtraction of fractions? What does it mean to divide by a fraction? Why would we need to divide by a fraction?

Measurement and Data	Students will be able to convert like measurement units within a given measurement system. Students will be able to represent and interpret data. Students will be able to understand concepts of volume and relate volume to multiplication and to addition.	Students will understand that measurement units vary in the (U.S.) customary system differently than in the metric system. Students will understand that understanding place value helps one to understand the metric system. Students will understand that data can be represented in a visual format. Students will understand that volume is an attribute of solid figures which involves filling up space. Students will understand that volume is related to the operations of multiplication and addition.	Why would one need to convert measurements from one unit to another? How does measurement help solve problems? How can collecting information be useful in solving problems? What types of data can be graphed on a line plot with a fractional scale? When would we measure volume? What are different ways to find volume of an object?
Geometry	Students will be able to graph points on the coordinate plane. Students will be able to classify two-dimensional figures into categories based on their properties.	Students will understand that the first number in an ordered pair indicates how to travel horizontally along the x-axis and the second number indicates how to travel vertically along the y-axis. Students will understand that attributes belonging to a category of two dimensional figures also belong to all subcategories of that category.	Why would we need to graph on a coordinate plane? How do we classify two dimensional figures? Why would we need to classify a two dimensional figure?

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Grade 6

Unit Theme	Unit Goal	Enduring Understandings for the Unit	Essential Questions for the Unit
Whole Number and Patterns	Students will solve order of operations problems. Students will know the Mental Math Properties. Students will identify patterns and sequences.	Students will understand that the order of operations (PEMDAS), performed accurately will yield the correct answer. Students will understand that the Commutative Property, Associative Property, and Distributive Property can lead to solving a problem mentally. Students will understand that patterns and sequences directly affect the world around them.	How does changing the order of operations affect the outcome when simplifying an expression? How do you express a pattern to show a relationship? How can patterns be used to make predictions?
Introduction to Algebra	Students will translate between tables and expressions. Students will solve one step addition, subtraction, multiplication, division and multi-step algebraic equations. Students will explore perimeter and area using algebraic reasoning.	Students will understand that converting words into expressions will help to solve story problems. Students will understand that showing your work within a one-step algebraic equation directly impacts your ability to solve a multi-step algebraic equation. Students will understand that using algebraic reasoning to solve for the perimeter, area, and missing side of a figure is a lifelong skill.	How do we use algebraic expressions to analyze or solve problems? How is algebraic equation like a balanced scale?
Decimals	Students will represent, compare, and order decimals. Students will solve addition, subtraction, multiplication, and division decimal problems.	Students will understand that representing, comparing, and ordering decimals is a skill needed to be successful in society, especially when dealing with money. Students will understand that there is more than one way to correctly solve decimal problems, but some are more effective and efficient than others.	What does a decimal represent? How can numbers in different forms becompared?

	Students will solve multi-step decimal story problems.		
Number Theory and Fraction Operations	Students will use equivalent fractions to compare and order fractions. Students will use prime factorization and be able to find a greatest common factor. Students will add, subtract, multiply, and divide unlike and like fractions, as well as mixed numbers. Students will solve algebraic fraction equations.	Students will understand that finding a common denominator is needed to compare, order, add, and subtract fractions accurately. Students will understand that there can be more than one common denominator when converting or comparing equivalent fractions. Students will understand that adding, subtracting, multiplying, and dividing fractions and mixed numbers is a skill you must know to solve future problems accurately.	How can the knowledge of divisibility affect finding a greatest common factor or least common multiple? How can adding, subtracting, multiplying and dividing fractions be used to solve real world problems? How can there be more than one way to get to an answer when thinking in terms of equivalent fractions?
Collecting and Displaying Data	Students will identify a statistical question. Students will construct and analyze a bar graph, double bar graph, line graph, and double line graph. Students will create a stem-and-leaf plot, and be able to make sense of it. Students will effectively use mean, median, mode, and range of a given data set.	Students will understand that there are many ways to show visual data, but depending on the data, some graphs, tables, and charts, are better choices than others. Students will understand that being able to analyze and critique different tables, bar, graphs, and line graphs is a daily skill used throughout life. Students will understand that solving for mean, median, mode, and range is a staple in making sense of a set of data.	How can different types of graphs be used to organize/show information and potentially patterns? How can you identify features of a graph that may be misleading? What would be the purpose of a misleading graph?
Proportional Relationships	Students will use ratios and rates, and be able to solve for a unit rate. Students will solve a word problem by	Students will understand that knowing how to solve for a unit rate can directly affect how great or poor of a decision the value of a purchase might be. Students will understand that applying knowledge of percents to solving sales tax, tips,	Why are ratios, rates, and proportions important? How are ratios, proportions, and conversions used in the real world?

	setting up and solving proportions. Students will convert time and temperature. Students will apply percents and solve percent problems.	and discount problems directly affects their money management. Students will understand how to convert time and temperature.	
Measurement (Geometry, Area, Volume)	Students will find the perimeter and area of polygons and circles. Students will find the area of a triangle, trapezoid, and composite figures. Students will find the volume of rectangular and triangular prisms and cylinders. Students will solve for the surface area of rectangular prisms, square pyramids, and cylinders.	Students will understand that finding perimeters, areas, and volumes are most effectively found by use of discovered formulas. Students will understand that it is important to find the volume of rectangular and triangular prisms and cylinders, and effectively know how to solve for them. Students will understand that there is a connection in finding the surface area of a rectangular prism or cylinder would affect how much material would be needed to cover a prism or cylinder. (Ex: Cardboard, wrapping paper, etc.)	How do two-dimensional and three-dimensional figures differ? How are geometric properties used to solve problems in everyday life? What types of problems are solved with measurement?
Integers and Probability	Students will solve for absolute values and integer equations. Students will plot points and show translations on the Coordinate Plane. Students will identify differences between theoretical and experimental probabilities.	Students will understand that absolute value means the distance away from zero on a number line. Students will understand that correctly plotting points on a Coordinate Plane will effectively lead to translations on the Coordinate Plane. Students will understand that the more outcomes a sample has in a given experiment, the closer the theoretical and experimental probability becomes.	How can integers be represented by models and real world situations? How can you recognize integers and their opposites with and without the number line? How can predictions be made based on data?

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Grade 7

Unit Theme	Unit Goal	Enduring Understandings for the Unit	Essential Questions for the Unit
Algebraic Reasoning	Students will simplify numerical expressions using order of operations. Students will translate words into numbers, variables, and operations. Students will simplify algebraic expressions.	Students will understand that simplifying a numerical expression using order of operations (PEMDAS) will result in the correct answer. Students will understand that when simplifying an algebraic expression only like terms can be combined. Students will understand that rewriting an expression in different forms in a problem context can clarify the problem.	How does changing the order of operations (PEMDAS) affect the outcome when simplifying a numerical expression? How do I know which mathematical operation to use when translating words into math? Why are variables used?
Integers and Rational Numbers	Students will compare and order integers and find absolute values. Students will add, subtract, multiply, and divide integers. Students will write fractions as decimals and vice versa.	Students will understand that an absolute value represents distance on a number line, therefore it is always non-negative. Students will understand that addition and subtraction are inverse operations. Students will understand that multiplication and division are inverse operations. Students will understand that integers can be divided, as long as the divisor is not zero.	Why are rational numbers important and useful? How can we tell if two rational numbers are equal?
Applying Rational Numbers	Students will add, subtract, multiply, and divide decimals. Students will add, subtract, multiply, and divide fractions and mixed numbers. Students will solve equations containing decimals or fractions.	Students will understand that rational numbers represent a part out of a whole. Students will understand that common denominators are required when adding and subtracting fraction and mixed numbers. Students will understand that when dividing fractions, multiply by its reciprocal or multiplicative inverse.	How is computation with rational numbers similar and different to whole number computation? How is adding unlike fractions similar and different to adding like fractions? How is multiplying fractions similar and different from adding fractions?
Proportional Relationships	Students will identify proportions and solve using cross products. Students will use ratios to determine if two figures are similar.	Students will understand that figures are similar only if corresponding side lengths are proportional and corresponding angles are congruent. Students will understand that proportions express how quantities change in relationship to each other.	Why do we use cross products to solve proportions? How does using proportions determine if two figures are similar?

	Students will use similar figures to find an unknown measures.		
Graphs and Functions	Students will plot and identify ordered pairs on a coordinate plane. Students will determine the slope of a line and to recognize constant and variable rates of change. Students will identify, write, and graph an equation of direct variation.	Students will understand that equations are fundamental tools for modeling situations. Students will understand that functions are used to describe physical relationships in the real world. Students will understand that ordered pairs show an exact location on a coordinate plane.	How do we represent functions through graphic representations? How is the location of a point on a coordinate plane described?
Percents	Students will write decimals and fractions as percents. Students will solve problems involving percent of change. Students will solve problems involving simple interest.	Students will understand how quantities change in relationship to each other (decimals to percents, fractions to percents …). Students will understand that fractions, decimals, and percents express a relationship between two numbers.	How are common fractions, decimals, and percents alike and different? How do we convert any form of a rational number to at least two other forms?
Geometric Figures	Students will identify and describe geometric figures. Students will identify parallel, perpendicular, and skew lines, and angles formed by a transversal. Students will classify triangles by their side lengths and angle measures. Students will name, identify, and draw types of quadrilaterals.	Students will understand that analyzing geometric relationships develops reasoning skills. Students will understand that points, lines, and planes are the foundation of geometry. Students will understand that objects can be described and compared using their geometric attributes.	How are geometric shapes and objects classified? How are geometric properties used to solve problems in everyday life?
Measurement and 3-D Geometry	Students will find the perimeter of a polygon and the circumference of a circle. Students will find the area of circles. Students will identify various three-dimensional figures.	Students will understand that perimeter and area are distinct concepts that require different units of measure and appropriate labels. Students will understand that three-dimensional figures have surface area and volume that require different units of measure and appropriate labels.	How do you use different types of measurements? What are the connections between perimeter and area and what are their appropriate labels?

	Students will find the surface area and volume of prisms and cylinders.		
Data Analyzing and Probability	Students will find the mean, median, mode, and range of a data set. Students will display and analyze data in box-and-whisker plots. Students will find experimental and theoretical probability. Students will find the probability of independent and dependent events. Students will find the number of possible combinations and permutations.	Students will understand that the way data is collected and displayed influences its interpretation. Students will understand that the expected outcome of an event is a prediction of what might happen in the long run.	Why is data collected, recorded, and analyzed? How do people use data to influence others? How is the probability of an event determined and described?
Multi-Step Equations and Inequalities	Students will solve multi-step equations. Students will solve equations with variables on both sides. Students will solve one-step inequalities by adding, subtracting, multiplying, or dividing. Students will solve multi-step inequalities.	Students will understand that mathematical equations represent relationships. Students will understand that the inequality symbol reverses when multiplying and dividing both sides of an inequality by a negative number.	What strategies can be used to solve for unknowns? How can relationships be expressed symbolically?

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Math Grade 8

Unit Theme	Unit Goal	Enduring Understandings for the Unit	Essential Questions for the Unit
Linear Equations	Use mathematical properties to transform given equations into an equivalent equation Solve linear equations with rational number coefficients Graph proportional relationship Compare two different proportional relationship represented in tables, graphs and equations Write and interpret an equation in slope intercept form; $y = mx$; $y = mx + b$	Rate is a ratio that compares two quantities of different units, a unit rate is a ratio between two measurements in which the second term is one. The relationship between variables can be represented using work descriptions, tables, graphs and equations. Proportional relationships can be represented by lines and linear equations. When slopes are the same, the rise divided by the run is constant. When the ratio of rise to run is the same between two right triangles, their corresponding sides must be proportional. The solution to a linear equation is a point or set of points which will make the equation true. Properties of operations with numbers can be applied to variables.	How does one interpret the number of solutions to linear equations in one variable? Why is there a need to represent relationships between variables in more than one way? When is a relationship between two variables proportional? How does thinking of a unit rate as the slope of a line help to solve problems?
Functions	Compare properties of two functions when they are represented in different ways. Use equations, graphs and tables to categorize functions	A function is a rule that assigns to each input exactly one output. Functions describe situations where one quantity determines another The graph of a function is the set of ordered pairs consisting of an input and the corresponding output	Why does one need to define a function? When should functions be evaluated and compared? How does knowing the algebraic properties of a function help to graph that function?

	as linear or non-linear Write and interpret function equations from multiple representations: algebraically, graphically, numerically in tables and by verbal descriptions. Interpret the rate of change and the y-intercept from the context of the problem.	Functions can be represented in four ways: algebraically, graphically, numerically in tables and by verbal descriptions. Linear functions have a constant rate of change between any two points. Linear functions can be used to model relationships between two quantities The equation represents the relationship between the x-value and the y-value. There are many different functional relationships that are not linear.	What applications could be represented by variables that are not related by a linear function? How are aspects of a function reflected in the different representations? Explain how you determine if a function is linear or non-linear? Why would one use functions to model relationships between quantities? What are the distinguishing characteristics of a graph of a function?
Transformations and Angle Relationships	Model characteristics of figures before and after transformations. Identify shapes that are similar or congruent. Make conjectures about the relationships between various angle measures	Transformations (translations, reflections and rotations) produce images of exactly the same size and shape as the pre-image and are known as rigid transformations. In rigid transformations the measures of the corresponding angles and corresponding line segments remain equal (are congruent) Congruent figures have the same shape and size There are relationships between the interior and exterior angles of a triangle. There are relationships among the angles formed when parallel lines are cut by a transversal. When two angles of one triangle are congruent to two angles of another triangle, the third angles are also congruent. On its own, congruence of corresponding angles determines similarity only for triangles. Similar figures have congruent angles and side that are proportional. Similar figures are produced from dilations. A scale factor greater than one will produce an enlargement in the figure while a scale factor less than one will produce a reduction in size.	Why does one need to perform transformations on figures? How does knowing two figures are congruent or similar help one to solve problems? What are the relationships between the interior and exterior angles of a triangle? What is the effect of dilations, translations, rotations and reflections on two dimensional figures What is the effect of dilations, translations, rotations and reflections on two dimensional figures in the coordinate plane? What are the relationships among the angles formed when parallel lines are cut by a transversal? What is the relationship between the measure of an exterior angle and the other two angles of a triangle? How can you use this relationship to use reasoning to find the measure of missing angles?
Rational, Irrational and the Pythagorean Theorem	Convert a decimal expansion that repeats eventually into a rational number.	All numbers, rational and irrational, have a location on a number line. Rational numbers show that the decimal expansion repeats eventually.	Why does one need to distinguish between rational and irrational numbers?

	Use rational approximations of irrational numbers to locate on a number line, estimate the value and compare the size of irrational numbers. Use models to prove the Pythagorean Theorem. Apply the Pythagorean Theorem in real-world and mathematical problems in two and three dimensions. Flexibility between fractions, decimals, percent and integers	The non-perfect square roots are irrational. Perfect square numbers are the whole numbers each raised to the second power. Perfect cube numbers are the whole number each raised to the third power. Every irrational square root can be estimated by its location between two rational square roots, e.g. $\sqrt{7}$ is between $\sqrt{4}$ and $\sqrt{9}$. The Pythagorean Theorem can be used to find the distance between two points. Theorem's are proved using models.	How does one locate irrational numbers on a number line? How can you determine if a decimal equivalent of a fraction will either terminate or repeat? How can you find the fraction equivalent to a repeating decimal? What is the relationship, if any, between non-perfect square roots and irrational numbers? How can one use the Pythagorean Theorem to solve real-world and mathematical problems? What is the relationship between the sides of a right triangle and its hypotenuse?
Statistics	Examine the relationships between two variables and describe patterns of association. Communicate different patterns of association with scatter plots of bivariate data and explain what the different patterns mean in specific contexts. Model real world linear relationships on a graph. Communicate the meaning of the fit line and its properties in terms of the context of the graph	Linear models can be represented with linear equations. Bivariate data refers to two-variable data, one to be graphed on the x-axis and the other on the y-axis. Lines used to model the association between two quantities will provide more information than just the data points themselves. Straight lines are widely used to model relationships between two quantities variables. Scatterplots show whether or not there is an association between two quantities. The model line gets more accurate as more data points are located on the line	What does the slope of a line say about the relationship in a scatter plot? Why is it important to describe patterns of an association between two quantities? When is a scatterplot used to determine if there is an association between two quantities? When is a two way table used to determine if there is an association between two variables?
Exponents and Scientific Notation	Apply their knowledge of integer exponent properties to generate	Numbers can be expressed in many equivalent forms.	Why does one need to express a number in a form with integer exponents?

	equivalent numerical expressions. Estimate very large or very small quantities, and to express how many times as much one is than the other. Perform operations with numbers expressed in scientific notation.	Very large or very small quantities can be estimated using numbers expressed in scientific notation. There are properties of integer exponents that help generate equivalent numerical expressions. Operations can be performed with numbers expressed in scientific notation.	Can exponents be negative, and if so, what does that mean? Can we have a zero exponent, if so, what does that mean? What are the properties/operations involving exponents Why does one need to write numbers in scientific notation? What is the advantage of performing operations on numbers expressed in scientific notation rather than numbers in standard form?
Geometric Formulas	Use models to explain the Pythagorean Theorem. Apply the Pythagorean Theorem to various situations in two and three dimensions. Derive volume formulas for a cylinder, cone and sphere from previous known volume formulas.	The Pythagorean Theorem can be used to find the distance between two points. The sum of the squares of the legs is equal to the square of the hypotenuse in a right triangle. Given three side lengths with this relationship forms a right triangle. There are relationships between the following formulas, when objects have the same height: cylinder to right rectangular prism, cylinder to cone, and sphere to cylinder Volume is a unit of measurement that indicates the number of cubic units a three-dimensional shape can hold.	How can one use the Pythagorean Theorem to solve real-world and mathematical problems? What is the relationship between the sides of a right triangle and its hypotenuse? What is the relationship, if any, between volume of cones, cylinders, and spheres? How can one use volume to solve real-world and mathematical problems? Why does a specific formula work? How does the formula relate to the measure and figure?
Systems of Equations	Solve linear systems of equations graphically, algebraically and by inspection depending on the problem presented. Describe the meaning of solution to a system of equations. Determine the most efficient way to solve a system based on the properties of given situation	Properties of operations with numbers can be applied to variables. Solutions to a system of two linear equations are points that will make both equations true. Solutions to a system of two linear equations correspond to points of intersection of their graphs. Equations need to be examined for similarities and differences to facilitate finding solutions.	What is a system of linear equations? What applications require solving simultaneous linear equations? How does mathematical properties help solve linear systems of equations? How can you apply a system of linear equations to real-world situations? What methods can be used to solve systems of linear equations? How would you describe the solution of a system of linear equations? How do you know how many solutions a systems will have?

			How do you determine the best method to solve a system of linear equations?

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Algebra 1

Unit Theme	Unit Goals	Enduring Understandings for the Unit	Essential Questions for the Unit
Expressions, Equations, and Functions	Students will be able to: 1. Mathematically model a real-world scenario with an unknown value 2. Determine whether or not a relation is a function	Students will understand that: 1. Variables can be used to represent an unknown quantity or quantities 2. Functions have independent and dependent variables, where the dependent variable is caused by the independent variable	1. How are variables applicable to various life situations? 2. How can equations be used to model real world scenarios?
Linear Relationships	Students will be able to: 1. Solving Linear Relations 2. Graph Linear Relations 3. Model and interpret using linear relationships	Students will understand that: 1. The graph of a linear equation is a line 2. You can solve for a variable using multiple methods following the rules of operations 3. Linear relationships can be represented with tables, equations, graphs, and scenarios 4. Relationships with a constant rate of change can be modeled linearly and can be used to make predictions	1. What are some examples and non-examples of linear relationships from real life? Justify your answer. 2. Is it necessary to follow algebraic rules when solving equations? Explain why or why not? 3. Are there multiple ways of solving algebraic equations?
Linear Systems	Students will be able to: 1. Solve linear systems graphically 2. Solve linear systems algebraically 3. Model scenarios using systems and interpret solution(s)	Students will understand that: 1. The solution to a system is the point(s) of intersection 2. Algebraically the solution(s) is the value(s) that make the relations true 3. Systems can be used to compare linear relationships	1. Create a scenario that can be solved using systems of linear relations. 2. When would each method be the most efficient for solving systems of equations and why?
Quadratics/Radicals	Students will be able to: 1. Determine the roots and vertex of a quadratic function algebraically/graphically 2. Model scenarios of quadratic relationships to interpret the roots and vertex 3. Perform operations with and solve equations with radicals	Students will understand that: 1. The graphs of quadratics are parabolas 2. The factored form of a quadratic can be used to find where curve crosses the x-axis 3. Quadratics can be used to model projectile motion 4. A Radical undoes a square	1. What are the most important points on a parabola and why? 2. How can you tell if data is linear, quadratic, or something else? 3. When would each method be the most efficient for solving quadratics and why?

Exponential Functions and Properties of Exponents	Students will be able to: 1. Graph exponentials 2. Model growth/decay using exponential functions 3. Apply exponent properties to simplify monomial expressions	Students will understand that: 1. The shape of an exponential function is unique 2. Exponentiation is just repeated multiplication 3. You can expand exponential expressions to derive the properties	1. What are some examples and non-examples of exponential relationships from real life? Justify your answer. 2. How can you tell if data is linear, quadratic, or exponential?
Rational Functions	Students will be able to: 1. Add/subtract/ multiply/divide rational functions 2. Solve Rational Equations	Students will understand that: 1. Algebraic operations with fractions are the same as numeric operations with fractions (You need a common denominator when adding/subtracting, but not when multiplying/dividing) 2. Algebraic manipulation is required to simplify and solve rationals	1. Why is it useful to rewrite an expression in equivalent forms?

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Geometry

Unit Theme	Unit Goals	Enduring Understandings for the Unit	Essential Questions for the Unit
Vocabulary and Notation	Students will be able to: 1. Identify and notate geometric objects used throughout the course 2. Identify, create definitions for, and sketch objects with special characteristics 3. Create definitions for parts of geometric objects	Students will understand that: 1. Vertical angles are formed by intersecting lines that share a common vertex, but not a common side 2. A linear pair of angles are two angles who share a common vertex and side and whose noncommon sides form a line 3. We can't assume things that aren't marked on a Geometric diagram	What is the process of writing a good definition in geometry and how is it possible to test a definition?
Reasoning in Geometry	Students will be able to: 1. Use inductive reasoning to find the next term in a number or picture pattern 2. Generalize basic number patterns to find the nth term in a number sequence 3. Write explicit rules for finding terms in sequences involving triangular and rectangular numbers 4. Apply mathematic models to problem solve 5. Apply the vertical angle conjecture, linear pair conjecture, and parallel line conjectures to find missing angle measures	Students will understand that: 1. Vertical angles are congruent 2. Linear pairs of angles sum to 180 degrees 3. You can write an explicit rule for a linear number sequence if you know the starting value and common difference	How is inductive reasoning different from deductive reasoning? Provide an example of each. What is an example of a mathematical model?

Tools of Geometry	Students will be able to: 1. Use a compass/straightedge or dynamic software to perform basic geometric constructions 2. Construct and apply points of concurrency to solve real world situations 3. Apply constructions to solve real world problems	Students will understand that: 1. Geometric sketches are freehand and require markings to show important information (i.e. congruent, parallel, and perpendicular segments) 2. Constructions are done using only a straightedge and compass/patty paper, with no measurement	Describe a way that our basic constructions can be used to create a square? Explain the process of creating a logo using constructions.
Discovering and Proving Triangle Properties	Students will be able to: 1. Inductively and/or deductively prove conjectures involving triangles 2. Deductively prove that triangles are congruent 3. Deductively prove that parts of triangles are congruent	Students will understand: 1. The sum of the interior angles of any triangle is 180 degree 2. There are shortcuts to prove that two triangles are congruent, (we do not need all 6 pieces of information) 3. what it means to deductively prove a conjecture	Provide examples of why AAA and SSA are not valid for proving triangles congruent. How is inductive reasoning different from deductive reasoning? Provide an example of each.
Discovering and Proving Polygon Properties	Students will be able to: 1. Inductively and/or deductively prove the sum of the interior angles of any polygon and the sum of the exterior angles of any polygon 2. Inductively and/or deductively prove and apply properties of special quadrilaterals 3. Inductively and/or deductively prove the properties of midsegments of triangles and trapezoids	Students will understand that: 1. Polygons can be broken up into triangles to calculate the sum of the interior angles 2. The special quadrilaterals can be arranged in a Venn Diagram to help understand their properties	Why is it important to deductively prove properties rather than just inductively proving them? What are the defining characteristics of all the special quadrilaterals?
Discovering and Proving Circle Properties	Students will be able to: 1. Inductively and/or deductively prove and apply properties involving tangents, chords, and arcs of a circle 2. Calculate the circumference/arc length of a circle	Students will understand that: 1. A circle is the set of all points equidistant from a given point 2. Pi is the ratio of the circumference to the diameter for any circle	Does 3.141 work as an approximation for pi? When would it be useful to use arc measure versus arc length?

Transformations	Students will be able to: 1. Perform translations, reflections, and dilations using patty paper or dynamic software 2. Describe the properties of reflections, translations, and dilations 3. Describe the transformations necessary to transform a pre-image onto its image	Students will understand that: 1. Congruent polygons have congruent corresponding angles/sides 2. Two congruent figures can be mapped onto one another using translations, reflections, and rotations, (rigid transformations) 3. Two similar figures can be mapped onto one another using rigid transformations and dilations, (a non-rigid transformations)	How can transformations help us prove that figures are congruent or similar?
Area/Volume	Students will be able to: 1. Calculate the area of a figures on a grid, rectangles, parallelograms, triangles, trapezoids, kites, circles and regular polygons 2. Calculate the surface area of 3-d objects 3. Calculate the volume of prisms, cylinders, pyramids, cones, and spheres 4. Apply area and volume to solve real world problems	Students will understand: 1. Area is the size of a 2 dimensional surface 2. Figures can be broken down into rectangles or triangles to calculate the area 3. The relationship between volume and area	How can we derive the area formulas for parallelograms, trapezoids, triangles, kites, and circles? How can physical models help us derive the formulas for the volumes of prisms, cylinders, pyramids, cones, and spheres?
Pythagorean Theorem, Similarity, and Right Triangle Trigonometry	Students will be able to: 1. Apply the Pythagorean theorem or special right triangles to solve for missing sides 2. Use similarity to find missing side lengths 3. Use similarity shortcuts to prove two triangles are similar 4. Use basic right triangle trigonometry to solve for missing sides or angles	Students will understand that: 1. The Pythagorean theorem allows us to find a missing side length on a right triangle when we know any two sides. 2. Trigonometric values are the ratios of side lengths.	It is often said that similar figures have “the same shape, but different size.” What is meant by “the same shape”? How does right triangle trigonometry relate to similar triangles?

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Advanced Geometry

Unit Theme	Unit Goals	Enduring Understandings for the Unit	Essential Questions for the Unit
Vocabulary and Notation	Students will be able to: 1. Identify and notate geometric objects used throughout the course 2. Identify, create definitions for, and sketch objects with special characteristics 3. Create definitions for parts of geometric objects	Students will understand that: 1. Vertical angles are formed by intersecting lines that share a common vertex, but not a common side 2. A linear pair of angles are two angles who share a common vertex and side and whose noncommon sides form a line 3. We can't assume things that aren't marked on a Geometric diagram	What is the process of writing a good definition in geometry and how is it possible to test a definition?
Reasoning in Geometry	Students will be able to: 1. Use inductive reasoning to find the next term in a number or picture pattern 2. Generalize basic number patterns to find the nth term in a number sequence 3. Write explicit rules for finding terms in sequences involving triangular and rectangular numbers 4. Apply mathematic models to problem solve 5. Apply the vertical angle conjecture, linear pair conjecture, and parallel line conjectures to find missing angle measures	Students will understand that: 1. Vertical angles are congruent 2. Linear pairs of angles sum to 180 degrees 3. You can write an explicit rule for a linear number sequence if you know the starting value and common difference	How is inductive reasoning different from deductive reasoning? Provide an example of each. What is an example of a mathematical model?

Tools of Geometry	Students will be able to: 1. Use a compass/straightedge or dynamic software to perform basic geometric constructions 2. Construct and apply points of concurrency to solve real world situations 3. Apply constructions to solve real world problems	Students will understand that: 1. Geometric sketches are freehand and require markings to show important information (i.e. congruent, parallel, and perpendicular segments) 2. Constructions are done using only a straightedge and compass/patty paper, with no measurement	Describe a way that our basic constructions can be used to create a square? Explain the process of creating a logo using constructions.
Discovering and Proving Triangle Properties	Students will be able to: 1. Inductively and deductively prove conjectures involving triangles 2. Deductively prove that triangles are congruent 3. Deductively prove that parts of triangles are congruent	Students will understand: 1. The sum of the interior angles of any triangle is 180 degree 2. There are shortcuts to prove that two triangles are congruent, (we do not need all 6 pieces of information) 3. what it means to deductively prove a conjecture	Provide examples of why AAA and SSA are not valid for proving triangles congruent. How is inductive reasoning different from deductive reasoning? Provide an example of each.
Discovering and Proving Polygon Properties	Students will be able to: 1. Inductively and deductively prove the sum of the interior angles of any polygon and the sum of the exterior angles of any polygon 2. Inductively and deductively prove and apply properties of special quadrilaterals 3. Inductively and deductively prove the properties of midsegments of triangles and trapezoids	Students will understand that: 1. Polygons can be broken up into triangles to calculate the sum of the interior angles 2. The special quadrilaterals can be arranged in a Venn Diagram to help understand their properties	Why is it important to deductively prove properties rather than just inductively proving them? What are the defining characteristics of all the special quadrilaterals?
Discovering and Proving Circle Properties	Students will be able to: 1. Inductively and deductively prove and apply properties involving tangents, chords, and arcs of a circle 2. Calculate the circumference/arc length of a circle	Students will understand that: 1. A circle is the set of all points equidistant from a given point 2. Pi is the ratio of the circumference to the diameter for any circle	Does 3.141 work as an approximation for pi? When would it be useful to use arc measure versus arc length?

Transformations	Students will be able to: 1. Perform translations, reflections, and dilations using patty paper or dynamic software 2. Describe the properties of reflections, translations, and dilations 3. Describe the transformations necessary to transform a pre-image onto its image	Students will understand that: 1. Congruent polygons have congruent corresponding angles/sides 2. Two congruent figures can be mapped onto one another using translations, reflections, and rotations, (rigid transformations) 3. Two similar figures can be mapped onto one another using rigid transformations and dilations, (a non-rigid transformations)	How can transformations help us prove that figures are congruent or similar?
Area/Volume	Students will be able to: 1. Calculate the area of a figures on a grid, rectangles, parallelograms, triangles, trapezoids, kites, circles and regular polygons 2. Calculate the surface area of 3-d objects 3. Calculate the volume of prisms, cylinders, pyramids, cones, and spheres 4. Apply area and volume to solve real world problems	Students will understand: 1. Area is the size of a 2 dimensional surface 2. Figures can be broken down into rectangles or triangles to calculate the area 3. The relationship between volume and area	How can we derive the area formulas for parallelograms, trapezoids, triangles, kites, and circles? How can physical models help us derive the formulas for the volumes of prisms, cylinders, pyramids, cones, and spheres?
Pythagorean Theorem, Similarity, and Right Triangle Trigonometry	Students will be able to: 1. Apply the Pythagorean theorem or special right triangles to solve for missing sides 2. Use similarity to find missing side lengths 3. Use similarity shortcuts to prove two triangles are similar 4. Use basic right triangle trigonometry to solve for missing sides or angles 5. Apply right triangle trigonometry to solve real world problems	Students will understand that: 1. The Pythagorean theorem allows us to find a missing side length on a right triangle when we know any two sides. 2. Trigonometric values are the ratios of side lengths. 3. We can use trigonometry for indirect measurement	It is often said that similar figures have "the same shape, but different size." What is meant by "the same shape"? How does right triangle trigonometry relate to similar triangles?

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Algebra 2

Unit Theme	Unit Goals	Enduring Understandings for the Unit	Essential Questions for the Unit
Expressions, Equations, and Functions	Students will be able to: 1. Mathematically model a real-world scenario with an unknown value 2. Determine whether or not a relation is a function 3. Solve and graph solution(s) for absolute value relationships	Students will understand that: 1. Variables can be used to represent an unknown quantity or quantities 2. Functions have independent and dependent variables, where the dependent variable is caused by the independent variable 3. Absolute value relations represent the distance from zero	1. How are variables applicable to various life situations? 2. How can equations be used to model real world scenarios? 3. What types of measurements in your life involve magnitude rather than having negative values?
Linear Relationships	Students will be able to: 1. Solve, graph, and model Linear Relations 2. Create an equation for a line in slope-intercept, point-slope, standard, and vertex form 3. Describe transformations of lines	Students will understand that: 1. Linear relationships can be represented with tables, equations, graphs, and scenarios 2. The same linear equation can be written algebraically in many different ways. 3. If a scatterplot of real data looks roughly linear, you can find a line that fine the date and use it to make predictions about the relationship	1. What are some examples and non-examples of linear relationships from real life? Justify your answer. 2. What is the best way to write a linear equation? What advantages are there for each form? 3. What patterns can you identify between the equations and graphs of linear relationships?
Linear Systems	Students will be able to: 1. Solve linear systems graphically and algebraically 2. Model scenarios using systems and interpret the solution(s) 3. Create and apply a system of multiple linear equations to represent real-world constraints in a scenario	Students will understand that: 1. Algebraically the solution(s) is the value(s) that make the relations true 2. Systems can be used to compare linear relationships 3. Many real-world constraints on businesses can be modeled mathematically and then used to maximize a businesses' profit.	1. Create a scenario that can be solved using systems of linear relations. 2. What method is most efficient for solving systems of equations and why? 3. How can linear optimization be used to help a business determine how much of a product to make?
Quadratics	Students will be able to: 1. Determine the domain, range, complex roots, & vertex of a quadratic function algebraically/graphically 2. Model and interpret scenarios of quadratic relationships 3. Rewrite the equation of a quadratic in standard, vertex, & factored forms	Students will understand that: 1. The same quadratic equation can be written algebraically in many different ways. 2. Quadratics can be used to model real world scenarios 3. All quadratic functions can be understood through using transformations	1. How can you tell if data is linear, quadratic, or something else? 2. What is the most efficient method for solving quadratics and why? 3. Why is it useful to be able to write a quadratic relationship in multiple algebraic ways?

Exponential Functions	Students will be able to: 1. Model and graph growth/decay using exponential functions to solve real world problems 2. Apply exponent properties to simplify monomial expressions 3. Determine the domain and range of an exponential function	Students will understand that: 1. You can expand exponential expressions to derive the properties 2. Real-world interest scenarios such as loans and bank accounts can be modeled with exponentials	1. How can you tell if data is linear, quadratic, or exponential? 2. How do exponential functions impact financial planning? 3. Which method is best for solving for an unknown exponent and why?
Rational Functions	Students will be able to: 1. Add/subtract/ multiply/divide rational functions 2. Solve Rational Equations 3. Graph Rational relationships, identifying important characteristics such as domain, range, asymptotes, holes, and x/y intercepts	Students will understand that: 1. Algebraic operations with fractions are the same as numeric operations with fractions 2. Algebraic manipulation is required to simplify and solve rational equations 3. The graph of a rational function often involves multiple curves that have asymptotes and can be interpreted through transformations	1. Why is it useful to rewrite an expression in equivalent forms? 2. How can the individual graphs of the numerator and denominator of a rational function help you to make sense of the rational function's graph as a whole? 3. Why are the asymptotes important to fully understand a rational function?
Radicals and Inverses	Students will be able to: 1. Perform operations with and solve equations with radicals and rational exponents 2. Graph and determine the domain and range of a radical function under transformations 3. Derive the inverse of a function involving basic operations 4. Compose multiple functions together	Students will understand that: 1. Basic radical functions can be thought of through transformations 2. Rational exponents represent both a power and a root simultaneously 3. An inverse function is a function that does the opposite operations in the opposite order	1. How is solving an equation for a variable related to the equation's inverse? 2. Why rewrite a power and root together as a rational exponent?
Polynomials	Students will be able to: 1. Perform basic operations with polynomial functions, including polynomial division 2. Graph and identify extrema, end behavior, domain and range of polynomials; derive all of the zeroes of a polynomial 3. Sketch a graph of a polynomial if given in factored form and visa-versa	Students will understand that: 1. Polynomials are relations involving variables raised to whole number exponents. 2. Basic characteristics of a polynomial can be determined from the equation, particularly if in factored form. 3. Every polynomial has as many roots as its degree.	1. Why invent imaginary numbers? 2. How does polynomial division related to polynomial multiplication both conceptually and algebraically? 3. How can polynomials help us to model more complicated real world relationships?

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Advanced Algebra and Trigonometry

Unit Theme	Unit Goals	Enduring Understandings for the Unit	Essential Questions for the Unit
Expressions, Equations, and Functions	Students will be able to: 1. Mathematically model a real-world scenario with an unknown value 2. Determine whether or not a relation is a function 3. Solve and graph solution(s) for absolute value relationships	Students will understand that: 1. Variables can be used to represent an unknown quantity or quantities 2. Functions have independent and dependent variables, where the dependent variable is caused by the independent variable 3. Absolute value relations represent the distance from zero	1. How are variables applicable to various life situations? 2. How can equations be used to model real world scenarios? 3. What types of measurements in your life involve magnitude rather than having negative values?
Linear Relationships	Students will be able to: 1. Solve, graph, and model Linear Relations 2. Create an equation for a line in slope-intercept, point-slope, standard, and vertex form 3. Describe transformations of lines	Students will understand that: 1. Linear relationships can be represented with tables, equations, graphs, and scenarios 2. The same linear equation can be written algebraically in many different ways. 3. If a scatterplot of real data looks roughly linear, you can find a line that fine the date and use it to make predictions about the relationship	1. What are some examples and non-examples of linear relationships from real life? Justify your answer. 2. What is the best way to write a linear equation? What advantages are there for each form? 3. What patterns can you identify between the equations and graphs of linear relationships?
Linear Systems	Students will be able to: 1. Solve linear systems graphically and algebraically 2. Model scenarios using systems and interpret the solution(s) 3. Create and apply a system of multiple linear equations to represent real-world constraints in a scenario	Students will understand that: 1. Algebraically the solution(s) is the value(s) that make the relations true 2. Systems can be used to compare linear relationships 3. Many real-world constraints on businesses can be modeled mathematically and then used to maximize a businesses' profit.	1. Create a scenario that can be solved using systems of linear relations. 2. What method is most efficient for solving systems of equations and why? 3. How can linear optimization be used to help a business determine how much of a product to make?
Quadratics	Students will be able to: 1. Determine the domain, range, complex roots, & vertex of a quadratic function algebraically/graphically 2. Model and interpret scenarios of quadratic relationships 3. Rewrite the equation of a quadratic in standard, vertex, & factored forms	Students will understand that: 1. The same quadratic equation can be written algebraically in many different ways. 2. Quadratics can be used to model real world scenarios 3. All quadratic functions can be understood through using transformations	1. How can you tell if data is linear, quadratic, or something else? 2. What is the most efficient method for solving quadratics and why? 3. Why is it useful to be able to write a quadratic relationship in multiple algebraic ways?

Exponential Functions and Logarithms	Students will be able to: 1. Model and graph growth/decay using exponential functions to solve real world problems 2. Apply exponent properties to simplify monomial expressions 3. Solve exponential equations for the variable by using logarithms and their properties 4. Determine the domain and range of an exponential function	Students will understand that: 1. You can expand exponential expressions to derive the properties 2. Real-world interest scenarios such as loans and bank accounts can be modeled with exponentials 3. Logarithms are the inverse of exponential functions	1. How can you tell if data is linear, quadratic, or exponential? 2. How do logarithmic and exponential functions impact financial planning? 3. Which method is best for solving for an unknown exponent and why?
Rational Functions	Students will be able to: 1. Add/subtract/ multiply/divide rational functions 2. Solve Rational Equations 3. Graph Rational relationships, identifying important characteristics such as domain, range, asymptotes, holes, and x/y intercepts	Students will understand that: 1. Algebraic operations with fractions are the same as numeric operations with fractions 2. Algebraic manipulation is required to simplify and solve rational equations 3. The graph of a rational function often involves multiple curves that have asymptotes and can be interpreted through transformations	1. Why is it useful to rewrite an expression in equivalent forms? 2. How can the individual graphs of the numerator and denominator of a rational function help you to make sense of the rational function's graph as a whole? 3. Why are the asymptotes important to fully understand a rational function?
Radicals and Inverses	Students will be able to: 1. Perform operations with and solve equations with radicals and rational exponents 2. Graph and determine the domain and range of a radical function under transformations 3. Derive the inverse of a function involving basic operations 4. Compose multiple functions together	Students will understand that: 1. Basic radical functions can be thought of through transformations 2. Rational exponents represent both a power and a root simultaneously 3. An inverse function is a function that does the opposite operations in the opposite order	1. How is solving an equation for a variable related to the equation's inverse? 2. Why rewrite a power and root together as a rational exponent?
Polynomials	Students will be able to: 1. Perform basic operations with polynomial functions, including polynomial division 2. Graph and identify extrema, end behavior, domain and range of polynomials; derive all of the zeroes of a polynomial 3. Sketch a graph of a polynomial if given in factored form and visa-versa	Students will understand that: 1. Polynomials are relations involving variables raised to whole number exponents. 2. Basic characteristics of a polynomial can be determined from the equation, particularly if in factored form. 3. Every polynomial has as many roots as its degree.	1. Why invent imaginary numbers? 2. How does polynomial division related to polynomial multiplication both conceptually and algebraically? 3. How can polynomials help us to model more complicated real world relationships?

Conic Sections	Students will be able to: 1. Identify the standard form for each type of conic section. 2. Graph each type of conic section 3. Given a graph, write the equation of any conic section	Students will understand that: 1. All conic sections relate to various ways of intersecting a plane with a double right circular cone. 2. All conic sections can be defined as relationships between foci points and lines.	1. Can a “parabola” be sideways? Does this fit the definition of a parabola? 2. What is the inverse of a parabola? Can it be described using functions? 3. What commonalities can you find between the equations of parabolas, circles, ellipses, and hyperbolas?
Trigonometric Functions	Students will be able to: 1. Convert between degree and radian angle measurements 2. Extend the definition of trigonometric relationships to any possible angle 3. Graph the relationships between angles and trigonometric ratios under transformations; determine the domain/range	Students will understand that: 1. Radian angle measurement is based upon the idea of an arc length compared to that circle’s radius 2. Trigonometry can be extended to all angles, not just angles inside right triangles 3. The graphs of trigonometric functions can be transformed	1. How can a unit circle on an x-y plane help us understand how the “rules” allow trigonometry to extend to ALL angles? 2. What is the relationship between the unit circle and the graphs of sine and cosine? 3. Explain how right triangle trigonometry relates to sound and light waves?
Trigonometric Identities	Students will be able to: 1. Use the laws of sines and cosines to find missing sides and angles of any type of triangle 2. Verify trigonometric identities and solve trigonometric equations	Students will understand that: 1. The laws of Sines and Cosines are derived from creating right triangles within non-right triangles 2. Trigonometric expressions/equations can be manipulated/solved algebraically	1. What is the value of having multiple representations of trigonometric functions? 2. How can you use right triangle trigonometry to prove the Law of Sines and Law of Cosines?

Lake Mills School District

Year at a Glance Scope and Sequence for Math

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Integrated College Math

Unit Theme	Unit Goals	Enduring Understandings for the Unit	Essential Questions for the Unit
Sequences	Students will be able to: 1. Write recursive formulas that generate arithmetic/geometric sequences; apply them to model real world scenarios 2. Identify graphs of sequences as arithmetic, geometric, or shifted geometric 3. For shifted geometric sequences, calculate the long run value and model loans/ investments	Students will understand that: 1. An arithmetic formula can be written when you know the starting value and have a common difference 2. A geometric formula can be written when you know the starting value and have a common ratio 3. The graphs of arithmetic sequences are linear while the graphs of geometric sequences are curves	1. How can you use a recursive formula to determine how much money needs to be paid each month to pay off a given loan in a given amount of time?
Linear Relationships	Students will be able to: 1. Solve, graph, and model Linear Relations 2. Create an equation for a line in slope-intercept, point-slope, standard, and vertex form 3. Describe transformations of lines	Students will understand that: 1. Linear relationships can be represented with tables, equations, graphs, and scenarios 2. The same linear equation can be written algebraically in many different ways. 3. If a scatterplot of real data looks roughly linear, you can find a line that fine the date and use it to make predictions about the relationship	1. What are some examples and non-examples of linear relationships from real life? Justify your answer. 2. What is the best way to write a linear equation? What advantages are there for each form? 3. What patterns can you identify between the equations and graphs of linear relationships?
Linear Systems	Students will be able to: 1. Solve linear systems graphically and algebraically 2. Model scenarios using systems and interpret the solution(s) 3. Create and apply a system of multiple linear equations to represent real-world constraints in a scenario	Students will understand that: 1. Algebraically the solution(s) is the value(s) that make the relations true 2. Systems can be used to compare linear relationships 3. Many real-world constraints on businesses can be modeled mathematically and then used to maximize a businesses' profit.	1. Create a scenario that can be solved using systems of linear relations. 2. What method is most efficient for solving systems of equations and why? 3. How can linear optimization be used to help a business determine how much of a product to make?

Functions, Relations, and Transformations	Students will be able to: 1. Interpret graphs of functions/relations and evaluate expressions using function notation 2. Graph quadratic, square roots, absolute value, semicircles, under transformations; write equations given the graphs 3. Use functions, (quadratic, square root, absolute value, semicircles,) to model real world phenomena	Students will understand: 1. the different shapes of the graphs of quadratics, absolute values, square root, and semicircle functions 2. All functions behave the same under transformations	1. When modeling data, how do we know what parent function to use? 2. How do we fit an equation to data when modeling?
Quadratics	Students will be able to: 1. Determine the domain, range, complex roots, & vertex of a quadratic function algebraically/graphically 2. Model and interpret scenarios of quadratic relationships 3. Rewrite the equation of a quadratic in standard, vertex, & factored forms	Students will understand that: 1. The same quadratic equation can be written algebraically in many different ways. 2. Quadratics can be used to model real world scenarios 3. All quadratic functions can be understood through using transformations	1. How can you tell if data is linear, quadratic, or something else? 2. What is the most efficient method for solving quadratics and why? 3. Why is it useful to be able to write a quadratic relationship in multiple algebraic ways?
Exponential Functions and Logarithms	Students will be able to: 1. Model and graph growth/decay using exponential functions to solve real world problems 2. Apply exponent properties to simplify monomial expressions 3. Solve exponential equations for the variable by using logarithms and their properties 4. Determine the domain and range of an exponential function	Students will understand that: 1. You can expand exponential expressions to derive the properties 2. Real-world interest scenarios such as loans and bank accounts can be modeled with exponentials 3. Logarithms are the inverse of exponential functions	1. How can you tell if data is linear, quadratic, or exponential? 2. How do logarithmic and exponential functions impact financial planning? 3. Which method is best for solving for an unknown exponent and why?
Trigonometric Functions	Students will be able to: 1. Convert between degree and radian angle measurements 2. Extend the definition of trigonometric relationships to any possible angle 3. Use the laws of Sines and Cosines to find missing sides and angles of any type of triangle	Students will understand that: 1. Radian angle measurement is based upon the idea of an arc length compared to that circle's radius 2. Trigonometry can be extended to all angles, not just angles inside right triangles 3. The values on the unit circle can be found using special right triangles	1. How can a unit circle on an x-y plane help us understand how the "rules" allow trigonometry to extend to ALL angles? 2. What is the relationship between the unit circle and the graphs of sine and cosine?

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Pre-Calculus

Unit Theme	Unit Goals	Enduring Understandings for the Unit	Essential Questions for the Unit
Properties of Functions	Students will be able to: 1. Analyze graphs of functions and relations. 2. Describe end behavior using limit notation. 3. Perform operations on functions and their inverses.	Students will understand: 1. How to analyze and describe the graph of a function. 2. The relationship between limits and continuity.	1. What information does the graph communicate about the equation of a function? 2. What information does the equation communicate about the graph of a function?
Polynomial and Rational Functions	Students will be able to: 1. Graph and identify extrema, end behavior, domain and range of polynomials/rationals; derive all of the zeroes of a polynomial/rational function 2. Sketch a graph of a polynomial if given in factored form and visa-versa 3. Solve Rational Equations	Students will understand that: 1. Basic characteristics of a polynomial or rational function can be determined from the equation or the graph. 2. Every polynomial has as many roots as its degree. 3. The graph of a rational function often involves multiple curves that have asymptotes and can be interpreted through transformations	1. How can polynomials help us to model more complicated real world relationships? 2. How can the individual graphs of the numerator and denominator of a rational function help you to make sense of the rational function's graph as a whole? 3. Why are the asymptotes important to fully understand a rational function?
Exponential Functions and Logarithms	Students will be able to: 1. Model and graph real data using exponential functions to solve real world problems 2. Solve exponential equations for the variable by using logarithms/natural logarithms and their properties 3. Determine the domain and range of an exponential function	Students will understand: 1. Real-world interest scenarios can be modeled with exponentials and logarithmic functions. 2. Logarithms are the inverse of exponential functions 3. The relationship between "e" and the natural logarithm	1. Why is log base "e" commonly called a "natural" logarithm. 2. How do logarithmic and exponential functions impact financial planning? 3. Which method is best for solving for an unknown exponent and why?

Trigonometric Functions	Students will be able to: 1. Graph the relationships between angles and all trigonometric ratios and inverses under transformations; determine the domain/range 2. Use the laws of sines and cosines to find missing sides and angles of any type of triangle 3. Model using trigonometric ratios	Students will understand that: 1. The graphs of trigonometric functions can be transformed 2. The laws of Sines and Cosines are derived from creating right triangles within non-right triangles	1. What is the relationship between the unit circle and the graphs of sine and cosine? 2. Explain how right triangle trigonometry relates to sound and light waves? 3. How do you come up with an equation to model periodic data?
Trigonometric Identities and Equations	Students will be able to: 1. Simplify trigonometric expressions 2. Verify trigonometric identities 3. Solve trigonometric equations for angles over a given a domain	Students will understand that: 1. Trigonometric expressions/equations can be manipulated/solved algebraically 2. Every trigonometric function can be expressed in multiple ways	1. What is the value of having multiple representations of trigonometric functions? 2. How can you use right triangle trigonometry to prove the Law of Sines and Law of Cosines?
Systems of Equations and Matrices	Students will be able to: 1. Solve and model linear systems graphically, algebraically, and matrices; be able to interpret the solution(s) 2. Perform matrix operations, calculate inverse matrices by hand and using technology 3. Perform partial fraction decompositions for rational expressions	Students will understand that: 1. Linear systems can be represented and solved using a variety of techniques 2. Matrices are an efficient way of solving complicated real world systems	1. What method is most efficient for solving systems of equations and why? 2. Are matrices necessary today?
Conic Sections	Students will be able to: 1. Redefine conic sections based upon a defined locus set 2. Given the graph of a conic, write the equation, and vice versa 3. Use parametric equations to model two variables as function of time	Students will understand: 1. All conic sections can be defines as relationships between foci points and lines. 2. Parametric equations can be used to graph the horizontal and vertical position of a projectile 3. How to algebraically express each conic section in multiple ways	1. Can a parabola ever be sideways? Is it still then a parabola? 2. What commonalities can you find between the equations of parabolas, circles, ellipses, and hyperbolas? 3. How does a parametric equation model a projectile differently from a quadratic equation?

Vectors	Students will be able to: 1. Perform operations with vectors, calculate magnitude, and convert between polar to rectangular and vice versa 2. Calculate the angle between two vectors 3. Project one vector onto another and its applications	Students will understand: 1. Vectors represent a direction and distance 2. Any vector can be expressed in polar and rectangular form 3. How vectors apply to real world scenarios	How can vectors be used to analyze and solve real-world problems? How do operations on vectors compare to numerical operations?
Polar Coordinates	Students will be able to: 1. Graph polar coordinates and equations 2. Identify equations given the graph of polar equations 3. Convert ordered pairs and equations from polar to rectangular and vice versa	Students will understand: 1. Polar coordinates represent an angle of orientation and a distance 2. Equations can be expressed in polar and rectangular form	Is it better to write an equation in polar or rectangular form? Why are polar equations useful? How is the polar coordinate system similar to and different from the rectangular coordinate system?

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Math Concepts

Unit Theme	Unit Goals	Enduring Understandings for the Unit	Essential Questions for the Unit
Expressions, Equations, and Functions	Students will be able to: 1. Mathematically model a real-world scenario with an unknown value 2. Determine whether or not a relation is a function	Students will understand that: 1. Variables can be used to represent an unknown quantity or quantities 2. Functions have independent and dependent variables, where the dependent variable is caused by the independent variable	1. How are variables applicable to various life situations? 2. How can equations be used to model real world scenarios?
Linear Relationships	Students will be able to: 1. Solving Linear Relations 2. Graph Linear Relations 3. Model and interpret using linear relationships	Students will understand that: 1. The graph of a linear equation is a line 2. You can solve for a variable using multiple methods following the rules of operations 3. Linear relationships can be represented with tables, equations, graphs, and scenarios 4. Relationships with a constant rate of change can be modeled linearly and can be used to make predictions	1. What are some examples and non-examples of linear relationships from real life? Justify your answer. 2. Is it necessary to follow algebraic rules when solving equations? Explain why or why not? 3. Are there multiple ways of solving algebraic equations?
Linear Systems	Students will be able to: 1. Solve linear systems graphically 2. Solve linear systems algebraically 3. Model scenarios using systems and interpret solution(s)	Students will understand that: 1. The solution to a system is the point(s) of intersection 2. Algebraically the solution(s) is the value(s) that make the relations true 3. Systems can be used to compare linear relationships	1. Create a scenario that can be solved using systems of linear relations. 2. When would each method be the most efficient for solving systems of equations and why?
Quadratics/Radicals	Students will be able to: 1. Determine the roots and vertex of a quadratic function algebraically/graphically 2. Model scenarios of quadratic relationships to interpret the roots and vertex 3. Perform operations with and solve equations with radicals	Students will understand that: 1. The graphs of quadratics are parabolas 2. The factored form of a quadratic can be used to find where curve crosses the x-axis 3. Quadratics can be used to model projectile motion 4. A Radical undoes a square	1. What are the most important points on a parabola and why? 2. How can you tell if data is linear, quadratic, or something else? 3. When would each method be the most efficient for solving quadratics and why?

Exponential Functions and Properties of Exponents	Students will be able to: 1. Graph exponentials 2. Model growth/decay using exponential functions 3. Apply exponent properties to simplify monomial expressions	Students will understand that: 1. The shape of an exponential function is unique 2. Exponentiation is just repeated multiplication 3. You can expand exponential expressions to derive the properties	1. What are some examples and non-examples of exponential relationships from real life? Justify your answer. 2. How can you tell if data is linear, quadratic, or exponential?
Rational Functions	Students will be able to: 1. Add/subtract/ multiply/divide rational functions 2. Solve Rational Equations	Students will understand that: 1. Algebraic operations with fractions are the same as numeric operations with fractions (You need a common denominator when adding/subtracting, but not when multiplying/dividing) 2. Algebraic manipulation is required to simplify and solve rationals	1. Why is it useful to rewrite an expression in equivalent forms?
Polynomials	Students will be able to: 1. Perform basic operations with polynomial functions, including polynomial division	Students will understand that: 1. Polynomials are relations involving variables raised to whole number exponents.	1. How does polynomial division related to polynomial multiplication both conceptually and algebraically? 2. How can polynomials help us to model more complicated real world relationships?

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AP Calculus AB

Unit Theme	Unit Goal	Enduring Understandings for the Unit	Essential Questions for the Unit
Limits & Continuity	Students will be able to: 1. find limits of functions algebraically, graphically, and numerically 2. understand, describe, and compare the behavior of functions at its asymptotes as well as when the function approaches infinity 3. understand, determine, and describe the continuity of a function.	Students will understand: 1. limits can be determined through algebraic manipulation of the function 2. the similarity and differences between the roles of vertical and horizontal asymptotic lines 3. continuity is not required in order to determine the limit of a function	1. Is the limit of a function at a specified point the same as the value of the function at that point? Justify your answer. 2. Justify why a function can cross a horizontal asymptote, but not a vertical asymptote. 3. Is a discontinuous relation a function?
Differentiation	Students will be able to: 1. differentiate any given function using the rules of differentiation. 2. differentiate any multi-variable function with respect to the independent variable. 3. use differentiation to find rates of change in relation to time in real life situations.	Students will understand that: 1. differentiation is the instantaneous rate of change (slope of the curve at a specific point on the graph) of any polynomial function 2. a function with multiple variables can be differentiated implicitly. 3. the rate of change of a function changes over the course of time	1. Explain how the derivative of a function represents the slope of a non-linear curve 2. How does time play a role in rates of change?

Applications of Differentiation	Students will be able to: 1. use a graph of either a function's 1^{st} derivative or its 2^{nd} derivative to interpret, analyze, hypothesize, and describe the graph of the function 2. use derivatives in varied applied contexts including velocity, speed, and acceleration.	Students will understand: 1. the corresponding characteristics of graphs of a function, its derivative, and its second derivative. 2. the correlation between the position of an object, its velocity at any given time, its acceleration, and its speed	1. What are the relationships between the 2^{nd} derivative, 1^{st} derivative and original function? 2. What is the relationship between the position of an object, its velocity, its acceleration, and its speed?
Integration	Students will be able to: 1. graphically, algebraically, and numerically determine a Reimann Sum 2. use the Fundamental Theorem of Calculus to algebraically evaluate the area under a curve 3. evaluate complex functions through the substitution process	Students will understand that: 1. the inverse of a derivative is an anti-derivative and the process of finding the anti-derivative is known as integration. 2. the area under a curve can be found by finding the area of a sum of rectangles 3. the exact area under a curve found by using an infinite number of rectangles can be calculated using various algebraic manipulations in order to use the Fundamental Theorem of Calculus	1. What is the connection between the derivative and the integral in calculus? 2. How can the definite integral be interpreted graphically? 3. What are the important properties of the definite integral, and what do those properties mean graphically?
Logarithmic, Exponential, and Other Transcendental Functions	Students will be able to: 1. find the anti-derivative of trigonometric, logarithmic and exponential functions 2. use integration to model compound interest and exponential growth	Students will understand that: 1. anti-derivatives of trigonometric, logarithmic, and exponential functions follow directly from the derivatives of the basic functions 2. integrals can be used in a variety of applications to model physical, biological, and economic situations	1. How do you use the idea of accumulation in applications of the integral? 2. How are exponential and trigonometric functions used in the real world?
Slope Fields and Differential Equations	Students will be able to: 1. read and interpret a slope field to sketch a possible graph of the function 2. separate the variables of a function to solve simple differential equations 3. use exponential functions to model growth and decay in real world applications	Students will understand that: 1. a slope field represents the slope of a particular function at every point on the Cartesian/coordinate plane 2. in order to solve a differential equation, the 2 variables (and their derivatives) must be separated to different sides of the equal sign. 3. differential equations can be used to model growth and decay of a multitude of real world scenarios	1. Why is interpreting a slope field a valuable method for solving a differential equation? 2. Can all events in nature be represented by the exponential growth or decay? Justify your answer.

Solids of Revolution	Students will be able to: 1. find the area between two curves 2. find the volume of a solid revolved about either a vertical or horizontal line 3. find the volume of a solid whose cross sections are made up of known geometric shapes	Students will understand: 1. the area between two curves can be found by subtracting the area of the smaller curve from the smaller curve 2. volumes of any non-geometric shape can be calculated using integration 3. volumes of geometric shapes with non-geometric bases can be found using integration of geometric areas	1. What real world contexts involve finding the area between two curves? 2. What real world contexts involve finding the volume of non-geometric solids?