Excellence in Mathematics:
Consensus Curriculum
Instructional Framework

CATHOLIC SCHOOLS

DIOCESE of RICHMOND

Mathematics
July 1, 2022

Mission Statement

The mission of the Office of Catholic Schools is to assist the Bishop in his mandate as Teacher of the Catholic Faith, by establishing a climate and framework for fostering excellence in catechetical and academic education in the schools of the diocese in adherence to the Magisterium of the Church.

The mission of the schools in the Catholic Diocese of Richmond is to develop and nurture the spiritual, intellectual, social, and emotional growth of each student in the spirit of the Gospels and the teachings of the Catholic Church.

Framework

This curriculum is informed by the National Council for Teachers of Mathematics Standards, the Virginia Standards of Learning, and the Cardinal Newman Society Catholic Curriculum Standards. The Catholic Curriculum Standards and Dispositions are found at the beginning of this document and are intended to guide the instruction of mathematics across all grade levels in the Diocese of Richmond.

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Introduction

Through its mission, the Office of Catholic Schools in the Diocese of Richmond is called to establish a climate and framework for fostering excellence in its schools. Aligning to this mission, the Office of Catholic Schools has developed this document, "Excellence in Mathematics: Consensus Curriculum Instructional Framework."

The Consensus Curriculum Instructional Framework serves as the structure for Mathematics instruction in all Catholic schools in the Diocese of Richmond. This document identifies the standards and benchmarks that comprise the Mathematics Arts program and articulates what students should know and be able to do. Additionally, it guides and supports teachers in delivering high-quality, effective instruction. The purpose is to assist all students as they mature into skillful mathematicians while they grow their understanding of the Roman Catholic faith and deepen their relationship with Jesus Christ.

The revision process included educators from across the Diocese and representing all grade-level bands. In developing the standards, the committee reviewed the existing Consensus Curriculum standards, along with the standards from various other dioceses including the Diocese of Arlington and the Diocese of Raleigh, as well as the Virginia Department of Education (2016) Mathematic Standards of Learning Curriculum Framework. This document represents a compilation of information gleaned from these sources.

This well-designed curriculum not only imparts knowledge but also equips students with essential skills that they will use throughout their lives. Among these skills are critical thinking, reasoning, problem-solving, and study skills. Critical thinking involves evaluation arguments and evident to make informed decisions. Reasoning is the process of using logic to reach conclusions. Problem-solving is the ability to identify, analyze, and solve problems effectively. Study skills refer to the techniques that students use to manage their time, organize information, and retain what they learn. By incorporating these skills into the curriculum, students in the Diocese of Richmond learn how to approach challenges systematically, think creatively, and become independent learners who are capable of adapting to a changing world.

In updating the Math curriculum, the following guided the process:

- Update the standards to reflect the needs of our students, including those who come from other schools.
- Ensure that there are less gaps in the curriculum.
- Ensure students have a strong foundation in basic math skills.
- Remove some of the repetition to be able to work deeper.
- Each year the content builds upon skills learned previously.

For mathematics in Middle School, below are the different paths that students can take:

	6th Grade	7th Grade	8th Grade
Grade Level	Math 6	Math 7	Pre-Algebra
Accelerated	Math 6/7	Pre-Algebra	Algebra
Two-Year Accelerated	Pre-Algebra	Algebra	Geometry

Calculators in the middle school curriculum:
During the middle school years, students should be working toward mastering calculations with integers, fractions, and decimals. An emphasis should be placed on understanding how numbers work together. They should be building number sense and skills to help them with these calculations. Therefore, calculator use should be limited (especially in 6th grade). Students should learn how to use the calculators and practice by checking their work. It may also be helpful to use a calculator when emphasizing a different skill and manual calculation would limit the ability to work through problems.

Structure of the Framework

To guide the organization of the Consensus Curriculum, the Diocese of Richmond categorizes the Mathematic essential skills and understandings into five domains. These domains provide the focus of instruction. The domains are:

Number Sense: Number sense is the intuitive understanding and flexible grasp of numbers, their relationships, and their magnitude, enabling individuals to make sense of numerical information and solve mathematical problems in everyday life. It involves the ability to estimate quantities, compare numbers, recognize patterns, and mentally manipulate numerical information, allowing for confident and informed decision-making. Number sense develops through exposure to various numerical contexts, experiences with real-world applications, and the development of strategies for numerical reasoning and problem-solving.

Computation and Estimation: Computation refers to the process of performing mathematical or logical operations to solve problems, analyze data, or simulate complex systems. It involves manipulating and transforming information through algorithms and data structures to obtain desired results. Estimation, on the other hand, is the act of making an educated guess or approximation about a value, quantity, or outcome based on limited or incomplete information. It involves using available data, statistical techniques, and mathematical models to derive an estimate that is close to the true value, despite uncertainties and constraints. Both computation and estimation play crucial roles in various fields such as science, engineering, finance, and research, enabling us to make predictions, solve complex problems, analyze vast amounts of data, and make informed decisions in the face of uncertainty.

Measurement and Geometry: Measurement and geometry is a branch of mathematics that deals with the study of shapes, sizes, and their properties, as well as the quantification of various quantities and dimensions. It encompasses the concepts of distance, angle, area, volume, and coordinates, and provides the foundation for understanding spatial relationships and the principles of measurement. Through the application of measurement and geometry, we are able to solve real-world problems, design structures, analyze data, and explore the intricate patterns and symmetries found in the natural and manufactured world.

Probability and Statistics: Probability and statistics are branches of mathematics that deal with analyzing and interpreting data to make informed decisions and predictions. They provide tools and techniques for understanding the likelihood of events occurring and quantifying uncertainties. Probability is the study of uncertainty and measures the likelihood of specific outcomes or events happening. It enables us to assess risk, make predictions, and make decisions based on the available information. Statistics involves the collection, organization, analysis, interpretation, and presentation of data. It helps us understand patterns, relationships, and trends in data, and enables us to draw meaningful conclusions and make informed decisions based on the evidence provided by the data.

Patterns, Functions, and Algebra: Patterns are recurring sequences or arrangements of objects, numbers, or events that follow a predictable order or rule. They can be visual, numerical, or abstract in nature, and they often involve identifying and extending the pattern to make

predictions or solve problems. Functions are mathematical relationships that map inputs to outputs. They describe how one quantity (the input) is related to another quantity (the output). Functions can be represented graphically, algebraically, or as tables of values, and they are fundamental to understanding the relationships and behaviors of various mathematical phenomena. Algebra is a branch of mathematics that deals with symbols, variables, and mathematical operations to analyze and solve equations and expressions. It involves manipulating and rearranging these symbols and variables to find unknown quantities or to describe relationships between different quantities. The study of Patterns, Functions, and Algebra provides a powerful toolset for solving real-world problems and for understanding complex mathematical concepts.

The Diocesan Mathematics Instructional Framework is rooted in these five fundamental domains. These domains repeat in every grade with increasing levels of cognitive demand.

The **Scope and Sequence** document provides a longitudinal view of the instructional standards within each domain across the grades.

Grade specific matter follows. The format for each grade begins with the **Domain**, followed by a **Standard**, which offers the teacher guidance in the key concept to be covered. Each of the standards is then delineated into three components:

Benchmarks, which are the core content and specific knowledge students will know or be able to articulate at their grade level. They are minimum competencies that are measurable.

Essential Knowledge, or the key facts, concepts, and ideas needed to successfully meet benchmarks. These provide more detail about the teaching and learning of the benchmarks.

Essential Questions, or the overarching or topical questions that guide the lessons; these questions promote conceptual thinking and add coherence to instruction. They are not intended to be assessment questions, rather thinking questions.

It is important to recognize that certain elements of our instruction are revisited in greater depth at each grade level. Students receive spiraling instruction which develops skills in critical thinking, problem-solving, and study habits.

Additionally, **Appendices** offer teachers supplementary information and resources for instruction. Finally, sample **Pacing Guides** and **Instructional Outlines** are provided electronically in the evolving Curriculum Corner to assist teachers in long- and short-term planning.

Mathematical Process Goals for Students

The content of the Consensus Curriculum framework is intended to support five process goals for students: becoming mathematical problem solvers, communicating mathematically, reasoning mathematically, making mathematical connections, and using mathematical representations to model and interpret practical situations. Practical situations include real-world problems and problems that model real-world situations.

Mathematical Problem Solving

Students will apply mathematical concepts and skills and the relationships among them to solve problem situations of varying complexities. Students also will recognize and create problems from real-world data and situations within and outside mathematics and then apply appropriate strategies to determine acceptable solutions. To accomplish this goal, students will need to develop a repertoire of skills and strategies for solving a variety of problem types. A major goal of the mathematics program is to help students apply mathematics concepts and skills to become mathematical problem solvers.

Mathematical Communication

Students will communicate thinking and reasoning using the language of mathematics, including specialized vocabulary and symbolic notation, to express mathematical ideas with precision. Representing, discussing, justifying, conjecturing, reading, writing, presenting, and listening to mathematics will help students to clarify their thinking and deepen their understanding of the mathematics being studied. Mathematical communication becomes visible where learning involves participation in mathematical discussions.

Mathematical Reasoning

Students will recognize reasoning and proof as fundamental aspects of mathematics. Students will learn and apply inductive and deductive reasoning skills to make, test, and evaluate mathematical statements and to justify steps in mathematical procedures. Students will use logical reasoning to analyze an argument and to determine whether conclusions are valid. In addition, students will use number sense to apply proportional and spatial reasoning and to reason from a variety of representations.

Mathematical Connections

Students will build upon prior knowledge to relate concepts and procedures from different topics within mathematics and see mathematics as an integrated field of study. Through the practical application of content and process skills, students will make connections among different areas of mathematics and between mathematics and other disciplines, and to real-world contexts. Science and mathematics teachers and curriculum writers are encouraged to develop mathematics and science curricula that support, apply, and reinforce each other.

Mathematical Representations

Students will represent and describe mathematical ideas, generalizations, and relationships using a variety of methods. Students will understand that representations of mathematical ideas are an essential part of learning, doing, and communicating mathematics. Students should make connections among different representations – physical, visual, symbolic, verbal, and contextual – and recognize that representation is both a process and a product.

Instructional Technology

The use of appropriate technology and the interpretation of the results from applying technology tools must be an integral part of teaching, learning, and assessment. However, facility in the use of technology shall not be regarded as a substitute for a student's understanding of quantitative and

algebraic concepts and relationships or for proficiency in basic computations. Students must learn to use a variety of methods and tools to compute, including paper and pencil, mental arithmetic, estimation, and calculators. In addition, graphing utilities, spreadsheets, calculators, dynamic applications, and other technological tools are now standard for mathematical problem solving and application in science, engineering, business and industry, government, and practical affairs.

Calculators and graphing utilities should be used by students for exploring and visualizing number patterns and mathematical relationships, facilitating reasoning and problem solving, and verifying solutions. However, according to the National Council of Teachers of Mathematics, "… the use of calculators does not supplant the need for students to develop proficiency with efficient, accurate methods of mental and pencil-and-paper calculation and in making reasonable estimations." State and local assessments may restrict the use of calculators in measuring specific student objectives that focus on number sense and computation.

Computational Fluency

Mathematics instruction must develop students' conceptual understanding, computational fluency, and problem-solving skills. The development of related conceptual understanding and computational skills should be balanced and intertwined, each supporting the other and reinforcing learning.

Computational fluency refers to having flexible, efficient, and accurate methods for computing. Students exhibit computational fluency when they demonstrate strategic thinking and flexibility in the computational methods they choose, understand, and can explain, and produce accurate answers efficiently.

The computational methods used by a student should be based on the mathematical ideas that the student understands, including the structure of the base-ten number system, number relationships, meaning of operations, and properties. Computational fluency with whole numbers is a goal of mathematics instruction in the elementary grades. Students should be fluent with the basic number combinations for addition and subtraction to 20 by the end of grade two and those for multiplication and division by the end of grade four. Students should be encouraged to use computational methods and tools that are appropriate for the context and purpose.

Algebra Readiness

The successful mastery of Algebra I is widely considered to be the gatekeeper to success in the study of upper-level mathematics. "Algebra readiness" describes the mastery of, and the ability to apply, the Mathematics Standards of Learning, including the Mathematical Process Goals for Students, for kindergarten through grade eight. The study of algebraic thinking begins in kindergarten and is progressively formalized prior to the study of the algebraic content found in the Algebra I Standards of Learning. Included in the progression of algebraic content is patterning, generalization of arithmetic concepts, proportional reasoning, and representing mathematical relationships using tables, symbols, and graphs. The K-8 Mathematics Standards of Learning form a progression of content knowledge and develop the reasoning necessary to be well-prepared for mathematics courses beyond Algebra I, including Geometry and Statistics.

Mathematics - Scope and Sequence

The student will:

	Kindergarten	1st Grade	2nd Grade	3rd Grade	4th Grade	5th Grade
Number Sense 	• Count forward, backwards, and skip count. • Count and represent numbers to 20. • Decompose numbers up to 10. • Compare sets of objects. • Investigate fractions by representing and solving practical problems equal sharing with two sharers.	• count forward, backwards, and skip count. • describe position using ordinal numbers. • develop an understanding of place value with 2-digit numbers. • represent and solve practical problems involving equal sharing with two or four sharers.	• Count forwards, backwards, skip count and determine even or odd. • develop an understanding of Place Value with 3-digit numbers. • count and identify the ordinal positions first through twentieth. • develop an understanding of fractions represented using various models	• demonstrate an understanding of six-digit numbers. • identify Roman numerals. • demonstrate fractions as parts of a whole.	• demonstrate an understanding of nine-digit numbers. • identify prime and composite numbers. • demonstrate fractions as parts of a whole. • demonstrate decimals as parts of a whole	• identify prime and composite numbers. • demonstrate fractions as parts of a whole. • demonstrate decimals as parts of a whole
Computation and Estimation 	• Use concrete objects to solve story problems with sums and differences up to 10.	• demonstrate fluency with addition and subtraction facts up to 10. • solve and create single step story problems including addition and subtraction for numbers up to 20.	• develop Basic Facts Strategies and demonstrate fluency with addition and subtraction within 20. • add and subtract 2-digit numbers to solve problems	• add and subtract four-digit numerals. • multiply and divide whole numbers	• add and subtract six-digit numbers. • add and subtract fractions. • add and subtract decimals and money. • multiply and divide by multiple digits	• add and subtract fractions. • add and subtract decimals and money. • multiply and divide whole numbers. • multiply and divide decimals and fractions
Measurement and Geometry 	• Identify and determine the value of coins. • Investigate the passage of time using a calendar. • Make direct comparisons of two objects or events using one or more attributes. • Identify, describe, and compare 2-dimensional shapes.	• determine the value of a collection of coins (pennies, nickels, dimes) whose total values is 100¢ or less. • investigate the passage of time by telling time using analog and digital clocks and reading and interpreting a calendar. • measure and compare length, weight, and volume using non-standard units. • recognize and describe 2-dimensional figures.	• count and compare collections of pennies, nickels, dimes, and quarters whose total value is $2.00 or less. • investigate the passage of time by telling time using analog and digital clocks and reading and interpreting a calendar. • estimate and measure length, weight, and capacity. • read a thermometer to the nearest 10 degrees Fahrenheit. • identify, describe, compare, and contrast 2-dimensional and 3-dimensional figures. • identify and create figures with at least one line of symmetry.	• demonstrate an understanding of money. • estimate and use customary and metric units. • understand the concept of time. • draw, classify, and represent lines and angles. • identify and describe the characteristics of geometric shapes (polygons). • measure polygons	• estimate and use customary and metric units. • demonstrate an understanding of the concept of time. • identify geometric figures. • measure polygons.	• demonstrate an understanding of elapsed time. • analyze and measure two- and three-dimensional geometric shapes.
Probability and Statistics 	• Organize, read, and interpret data in object graphs, picture graphs, and tables.	• construct and interpret graphs. • sort and classify concrete objects using up to two attributes.	• collect data and use and interpret pictographs and bar graphs	• read, organize, and analyze data and probability using charts and graphs.	• read, interpret, organize, and analyze data and probability using charts and graphs	• read, interpret, organize, and analyze data and probability using charts and graphs.
Patterns, Functions, and Algebra 	• Sort and classify objects according to one attribute. • Identify, describe, extend, create, and transfer repeating patterns.	• identify, describe, extend, create, and transfer growing and repeating patterns.	• identify, describe, create, extend, and transfer patterns found in objects, pictures, and numbers	• analyze patterns to represent mathematical relationships	• patterns to represent mathematical relationships	• demonstrate an understanding of patterns, relations, and equations as represented in mathematical relationships

	6th Grade	6th/7th Grade	7th Grade	Prealgebra	High School
Number Sense 	• represent and evaluate positive exponents. • calculate and apply perfect squares and square roots without the use of a calculator. • demonstrate an understanding of integers within the Real Number System.	• represent and evaluate exponents. • determine and apply perfect squares, square roots, perfect cubes, and cube roots without the use of a calculator. • demonstrate an understanding of integers within the Real Number System.	• Count forwards, backwards, skip count and determine even or odd. • develop an understanding of Place Value with 3-digit numbers. • count and identify the ordinal positions first through twentieth. • develop an understanding of fractions represented using various models	• classify and graph real numbers. • estimate and determine square roots.	**Sequential Offerings:** Algebra 1 Geometry Algebra 2 Trigonometry Precalculus Calculus Statistics
Computation and Estimation 	• add, subtract, multiply, and divide integers without the use of a calculator. • simplify expressions without the use of a calculator. • convert and compare between fractions and decimals without the use of a calculator. • multiply and divide fractions and mixed numerals without the use of a calculator. • multiply and divide decimals without the use of a calculator.	• add, subtract, multiply, and divide integers without the use of a calculator. • simplify expressions without the use of a calculator. • convert and compare between fractions, decimals, and percents without the use of a calculator. • multiply and divide fractions and mixed numerals without the use of a calculator. • multiply and divide decimals without the use of a calculator. • solve practical problems using rational numbers without the use of a calculator.	• apply integer operations to solve real-world problems. • convert and compare between fractions, decimals, and percents without the use of a calculator. • solve practical problems using rational numbers without the use of a calculator. • simplify expressions without the use of a calculator.	• add, subtract, multiple, and divide rational numbers to solve real-world problems. • represent scientific notation. • compare and order real numbers.	
Measurement and Geometry 	• read, interpret, and graph on a coordinate plane. • classify 2-dimensional figures. • calculate the perimeter and area of figures.	• Determine the value of a read, interpret, and graph on a coordinate plane. • classify 2-dimensional figures. • find the circumference and area of a circle.	• find the circumference and area of a circle. • calculate volume and surface area of 3-dimensional figures.	• apply angle relationships. • apply Pythagorean Theorem. • calculate the perimeter and area of composite figures. • apply transformations, including translations, reflections, and dilations, give a polygon on the coordinate plane. • derive and use the formulas for volume and surface area.	
Probability and Statistics 	• determine and analyze the measures of center. • represent and analyze data using graphs. • determine the theoretical and experimental probabilities of a simple event.	• determine the theoretical and experimental probabilities of an event. • represent and analyze data using graphs. • analyze and interpret data using measures of center.	• determine the probability of independent and dependent events. • represent and analyze data using graphs.	• analyze scatter plots. • create and analyze a box plot. • determine the probability of independent and dependent events.	
Patterns, Functions, and Algebra 	• identify and apply the properties of Real Numbers. • model, translate, and solve one-step equations. • model, translate, and solve one-step inequalities. • represent the relationship between two quantities as a ratio. • solve practical problems using proportional reasoning.	• Identify, describe, extend, create, identify, and apply the properties of Real Numbers. • model, translate, and solve one- and two-step equations. • model, translate, solve, and graph inequalities. • represent the relationship between two quantities as a ratio. • solve practical problems using proportional reasoning.	• justify the properties of Real Numbers. • model, translate, and solve two-step equations. • model, translate, solve, and graph inequalities. • solve practical problems using proportional reasoning.	• identify and apply the properties of Real Numbers. • evaluate expressions. • simplify algebraic expressions. • solve equations with rational numbers. • solve and graph inequalities. • solve practical problems involving percents. • represent functions as ordered pairs, tables, graphs, and equations and identify the parts of the function for discrete points. • identify the slope/rate of change given a practical problem or graph.	

Kindergarten

Kindergarten

The student will:

Number Sense

- count forward, backwards, and skip count.
- count and represent numbers to 20.
- decompose numbers up to 10.
- compare sets of objects.
- investigate fractions by representing and solving practical problems equal sharing with two sharers.

Computation and Estimation

- use concrete objects to solve story problems with sums and differences up to 10.

Measurement and Geometry

- identify and determine the value of coins.
- investigate the passage of time using a calendar.
- make direct comparisons of two objects or events using one or more attributes.
- identify, describe, and compare 2-dimensional shapes.

Probability and Statistics

- organize, read, and interpret data in object graphs, picture graphs, and tables.

Patterns, Functions, and Algebra

- sort and classify objects according to one attribute.
- identify, describe, extend, create, and transfer repeating patterns.

Standard K.1 **Number Sense**

The student will count forward, backwards, and skip count.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. count forward orally by ones from 0-100. b. count backwards orally by ones when given any number between 1 and 10. c. count forward by tens to 100 to determine the total number of objects to 100. d. determine one more or one less than a given number of objects, 10 or less, without counting. e. identify the number after, without counting, when given any number between 0 and 100 and identify the number before, without counting, when given any number between 1 and 10;	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• Count forward orally by ones from 0-100. • Count backwards orally by ones when given any number between 1 and 10. • Count forward by tens to 100 to determine the total number of objects to 100. • Determine one more and one less, without counting, for numbers 10 or less. • Identify the number after, without counting, when given any number between 0 and 100 • Understand the meaning of zero. • Vocabulary: skip count, forward, backward, after, before, zero, one more than, one less than, pattern	• How can we use tools to help us count forward to 100? (Counters, snap cubes, hundred chart, ten frames, number paths/tracks) • How can we use tools to count backwards by ones from any number between 1 and 10? (Counters, snap cubes, hundred chart, ten frames, number paths/tracks) • How can we find the number after a given number between 0 and 100 without counting? • How can we find the number before a given number between 1 and 10 without counting? • How can we use tools to count forward by tens starting at 0 to determine a number of objects? (Bundles of tens, ten frames, snap cubes) • How can patterns help us count to 100? (Hundreds chart) • How can we group objects by 10s and skip count by 10s to find out how many?

Standard K.2 **Number Sense**

The student will count and represent numbers to 20.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. tell how many are in a given set of 20 or few objects by counting orally. b. read, write, and represent numbers from 0-20 c. recognize number words through ten	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• Count orally to tell how many are in a given set containing 20 or fewer concrete objects using **one to one correspondence** and identify (and write) the corresponding number. • Construct a set of objects that corresponds to a given number. • Identify written numerals from 0 through 20 represented in random order. • Read and write the numerals from 0 through 20. • Students will recognize number words to 10. • Students should describe teen numbers as a set of ten and some more. • Use ten frames & base 10 blocks to show ten numbers. • Vocabulary: digit, quantity, rearrange	• What words can we use to count a set of objects? • How do we count to find a quantity? • How do we write a digit to show how many? • How can we be careful not to count something more than once? • How can we prove that the total number does not change if we rearrange the objects in a set? • How do we write number words through ten?

Standard K.3 **Number Sense**

The student will decompose numbers up to 10.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. describe part/whole relationships with numbers up to 10 (ex: 5 is made up of 4 and 1, 3 and 2, or 5 and 0) b. show fluency with part-whole relationships for numbers up to 5.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• Numbers 0-10 can be represented using 2 addends in multiple ways. • Students should be able to identify a single set up to 5 without counting or making parts (subitizing) • Recognize and describe with fluency part-whole relationships for numbers up to 5 in a variety of configurations. • Investigate and describe part-whole relationships for numbers up to 10 using a variety of configurations. • Vocabulary: part, whole, set	• How many ways can we represent/show a number? • How can we look at an image and recognize parts of a set up to five without counting? (Dot images, rekenreks, tiles, toothpicks, dice) • How can we use manipulatives to describe parts in a set for numbers up to ten? (Ten frames, five frames, counters, unifix cubes, beads)

Standard K.4 **Number Sense**

The student will compare sets of objects.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. compare/order 2 sets of 20 or less objects using the words more than, same, or less than b. compare and describe one set as having more, fewer, or the same number of objects as the other set(s), given no more than three sets, each set containing 10 or fewer concrete objects, c. compare and order the sets from least to greatest and greatest to least.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• Create a set that is less than/more than a given set or the same as a given set (up to 20 objects in each set). • Use the words more than, same, or less than to compare two sets (up to 20 objects in each set). • Use one to one correspondence when counting sets. • Vocabulary: more, less, same, set, greatest, least, fewer,	• How do we compare two sets to tell whether they have the same number of items? • How can we make a set that has the same number of items as another set? • What do the words fewer, more, and the same mean? • How do we know when one set has fewer items than another set? • How can we make a set that has fewer items than another set? • How do we know when one set has more items than another set? • How can we make a set that has more items than another set? • How can we order three sets of objects from least to greatest? • How can we order three sets of objects from greatest to least?

Standard K.5 **Number Sense**

The student will investigate fractions by representing and solving practical problems involving equal sharing. with two sharers.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. share a whole equally between two sharers when given a practical situation (using a set of objects and using a single object). b. represent fair shares concretely or pictorially.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• Describe shares as equal pieces or parts of the whole. • Understand what fair share means. • Share the whole equally with two sharers, when given a practical situation. • Represent fair shares concretely or pictorially, when given a practical situation. • Describe shares as equal pieces or parts of the whole (e.g., halves), when given a practical situation. • Vocabulary: equal, sharer, fair, whole, part, half, halves	• Why do the parts of a whole need to be equal when making fair shares? • How can we share a whole equally with two sharers? • When do we share equal pieces or parts of a whole in our daily lives?

Standard K.6 **Computation and Estimation**

The student will use concrete objects to solve story problems with sums and differences of up to 10.

Benchmarks
Key knowledge and skills we want students to know and be able to do

a. use concrete objects to solve story problems with sums and differences up to 10.
b. solve story problems with or without addition or subtraction symbols.

Essential Knowledge
Key facts, concepts, and ideas needed to successfully meet benchmarks

- Vocabulary, one more, one less, part, whole, sum, difference, combining, taking away, minus, plus.
- One more, one less
- One to one correspondence
- part-part-whole
- Symbols taught after the conceptual understanding of combining and taking away.
- They will understand what the subtraction sign (minus) and addition sign are.

KINDERGARTEN: COMMON ADDITION AND SUBTRACTION PROBLEM TYPES	
Join (Result Unknown)	Sue had 4 pennies. Josh gave her 2 more. How many pennies does Sue have altogether?
Separate (Result Unknown)	Sue had 8 pennies. She gave 5 pennies to Josh. How many pennies does Sue have now?
Part-Part-Whole (Whole Unknown)	Josh has 4 red balloons and 3 blue balloons. How many balloons does he have?
Part-Part-Whole (Both Parts Unknown)	Josh has 5 balloons. Some of them are red and some of them are blue. How many balloons can be blue and how many can be red?

Essential Questions
Questions to guide student inquiry and focus instruction to uncover big ideas

- Do you have more or less now than you started with?
- Join problems involve the process of combining or joining sets or quantities. How do we find the total number when we put together two sets?
- Separate problems can be viewed as a taking away or separating process. How do we find what is left when we separate out part of a set?
- Part-part-whole problems involve two quantities that are combined into one whole, but no physical action is required. How do we find the whole when given two parts? How do we find both parts when given the whole?
- How can we use models to solve joining problems?
- How can we use models to solve separating problems?
- How can we use models to solve part-part-whole scenarios?

Standard K.7 **Measurement and Geometry**

The student will identify and determine the value of coins.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. identify and describe the attributes (color, size) of pennies, nickels, dimes, quarters. b. determine the value of pennies, nickels, dimes, quarters. c. determine the number of pennies equivalent to a nickel, dime, and quarter.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
● Students will need to have one-to-one correspondence when counting pennies. ● Knowledge of colors ● Describe the attributes (e.g., color, relative size) of a penny, nickel, dime, and quarter. ● Identify a penny, nickel, dime, and quarter. ● Identify the number of pennies equivalent to a nickel, a dime, and a quarter (i.e., a nickel has the same value as five pennies). ● Vocabulary: penny, nickel, dime, quarter, attribute, alike, different, equal	● How can we describe a penny? … a nickel? … a dime? … a quarter? ● How can we identify a penny? … a nickel? … a dime? … a quarter? ● What is the value of a penny? .... a nickel? … a dime? … a quarter? ● How are these coins alike? different?

Standard K.8 **Measurement and Geometry**

The student will investigate the passage of time using a calendar.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. name the 7 days of the week. b. name the 12 months of the year. c. identify the day before or after a given day (yesterday, today, tomorrow)	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
● Students can use a calendar to identify the months of the year and days of the week. ● understanding of past, present, future ● Name the twelve months of the year. ● Name the seven days in a week. ● Determine the day before and after a given day (e.g., yesterday, today, tomorrow). ● Understand what happens in the morning, afternoon, and night. ● Vocabulary: day, week, month, year, before, after, yesterday, today, tomorrow, calendar, weekend, weekday, past, present, future, morning, afternoon, night	● Why do we use a calendar? ● What day was yesterday? ● What day will tomorrow be? ● How do calendars measure time in days? .weeks? … months? … years?

Standard K.9 **Measurement and Geometry**

The student will make direct comparisons of two objects or events using one or more attributes.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. compare two objects or events using one or more of the following attributes: length (longer, shorter), height (taller, shorter), weight (heavier, lighter), temperature (hotter, colder), volume (more, less), and time (longer, shorter)	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
● Length is the distance between two points. ● Height is the distance from the bottom or base of something to the top. ● Weight is a measure of the heaviness of an object. ● Temperature is the degree of hotness or coldness of an object or environment. ● Volume is the measure of the capacity of a container. ● Time is the measure of an event from its beginning to end. ● Compare and describe the lengths of two objects as longer or shorter, using direct comparison (e.g., the bus is longer than the car). ● Compare and describe heights of two objects (as taller or shorter), using direct comparison. ● Compare and describe weights of two objects (as heavier or lighter), using direct comparison. ● Compare and describe temperatures of two objects or environment (as hotter or colder), using direct comparison. ● Compare and describe volumes of two containers (as more or less), using direct comparison. ● Compare and describe the amount of time spent on two events (as longer or shorter), using direct comparison. ● Vocabulary: attribute, length, longer, shorter, height, taller, shorter, weight, heavier, lighter, temperature, hotter, colder, volume, more, less, time, longer, shorter, compare, measure	● When do we need to measure length? ● When do we need to measure height? ● How are length and height similar? ● When do we need to measure weight? ● When do we need to measure temperature? ● When do we need to measure volume? ● When do we need to measure time? ● How can we compare the length of two objects? What words do we use to compare lengths? ● How can we compare the height of two objects? What words do we use to compare heights? ● How can we compare the weight of two objects? What words do we use to compare weights? ● How can we compare the temperature of two objects or events? What words do we use to compare temperatures? ● How can we compare the volume of two objects? What words do we use to compare volumes? ● How can we compare the time spent on two events? What words do we use to compare time?

Standard K.10 **Measurement and Geometry**

The student will identify, compare, and describe 2 dimensional shapes (circle, square, rectangle, triangle).

Benchmarks
Key knowledge and skills we want students to know and be able to do

a. describe a triangle, square, and rectangle by stating the number of sides and vertices.
b. compare the size (smaller, larger) and shape of 2-dimensional figures (circle, triangle, square, and rectangle).
c. describe the location of one object relative to another (***above, below, next to***) and identify representations of 2-dimensional figures (circle, triangle, square, and rectangle) regardless of their positions and orientations in space.

Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• Vertices are the corners. Vertex refers to one corner. • A triangle has 3 sides and 3 vertices. ◦ Students should see different types of triangles so that they do not think that all triangles are equilateral. • A rectangle has 4 sides and 4 vertices, top and bottom are equal, left and right are equal. • A square has 4 equal sides and 4 vertices. • Identify a circle, triangle, square, and rectangle. • Describe the characteristics of triangles, squares, and rectangles, including number of sides and number of vertices. • Describe a circle using terms such as round and curved. • Compare and group 2-dimensional figures (circle, triangle, square, and rectangle) according to their relative sizes (smaller, larger). • Compare and group 2-dimensional figures (circle, triangle, square, and rectangle) according to their shapes. • Distinguish between examples and nonexamples of identified 2-dimensional figures (circle, triangle, square, and rectangle). • Identify pictorial representations of a circle, triangle, square, and rectangle, regardless of their position and orientation in space. • Describe the location of one object relative to another, using the terms above, below, and next to. • Vocabulary: compare, circle, square, rectangle, triangle, sides, vertex, vertices, above, below, next to, position, equal, round, curved, 2-dimensional	• How can we identify a circle? … a triangle? … a square? … a rectangle? • How do we identify examples and nonexamples of a shape? • What words help us describe a circle? … a triangle? … a square? … a rectangle? (Number of sides and number of vertices) • How do different characteristics of shapes help us compare and sort them in different ways? (… by size? …by shape?) • Where can we find examples of 2-dimensional shapes in our world? • How can we prove that turning, sliding, or flipping a 2-dimensional figure does not change its shape or name? • How can we use the words above, below, and next to describe the position of 2-dimensional shapes in a picture?

Standard K.11 **Probability, Statistics, and Data Analysis**

The student will organize, read, and interpret data in object graphs, picture graphs, and tables.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. collect, organize, and represent data. b. read and interpret data in object graphs, picture graphs and tables	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• Collect data on categories identified by the teacher and/or student (e.g., number of siblings, types/numbers of pets, types of flowers in the garden). • Represent data by arranging concrete objects into organized groups to form a simple object graph. • Represent gathered data, using pictures to form a simple picture graph (e.g., a picture graph of the weather for a month). • Represent gathered data in tables (vertically or horizontally). • Represent data using tally marks. • Answer questions related to the gathered data displayed in object graphs, picture graphs, and tables. • Read the graph to determine the categories of data and the data as a whole (e.g., the total number of responses) and its parts (e.g., five people are wearing sneakers); and • Interpret the data, including categories with the greatest, the least, or the same. • Vocabulary: data, graph, picture graph, table, tally marks, greatest, least	• What is data? • What are some ways to represent data? • Why represent data in a graph? • What questions can we ask each other to gather data? • How do we display data using an object graph? • How do we display data using a picture graph? • How do we display data using a table? • How do tables and graphs help us understand our data? • How can tables and graphs help us answer questions about our data?

Standard K.12 **Patterns, Functions and Algebra**

The student will sort and classify objects according to one attribute.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. sort and classify objects according to one attribute.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• Identify the attributes of an object (e.g., color, size, shape, thickness) • Sort objects into appropriate groups (categories) based on one attribute (e.g., size – large bears and small bears). • Classify sets of objects into groups (categories) of one attribute. • Label attributes of a set of objects that has been sorted. • Name multiple ways to sort a set of objects. • Vocabulary: attribute, characteristic, color, size, sort, shape, thickness	• What are the attributes? • How can we use a characteristic (attribute) to sort a set of objects into groups? • How can we classify sets of objects? • How can we name (label) sets of objects that have been sorted? • How do we decide what characteristics (attributes) we could use to classify a set of objects into groups? • How many different ways can we sort a set of objects using common characteristics (attributes)?

Standard K.13 **Patterns, Functions and Algebra**

The student will identify, describe, extend, create, and transfer repeating patterns.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. identify, describe, extend, create, and transfer repeating patterns.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• Identify and describe the core (the part of the sequence that repeats) found in repeating patterns of common objects, sounds, movements, and pictures. • Extend a repeating pattern by adding at least two complete repetitions of the core to the pattern. • Create a repeating pattern. • Compare similarities and differences between patterns. • Transfer a repeating pattern from one representation to another. (e.g., naming patterns with letters AB, ABC, AABB, etc.) • Vocabulary: pattern, compare, repeat	• What is the pattern? • How can we identify and describe the core of a repeating pattern? • Patterns exist in many forms (common objects, sounds, movements, and pictures). How can we create patterns in different forms? • How do we use the part of a pattern that repeats (the core) to extend the pattern? • How can we compare and contrast patterns? • How can we transfer a repeating pattern from one representation to another?

1st Grade

1st Grade

The student will:

Number Sense

- count forward, backwards, and skip count.
- describe position using ordinal numbers.
- develop an understanding of place value with 2-digit numbers.
- represent and solve practical problems involving equal sharing with two or four sharers.

Computation and Estimation

- demonstrate fluency with addition and subtraction facts up to 10.
- solve and create single step story problems including addition and subtraction for numbers up to 20.

Measurement and Geometry

- determine the value of a collection of coins (pennies, nickels, dimes) whose total values is 100¢ or less.
- investigate the passage of time by telling time using analog and digital clocks and reading and interpreting a calendar.
- measure and compare length, weight, and volume using non-standard units.
- recognize and describe 2-dimensional figures.

Probability and Statistics

- construct and interpret graphs.
- sort and classify concrete objects using up to two attributes.

Patterns, Functions, and Algebra

- identify, describe, extend, create, and transfer growing and repeating patterns.

Standard 1.1

Number Sense

The student will count forwards, backwards, and skip count.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. Students will be able to count forward by ones, twos, fives, and tens to 120. b. Students will be able to count backwards by ones starting at any number 30 or less. c. Students will write the numbers from 0 to 120. d. Students will identify the number that comes before, after, or between, without counting, for numbers up to 120.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• Count forward by ones, fives, and tens to 120. • Count objects by creating sets of 2s, 5s, 10s. • Count backwards by ones starting at any number 30 or less. • Write the numbers from 0 to 120. • Identify the number that comes before, after, or between for numbers up to 120. • Vocabulary: count, forwards, backwards, before, after, zero, between, ones, twos, fives, tens	• How can we use tools (counters, objects, number lines, hundred charts, and base ten block) to help us count to 120? • How do we know what numbers come before and after a certain number? • What is zero? When do we use zero? • How do we count how many objects are in a set? • How can we use tools (counters, objects, number lines, hundred charts, and base ten blocks) to help us skip count? • What patterns occur when we count by ones? … twos? … fives? … tens to 120? • When is skip counting useful? • What is different when counting backwards (between 1-30)?

Standard 1.2 **Number Sense**

The student will describe a position using ordinal numbers.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. The student, given an ordered set of ten objects and/or pictures, will indicate the ordinal position of each object, first through tenth. b. The student will be able to write the numbers first (1st) through tenth (10th).	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• Identify the starting point (left to right, right to left, top to bottom, bottom to top) • Identify the ordinal position of an object in a set of objects. • Write the numbers for 1st through 10th and recognize the words first through tenth. • Vocabulary: ordinal, left, right, top, bottom, first, second, third, fourth, fifth, sixth, seventh, eighth, ninth, tenth	• What number words (first through tenth) can we use to describe our place (order) in a line? • How are counting numbers similar to ordinal (order) numbers? How are they different? • How do we know if an object is first, second, third, fourth, fifth, sixth, seventh, eighth, ninth, or tenth? • Why does an object's position name (ordinal number) change if we count from left-to-right instead of right-to-left? …bottom-to-top instead of top-to-bottom?

Math 1.3 **Number Sense**

The student will develop an understanding of place value with 2-digit numbers.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. Students will be able to identify the tens place and ones place in a 2-digit number. b. Students will identify the place and value of each digit in a two-digit numeral. c. Students will compare and order 2-digit numbers, with and without models, using the words greater than, less than, and equal. d. Students will order three or fewer sets (numbers under 100) from least to greatest and greatest to least.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• Understand the relationship between the ones place and tens place (ex: ten ones are equal to one ten) • Identify the tens place and ones place. • Identify the value of each digit in a 2-digit number. • Group a collection of 100 objects or less into groups of tens and ones. • Vocabulary: tens, ones, value, greater, less, equal, digit	• How do we count how many objects are in a set? • How does grouping by tens and ones help us tell how many? • How does grouping by tens and ones help us say and write numbers? • How does the position (place) of a digit in a number affect the value of that digit? • How do we compare numbers (presented concretely) using words (greater than, less than, equal to)? • How can I order three or fewer sets (greatest to least, least to greatest)?

Math 1.4 **Number Sense**

The student will represent and solve practical problems involving equal sharing with two or four sharers.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. The student will represent and name fractions for halves and fourths, using models and pictures. b. The student will represent halves and fourths of a whole, using a region/area model (e.g., pie pieces, pattern blocks, paper folding, and drawings). c. The student will be able to partition models into halves and fourths.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• Describe shares as equal pieces or parts of the whole. • Understand what fair share means. • Share a whole equally with two or four sharers, when given a practical situation. • Represent fair shares pictorially, when given a practical situation. • Describe shares as equal pieces or parts of the whole (e.g., halves, fourths), when given a practical situation. • Represent halves and fourths of a whole, using a region/area model (e.g., pie pieces, pattern blocks, paper folding, and drawings). (b) • Name fractions represented by drawings or concrete materials for halves and fourths. • Vocabulary: whole, half, halves, fourths, partition, divide, sharers	• What is a fraction? What do we mean when we say that a fraction names equal parts of a whole? • How can we use region models to show wholes, halves, and fourths of objects? • How can we use set models to show wholes, halves, and fourths of a group (set)? • How can I share a whole with two or four sharers (given a practical situation)? • How can I describe fair shares of halves and fourths given a practical situation?

Standard 1.5 **Computation and Estimation**

The student will demonstrate fluency with addition and subtraction to 10.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. Identify + as a symbol for addition, and - as a symbol for subtraction, and = as a symbol for equality. b. Utilize a strategy to solve an addition or subtraction problem within 10. c. Students will understand the part-whole relationship for numbers within 10.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas

• Recognize and describe with fluency part-whole relationships for numbers up to 10 in a variety of configurations.
• Identify + as a symbol for addition, - as a symbol for subtraction, and = as a symbol for equality.
• Subtraction is the inverse of addition. Addition and subtraction should be taught concurrently.
• Strategies
  ○ counting on.
  ○ counting back.
  ○ "One more than," "two more than."
  ○ "One less than," "two less than."
  ○ "doubles" (e.g., 6 + 6 =); "near doubles" (e.g., 7 + 8 = (7 + 7) + 1 = or (8 + 8) – 1).
  ○ "make ten" (e.g., 7 + 4 can be thought of as 7 + 3 + 1 in order to make a 10);
  ○ "Think addition for subtraction" (e.g., for 9 – 5 = , think "5 and what number makes 9?").
  ○ use of the commutative property (e.g., 14 +3 is the same as 3 + 14); *students do not need to name the property.
  ○ use of related facts (e.g., 14 + 3 = 17, 3 + 14 = 17, 17 – 4 = 13, and 17 – 13 = 4).
  ○ use of the additive identity property (e.g., 14 + 0 = 14). *Students do not need to name the property
  ○ use patterns to make sums (e.g., 0 + 15 = 15, 1 + 14 = 15, 2 + 13 = 15, etc.).
• Vocabulary: zero, counting on, counting back, addition, subtraction, more than, less than, doubles, equal, pattern
	• How is addition like combining?
	• How is subtraction like separating?
	• How do we use the symbols "+": or "-" and "=" when we write a number fact?
	• How can models (counters, snap cubes, dot cards, ten frames) help us "picture" addition and subtraction facts in our minds?
	• How can I recognize and describe the part-whole relationships of numbers up to ten?
	• How can I break numbers apart to make ten?
	• What are some strategies for learning addition and subtraction combinations to 10?
	• How do I know when I use zero it remains the same when solving addition problems within 10? (Additive identity property)
	• How do I know when I subtract zero from a number that it remains the same?
	• How can I use patterns to solve addition and subtraction problems within 10? (0+ 5 =5, 1 + 4 =5, 2 + 3 =5, etc.)
	• How can I use efficient strategies for addition and subtraction problems to 10?

Standard 1.6 **Computation and Estimation**

The student will solve and create single step story problems including addition and subtraction for numbers up to 20.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. Students will Identify a number sentence to solve an oral or written story and picture problem, selecting from among addition and/or subtraction equations (e.g., number sentences). b. Explain strategies used to solve addition and subtraction problems within 20 using spoken words, objects, pictorial models, and number sentences. c. Create and solve single-step oral or written story and picture problems, using addition and subtraction within 20.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• Create and solve single-step oral or written story and picture problems, using addition and subtraction within 20. • Identify a number sentence to solve an oral or written story and picture problem, selecting from among addition and/or subtraction equations (e.g., number sentences). • Explain strategies used to solve addition and subtraction problems within 20 using spoken words, objects, pictorial models, and number sentences. • Vocabulary: sum, difference, addend	• How could you use addition to solve a subtraction problem? • How could you use subtraction to solve an addition problem? • Which strategy could you use to solve this problem? • How can "acting out" a single step story problem with models help us solve it? • How can we create a story problem to match a number sentence? • How can we write a number sentence to match a story problem? • How can I explain the strategy I used to solve addition and subtraction problems (within 20)?

Standard 1.7 **Measurement and Geometry**

The student will determine the value of a collection of coins (pennies, nickels, dimes) whose total value. is 100¢ or less.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. The student will identify the value of a penny, nickel, dime, and quarter. b. The student will count collections of pennies whose value is 100 ¢ or less. c. The student will count collections of nickels whose value is 100 ¢ or less. d. The student will count collections of dimes whose value is 100 ¢ or less. e. The student will count collections of mixed coins (pennies, nickels, dimes) whose total value is 100¢ or less.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
● Identify pennies, nickels, dimes, quarters. ● Count by 1s, 5s, and 10s. ● One to one correspondence ● Count by ones to determine the value of a collection of pennies whose total value is 100 cents or less. ● Group a collection of pennies by fives and tens as a way to determine the value. The total value of the collection is 100 cents or less. ● Count by fives to determine the value of a collection of nickels whose total value is 100 cents or less. ● Count by tens to determine the value of a collection of dimes whose total value is 100 cents or less. ● Count a mixed set of coins whose value is less than 100 ¢ ● Vocabulary: penny, nickel, dime, quarter, value	● What is the value of this group of coins? ● What is money? What are coins? ● What is the value of a penny? … a nickel? … a dime? ...a quarter? ● What strategies help us count a like collection of coins (i.e., all pennies)? ● What strategies help us count a mixed collection of coins?

Standard 1.8 **Measurement and Geometry**

The student will investigate the passage of time by telling time using analog and digital clocks and reading and interpreting a calendar.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. Students will tell time to the hour and half-hour using analog and digital clocks. b. Students will read a calendar to identify a given day or date.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• 7 days of the week; 12 months of the year • Identify the hour hand and the minute hand of an analog clock. • Identify different types of clocks (analog and digital) as instruments to measure time. • Tell time shown on an analog clock to the hour and half-hour. (a) • Tell time shown on a digital clock to the hour and half-hour. (a) • Match a written time (e.g., 1:00, 3:30, 11:00) to the time shown on a digital and analog clock to the hour and half-hour. (a) • Read a calendar to locate a given day or date (e.g., What day of the week is the 10th? What date is Saturday?). (b) • Determine the day/date before and after a given day/date (e.g., Today is the 30th, so yesterday must have been the ?). (b) • Given a calendar, determine the number of any day of the week (e.g., How many Fridays are in the month of October?) • Vocabulary: calendar, day, week, month, year, before, after, digital clock, analog clock, minutes, hours, half-hour	• Why is time important? • What tools are used to measure time? • How can you tell the difference between an analog clock and a digital clock? • How do we know what today's date is? • What are minutes? What are hours? How are these shown on an analog clock? … a digital clock? • How can a digital clock and an analog clock be used to show time to the hour and half-hour? • Can I match a written time to a digital or analog clock? • Why do we use calendars? • What units of time are shown on a calendar? • What words are important when we use a calendar? • How do patterns help us use a calendar? • Can I read a calendar to find a day or date? • Can I tell the day and date before and after any day on a calendar? • Can I determine the date of any day of the week?

Standard 1.9 **Measurement and Geometry**

The student will measure and compare length, weight, and volume using non-standard units.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. Students will measure and compare length using non-standard units. b. Students will measure and compare weight using non-standard units. c. Students will measure and compare volume using non-standard units.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• Length is the distance between two points. • Weight is a measure of the heaviness of an object. • Volume is the measure of the capacity of a container. • Measure the length of objects, using various nonstandard units (e.g., connecting cubes, paper clips, erasers). • Compare the length of two objects, using the terms longer/shorter, taller/shorter, or same as. • Measure the weight of objects, using a balance or pan scale with various nonstandard units (e.g., paper clips, bean bags, cubes). • Identify a balance scale or a pan scale as a tool for measuring weight. • Compare the weight of two objects, using the terms lighter, heavier, or the same, using a balance scale. • Measure the volume of objects, using various nonstandard units (e.g., connecting cubes, blocks, rice, water). • Compare the volumes of two containers to determine whether the volume of one is more, less, or equivalent to the other, using nonstandard units of measure (e.g., a spoonful or scoopful of rice, sand, jellybeans). • Compare the volumes of two containers to determine whether the volume of one is more, less, or equivalent to the other by pouring the contents of one container into the other. • Vocabulary: measure, length, volume, weight, estimate, attribute, taller, shorter, longer, scale, balance, nonstandard, lighter, heavier, equivalent)	• What is a tool used to measure weight? • Which objects could we use to measure the length of your desk? • What does it mean to "measure" something? • What characteristics (attributes) of an object can be measured? • What is length? Why are height and distance also measures of length? • What is volume? • What is weight (or mass)? • Why is it important to name the unit of measure we are using? • How can I estimate and measure the length of an object using nonstandard units? • How can I compare the length of two objects using the words longer/shorter, taller/shorter, or same as? • How can I estimate and measure the volume of one container using nonstandard units? • How can filling containers help us measure and compare their volumes? • What words are used to compare the volumes of two containers (more, less, equivalent to the other)? • How does a balance scale help us compare the weights of two objects? • How can I estimate and measure the weight/mass of objects using a balance scale with nonstandard units? • What words are used to compare the weight of two objects (lighter, heavier, equivalent to)?

Standard 1.10 **Measurement and Geometry**

The student will recognize and describe 2-dimensional figures.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. Students will identify and describe circles, rectangles, squares, and triangles according to the number of sides, vertices, and angles. b. Students will sort circles, rectangles, squares, and triangles. c. Students will identify right angles in squares and rectangles.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• A rectangle has 4 sides, 4 right angles, and 4 vertices and the top and bottom are the same and the left and right are the same. • A square has 4 equal sides, 4 right angles, and 4 vertices. • A triangle has 3 sides, 3 angles, and 3 vertices. • A circle does not have any angles, sides, or vertices. • 2-dimensional shapes are also called plane figures or flat shapes • Trace triangles, squares, rectangles, and circles. • Describe a circle using terms such as round and curved. • Describe triangles, squares, and rectangles by the number of sides, vertices, and angles. • Recognize that rectangles and squares have special types of angles called right angles. • Sort 2D figures based on their characteristics (number of sides, vertices, angles, curved, etc.). • Identify and describe representations of circles, squares, rectangles, and triangles, regardless of orientation, in different environments and explain reasoning. • Vocabulary: circle, rectangle, square, and triangles, angles, sides, vertices (vertex), 2-dimensional	• How can we tell if an angle is a right angle? • How can I find out how many angles a shape has? • How can we compare 2 shapes? How are they alike? How are they different? • How can we recognize a triangle? … a square? … a rectangle? … a circle? • What words help us describe geometric shapes? (Number of sides, vertices, angles, curved, right angles, etc.). • How do the characteristics of shapes help us sort them? • How can we recognize and describe the geometric shapes which are parts of pictures and models? • How can we recognize and describe geometric shapes in the world around us regardless of orientation?

Standard 1.11 **Probability and Statistics**

The student will construct and interpret graphs.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. The student will collect, organize, and represent various forms of data using tables, picture graphs, and object graphs; and b. The student will read and interpret data displayed in tables, picture graphs, and object graphs, using the vocabulary more, less, fewer, greater than, less than, and equal to.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• Vocabulary: data, graph, table, picture graph, object graph, more, less, more than, less than, equal to, tally, horizontal, vertical • Students should be able to collect data using tally marks. • Collect and organize data using various forms of data collection (e.g., counting and tallying, informal surveys, observations, voting). • Represent data in tables, picture graphs, and object graphs. • Analyze information displayed in tables, picture graphs, and object graphs (horizontally or vertically represented): ○ Read the graph to determine the categories of data and the data as a whole (e.g., the total number of responses) and its parts (e.g., 15 people are wearing sneakers) ○ Interpret the data that represents numerical relationships, to include using the words more, less, fewer, greater than, less than, and equal to.	• What is data? • What data is useful for us to collect? • What are some ways to gather and record information (data) (to include counting, tallying marks, informal surveys, observations, and voting)? • How do tables, picture graphs, and object graphs help us display and make sense of data? • How do we "read" a picture graph? What kinds of information does it show? • How do we "read" an object graph? What kinds of information does it show? • How can we use a picture graph or object graph to compare different categories of information? • Can I answer, "How many more?" "How many fewer?", "How many greater than/less than?", and "How many are equal to?" questions when reading tables, object graphs, and picture graphs?

Standard 1.12 **Probability, Statistics, and Data Analysis**

The student will sort and classify concrete objects using up to two attributes.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. The student will sort and classify concrete objects using up to two attributes.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• Sort and classify concrete objects into appropriate subsets (categories) based on one or two attributes, such as size, shape, color, and/or thickness (e.g., sort a set of objects that are both red and thick). • Label attributes of a set of objects that has been sorted. • Name multiple ways to sort a set of objects. • Vocabulary: sort, classify, group, category, size, color, shape, thick, thin, attribute	• What attributes might be used to sort objects (color, shape, size, thickness)? • How can we sort the same set of objects in different ways? • Can I describe how I grouped objects (color, shape, size, thickness)?

Standard 1.13 **Patterns, Functions and Algebra**

The student will identify, describe, extend, create, and transfer growing and repeating patterns.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. The student will identify, describe, extend, create, and transfer growing and repeating patterns.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• Identify the pattern in a given color, geometric figure, or numerical sequence. • Describe the pattern in a given color, geometric figure, or numerical sequence in terms of the core (the part of the sequence that repeats). • Extend a repeating or growing pattern, using manipulatives, geometric figures, numbers, or calculators. • Transfer a pattern from one form to another. (e.g., naming patterns with letters AB, ABC, AABB, etc.) • Growing patterns may be represented in various ways, including dot patterns, staircases, pictures, etc. • Vocabulary: pattern, repeating pattern, growing pattern, core	• What is a pattern? • How can we recognize a repeating pattern? … a growing pattern? (Color, geometric figure, or numerical sequences) • Can I describe a repeating and growing pattern in a given color, geometric figure, or numerical sequence? • What are some ways we can create patterns? • What patterns can be found in our environment? • How does finding and describing the repeated part (or core) of a pattern help us extend it? • Can I extend a repeating or growing pattern, using manipulatives, geometric figures, or numbers? • Can I transfer a pattern from one form to another? (i.e., 1, 2, 3, 4...has the same structure as 10, 11, 12, 13)

2nd Grade

2nd Grade

The student will:

Number Sense

- count forward, backwards, skip count, and determine even or odd.
- develop an understanding of Place Value with 3-digit numbers.
- count and identify the ordinal positions first through twentieth.
- develop an understanding of fractions represented using various models.

Computation and Estimation

- develop basic facts strategies and demonstrate fluency with addition and subtraction within 20.
- add and subtract 2-digit numbers to solve problems.

Measurement and Geometry

- count and compare collections of pennies, nickels, dimes, and quarters whose total value is $2.00 or less.
- investigate the passage of time by telling time using analog and digital close and reading and interpreting a calendar.
- estimate and measure length, weight, and capacity.
- read a thermometer to the nearest 10 degrees Fahrenheit.
- identify, describe, compare, and contrast 2-dimensional and 3-dimensional figures.
- identify and create figures with at least one line of symmetry.

Probability and Statistics

- collect data and use and interpret pictographs and bar graphs.

Patterns, Functions, and Algebra

- identify, describe, extend, create, and transfer patterns found in objects, pictures, and numbers.

Standard 2.1 **Number Sense**

The student will count forwards, backwards, skip count and determine even or odd.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. Students will be able to skip count by twos, fives, and tens given any multiple of two, five, or ten as a starting point. b. Students will be able to count backwards by tens starting at 120. c. Students will demonstrate if a number is even or odd by pairing objects or dividing them into two equal groups.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• Count forward by twos, fives, and tens given any multiple of two, five, or ten. • Count backward by ten starting at 120. • Use objects to determine whether a number is even or odd (e.g., dividing collections of objects into two equal groups or pairing objects) • Vocabulary: count, skip count, group, fives, twos, tens, even, odd, pattern, sequence	• How can we use tools (objects, number lines, hundred charts, and calculators) to help us find patterns in numbers? • How can patterns in our number system help us skip count by 2s, 5s, and 10s, no matter what number we start with? • Where are skip-counting patterns found in our everyday lives? • What patterns are formed by even and odd numbers? • How can we use pairing and grouping to demonstrate that a number is odd or even?

Standard 2.2 **Number Sense**

The student will develop an understanding of Place Value with 3-digit numbers.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. The student will read, write, and identify the place value of each digit in a 3-digit number, with and without models. b. The student will use models to represent numbers in multiple ways. (Example: 264 is two hundreds, six tens, four ones **or** twenty-six tens and four ones, etc.) c. The student will round a 3-digit number to the nearest ten. d. The student will compare (with words and symbols) and order whole numbers up to 999 within a set of five numbers. e. The student will be able to find ten more, ten less, 100 more and 100 less than a number up to 999.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• Understand the relationships between ones, tens, and hundreds (ex: ten tens are equal to one hundred.) • Identify the ones, tens, and hundreds place. • Identify the value of the digits in the ones, tens, and hundreds place. • Group collections of objects into groups of ones, tens, and hundreds • Use models to represent numbers in multiple ways, according to place value (e.g., 256 can be 1 hundred, 14 tens, and 16 ones, 25 tens and 6 ones, etc.; this flexibility builds background understanding for the ideas used when regrouping. When subtracting 18 from 174, a student may choose to regroup and think of 174 as 1 hundred, 6 tens, and 14 ones. • Identify which tens a 2-digit and 3-digit number lies between and which ten is closest. • Compare two numbers between 0 and 999 represented with concrete objects, pictorially or symbolically, using the symbols (>, <, or =) and the words greater than, less than or equal to. • Order five whole numbers between 0 and 999 represented with concrete objects, pictorially, or symbolically from least to greatest and greatest to least. • Use place value understanding to identify the number that is 10 more, 10 less, 100 more, or 100 less than a given number, up to 999. • Vocabulary: place, value, digit, group, one, ten, more, less, numeral, round, ones, tens, hundreds, greater than, less than, equal to, compare, nearest	• How can we use models to demonstrate the value of each digit in a two- or three-digit number? • How can you show a 3-digit number as a model in more than one way? (215 = 2 hundreds, 1 ten, 5 ones = 1 hundred 11 tens, 5 ones) • What does it mean to round numbers to the nearest 10? Why is rounding numbers useful? • How can a number line be used to round numbers to the nearest ten? • What words and symbols are used to compare and order whole numbers? • How do patterns in place value help us to find 10 more, 10 less, 100 more, or 100 less than a number?

Standard 2.3 **Number Sense**

The student will count and identify the ordinal positions first through twentieth.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. The student will count and identify the ordinal positions first through twentieth, using an ordered set of objects. b. The student will write the ordinal numbers 1st through 20th.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas

• The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to
  ○ Count an ordered set of objects, using the ordinal number words first through twentieth.
  ○ Identify the ordinal positions first through twentieth, using an ordered set of objects presented in lines or rows from
  ■ – left to right.
  ■ – right to left.
  ■ – top to bottom; and
  ■ – bottom to top.
  ○ Write 1st, 2nd, 3rd, through 20th in numerals.
• Vocabulary: order, first, …, twentieth, top, bottom, above, below, right, left, front, back, before, after, ordinal number, position
	• How do ordinal numbers help us identify items?
	• How are ordinal numbers named and written (number and word form)?
	• How are ordinal numbers different from counting numbers?
	• How can we use objects to model the ordinal positions from the first to the twentieth positions?

Standard 2.4 **Number Sense**

The student will develop an understanding of fractions represented using various models.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. The student will name and write fractions represented by a set, region, or length model for halves, fourths, eighths, thirds, and sixths. b. The student will represent fractional parts with models and with symbols. c. The student will compare the unit fractions for halves, fourths, eighths, thirds, and sixths, with models.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• Understand fair shares. • Represent fractions using symbols and pictures. • Understand unit fractions. • Represent halves, fourths, eighths, thirds, and sixths. • Students will describe a fraction using the terms numerator and denominator. • Vocabulary: fraction, half, third, fourth, sixth, eighth, set, region, length, part, whole, equal, greater than, less than, compare, numerator, denominator	• How can we model fractional parts of a region or area? How are the parts identified? • How can we model fractional parts of a set? How are the parts identified? • How can we model fractional parts of a length model? How are the parts identified? • Why are the words part, whole, and equal important when working with fractions? • What do we need to think about when we compare fractions or put them in order by size?

Standard 2.5 **Computation and Estimation**

The student will develop basic facts strategies and demonstrate fluency with addition and subtraction within 20.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. Determine the missing number in an equation (number sentence) (e.g., 3 + = 5; + 2 = 5; 5 - = 3; or 5 – 2 =). b. Write the related facts for a given addition or subtraction fact (e.g., given 3 + 4 = 7, write 7 – 4 = 3 and 7 – 3 = 4). c. Demonstrate fluency with addition and subtraction within 20. d. Recognize and use the relationship between addition and subtraction to solve single-step practical problems, with whole numbers to 20	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
● Strategies listed below for addition and subtraction. ○ counting on. ○ counting back. ○ "One more than," "two more than;" ○ "One less than," "two less than;" ○ "doubles" (e.g., 6 + 6 =); "near doubles" (e.g., 7 + 8 = (7 + 7) + 1 = or (8 + 8) – 1). ○ "make ten" (e.g., 7 + 4 can be thought of as 7 + 3 + 1 in order to make a 10); ○ "Think addition for subtraction" (e.g., for 9 – 5 = , think "5 and what number makes 9?"). ○ use of the commutative property (e.g., 14 +3 is the same as 3 + 14); *students do not need to name the property. ○ use of related facts (e.g., 14 + 3 = 17, 3 + 14 = 17, 17 – 4 = 13, and 17 – 13 = 4). ○ use of the additive identity property (e.g., 14 + 0 = 14). *Students do not need to name the property ○ use patterns to make sums (e.g., 0 + 15 = 15, 1 + 14 = 15, 2 + 13 = 15, etc.). ● Addition and subtraction problems should be presented in both horizontal and vertical written format. ● The equal sign means balance. ● The equal sign can come at the beginning or the end of a number sentence (5 + 2 = 7; 7 = 5 + 2) ● They should understand that a balanced equation can have addition or subtraction on either side of the equal sign. (e.g., 10 - 3 = 4 + 3; or 10 + 3 = 6 + 7)	● How are addition and subtraction related? ● How can we use models to demonstrate related facts? ● How can we use strategies to solve basic addition and subtraction facts? ● How do related facts help us identify missing numbers in number sentences? ● How can we use models to represent an addition or subtraction situation? ● How can the relationship between addition and subtraction be used to complete number sentences and solve problems?

● Addition and subtraction are related to each other. Addition and subtraction should be taught concurrently in order to develop understanding of the inverse relationship. ● Vocabulary: add, subtract, addition, subtraction, plus, minus, sum, difference, solve, strategy, equation, number sentence, related facts, counting on, counting back, one more than, one less than, doubles, near doubles, make ten, think addition, ten frame	

Standard 2.6 **Computation and Estimation**

The student will add and subtract 2-digit numbers to solve problems.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. Students will find the sum of two numbers with one or two digits with and without regrouping, using various methods. b. Students will find the difference of two numbers with one or two digits with and without regrouping, using various methods. c. Students will find the sums and differences of two numbers with three digits without regrouping. d. Students will estimate the sum of two numbers whose sum is 99 or less. e. Students will estimate the difference of two whole numbers each 99 or less. f. Create and solve single and two-step practical problems involving addition, subtraction, or both addition and subtraction.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• Students understand that ten ones make a ten and a ten is made up of ten ones. Students can demonstrate this understanding with base ten blocks. • Students understand that place value rules guide regrouping. Flexible thinking with place value is necessary for regrouping. • Students should begin to explore the properties of addition as strategies for solving addition and subtraction problems using a variety of representations, including manipulatives and diagrams. • Rounding to the nearest ten • Strategies for solving story problems - using manipulatives, drawing pictures. • Vocabulary: add, subtract, estimate, reasonable, solve, sum, difference, addend, flexible, strategy, join, separate, part-part-whole, compare	• When is an estimate more useful than an exact sum? What are some strategies to estimate sums? • When is an estimate more useful than an exact difference? What are some strategies to estimate differences? • How can we use models to represent an addition or subtraction situation? • What are different strategies to compute sums? How do we decide which to use? • What strategies help us compute sums mentally? • What are different strategies to compute differences? How do we decide which to use? • How can the relationship between addition and subtraction be used to complete number sentences and solve problems? • How do we know when solving a problem will require more than one step? • How can we create a story problem from a basic fact or numerical sentence?

Standard 2.7 **Measurement and Geometry**

The student will count and compare collections of pennies, nickels, dimes, and quarters whose. total value is $2.00 or less.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. Students will be able to count a mixed collection of coins (pennies, nickels, dimes, and quarters) and one dollar bills whose total value is $2.00 or less. b. Students will use the cent symbol, dollar symbol, and decimal point when writing the value of a collection of coins whose value is $2.00 or less. c. Students will compare two collections of coins and one-dollar bills where each set's value is $2.00 or less, using the terms greater than, less than, and equal to.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• Identify pennies, nickels, dimes, quarters, and dollar bills. • Identify the value of pennies, nickels, dimes, quarters. • Count on by 1s, 5s, 10s, 25s. • Compare numbers. • Understand the relationship between cents and dollars. • Determine the value of a collection of coins and one dollar bills whose total value is $2.00 or less. • Compare the values of two sets of coins and one-dollar bills (each set having a total value of $2.00 or less), using the terms greater than, less than, or equal to. • Students can solve word problems using their knowledge of coins. • Vocabulary: coin, bill, penny, nickel, dime, quarter, dollar, cent, value, collection, greater than, less than, equal to, decimal point	• How much is the group of coins worth? • How do you determine which group of coins has the greater value? • How can you show an amount in different ways? • What strategies help to count a collection of coins?

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Standard 2.8 **Measurement and Geometry**

The student will investigate the passage of time by telling time using analog and digital clocks. and reading and interpreting a calendar.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. Students will use analog and digital clocks to tell and write the time to the nearest five minutes. b. Students will describe the time as A.M. or P.M. c. Students will identify the relationships between units of time (24 hours/day; 7 days/week; 60 minutes/hour; 60 seconds/minute) d. Students will identify specific days and dates on a given calendar. e. Students will determine past and future days on a given calendar.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• Skip counting by 5. • Students should be able to identify the hour, minute and second hands of an analog clock. • Show, tell, and write time to the nearest five minutes, using an analog and digital clock. • Match a written time (e.g., 4:20, 10:05, 1:50) to a time shown on a clock face. • Match the time shown on a clock face to a written time. • AM is the time from midnight to noon; PM is the time from noon to midnight. • Students will identify the relationships between units of time (24 hours/day; 7 days/week; 60 minutes/hour; 60 seconds/minute) • Determine the day that is a specific number of days or weeks in the past or in the future from a given date, using a calendar. • Identify specific days and dates (e.g., What is the third Monday in a given month? What day of the week is May 11?) • Vocabulary: time, hour, minute, hour hand, minute hand, clock, analog, digital	• What units of time are represented on clocks? • How is reading time on an analog clock different from reading time on a digital clock? How is it similar? • How long does it take for the second hand to make one rotation around an analog clock? How long does it take for the minute hand to make one rotation around an analog clock? • How long does it take for the hour hand to make one rotation around an analog clock? • How does counting by fives help us read time on an analog clock? • What units of time are represented on calendars? • How can we find specific dates? • How can we use the calendar to find and describe past and future dates?

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Standard 2.9 **Measurement and Geometry**

The student will estimate and measure length, weight, and capacity.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. Students will estimate and measure length to the nearest inch. b. Students will estimate and measure weight to the nearest pound. c. Students will estimate and measure liquid volume using cups, pints, quarts, and gallons	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
● how to use a ruler, yardstick; using ruler when you do not start at 0" ("broken ruler") ● how to use a scale, different kinds of scales ● use investigations and reasoning skills to make comparisons of length or weight between 2 objects. ● use investigations and reasoning skills to make comparisons of liquid volume between 2 objects. ● Vocabulary: ruler, inch, weight, pound, volume, capacity, cups, pints, quarts, gallons	● What tool can be used to measure length? ● What tool can be used to measure weight? ● What tools can be used to measure liquid volume? ● Which of these objects is about a pound? more than a pound? less than a pound? ● Can you find an object that is about an inch long? ● Which of these objects is longer than an inch? shorter than an inch? ● How can liquid volume (capacity) of a container be measured?

Standard 2.10 **Measurement and Geometry**

The student will read a thermometer to the nearest 10 degrees Fahrenheit.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. Students will read a thermometer to the nearest 10 degrees Fahrenheit.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
● Degrees are the unit of measurement used to measure temperature. ● Temperature is the measurement of hotness or coldness of an object or environment. ● A thermometer is a tool used to measure temperature. ● Identify different types of thermometers as instruments used to measure temperature. ● The symbol used to write Fahrenheit is ℉	● What are some things that feel cold/hot? ● What units and tools are used to measure temperature? ● How do we read temperature on a Fahrenheit thermometer?

Standard 2.11 **Measurement and Geometry**

The student will identify, describe, compare, and contrast 2-dimensional and 3-dimensional figures.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. Identify and describe 3 dimensional figures (spheres, cubes, rectangular prisms), according to the shape of their faces, number of edges, and number of vertices, using models. b. Compare and contrast 2-dimensional and 3-dimensional figures (circles/spheres, squares/cubes, rectangles/rectangular prisms) according to their characteristics (number and shape of their faces, edges, vertices, and angles).	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• Vocabulary: circles, squares, rectangles, triangle, spheres, cubes, rectangular prisms, cones, cylinders, square pyramid, vertex, vertices, faces, edges, 2-dimensional, 3-dimensional, plane figure, solid figure, angles, prism, attribute • Determine similarities and differences between related 2D and 3D figures (circles/spheres, squares/cubes, rectangles/rectangular prisms), using models and cutouts. • Trace faces of 3D figures (cubes and rectangular prisms) to create the set of 2D figures related to the 3D figure. • Identify and describe 2D figures (circles, squares, and rectangles), according to their characteristics (number of sides, vertices, and angles). Squares and rectangles have four right angles. • Identify and describe 3D figures (spheres, cubes, and rectangular prisms), according to the shape of their faces, number of edges, and number of vertices, using models. • Compare and contrast 2D and 3D figures (circles/spheres, squares/cubes, and rectangles/rectangular prisms) according to their characteristics (number and shape of their faces, edges, vertices, and angles).	• How are 3D (solid) shapes and 2D (plane) shapes alike? Different? • Where can we find examples of shapes at school? • What are the attributes that determine or identify a 3D (solid) geometric figure? (Faces—sides and bases, edges, vertices, and angles) • How does a circle compare to a sphere? …a square to a cube? …a rectangle to a rectangular prism? • How can we find related 2D figures by tracing models of 3D shapes (solids)?

Standard 2.12 **Measurement and Geometry**

The student will identify and create figures with at least one line of symmetry.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. The student will draw a line of symmetry in a figure. b. Identify figures with at least one line of symmetry, using various concrete materials (e.g., mirrors, paper folding, pattern blocks). c. Create figures with at least one line of symmetry using various concrete models.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• A line of symmetry divides a figure into two congruent parts each of which is the mirror image of the other. • Lines of symmetry are not limited to horizontal and vertical lines. • Draw a line of symmetry in a figure. • Identify figures with at least one line of symmetry, using various concrete materials (e.g., mirrors, paper folding, pattern blocks). • Create figures with at least one line of symmetry using various concrete materials.	• What is a line of symmetry? • Do all figures have a line of symmetry? • Can some figures have more than one line of symmetry? • What strategies can we use to determine whether a figure has a line of symmetry? • How can we create a figure with a line of symmetry?

Standard 2.13 **Statistics, Probability, and Data Analysis**

The students will collect data and use and interpret pictographs and bar graphs.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. The students will collect, organize, and represent data in pictographs and bar graphs. b. The students will read and interpret data represented in pictographs and bar graphs.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• Collect and organize data using various forms of data collection (e.g., lists, tables, objects, pictures, symbols, tally marks, charts). • Represent data in pictographs and bar graphs. • Read and interpret data represented in pictographs and bar graphs. • Read and interpret a pictograph when the symbols represent 1, 2, 5 or 10 items. • Read and interpret a bar graph with a scale of 1, 2, 5 or 10. • Statements that represent an analysis and interpretation of the data in the graph should be discussed with students and written (e.g., similarities and differences, least and greatest, the categories, total number of responses, etc.).	• Why are pictographs and bar graphs useful? • What are the characteristics of pictographs and bar graphs? • Why do we organize data from experiments into lists, tables, tallies, pictures, symbols, and/or charts before we create a graph? • How do we construct a pictograph? • How do we construct a bar graph? • What special features of a graph help us read and interpret it? • How can we interpret the information in a graph to answer questions, make comparisons, draw conclusions, and make predictions?

Standard 2.14 **Patterns, Functions and Algebra**

The student will identify, describe, create, extend, and transfer patterns found in objects, pictures, and numbers.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. The students will identify, describe, create, extend, and transfer patterns found in objects, pictures, and numerical patterns.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• Identify a pattern as growing or repeating. • Describe the core (the part of the sequence that repeats) of a given repeating pattern. • Describe how a given growing pattern is changing. • Create a growing or repeating pattern, using objects, pictures, or numbers. • Extend a given pattern, using objects, pictures, or numbers. • Transfer a given growing or repeating pattern from one form to another using objects, pictures, or numbers. • In numeric patterns, students must determine the difference, called the common difference, between each succeeding number in order to determine what is added to each previous number to obtain the next number. Students do not need to use the term common difference at this level. (32, 39, 46, 53, _)	• What is the pattern? • How can we recognize and identify repeating patterns? • How can we recognize and identify growing patterns? • How are repeating and growing patterns created? • How can we extend a pattern to predict what comes next? • How can we recognize a pattern, to create the same pattern in a different form?

3rd Grade

3rd Grade

The student will:

Number Sense

- demonstrate an understanding of six-digit numbers.
- identify Roman numerals.
- demonstrate fractions as parts of a whole.

Computation and Estimation

- add and subtract 4-digit numbers.
- multiply and divide into whole numbers.

Measurement and Geometry

- demonstrate an understanding of money.
- estimate and use customary and metric units.
- understand the concept of time.
- draw, classify, and represent lines and angles.
- identify and describe the characteristic of geometry shapes (polygons).
- measure polygons.

Probability and Statistics

- read, organize, and analyze data and probability using charts and graphs.

Patterns, Functions, and Algebra

- analyze patterns to represent mathematical relationships.

Standard 3.1 **Number Sense**

The student will demonstrate an understanding of six-digit numbers.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. Students will recognize, read, count, compare, order, and write six-digit numbers in standard, expanded, and written forms (with and without models). b. Students will identify numbers as odd or even by dividing objects into two equal groups. c. Students will identify place value through the thousands place. d. Students will round numbers to the nearest tens, hundreds, and thousands up to 9,999.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
Vocabulary - period, digit, expanded form, standard form, word form, value, place value, odd, even, greater than >, less than < and equal to = ● Recognize the difference between a digit and a number. ● Recognize that the same numeral can have different values depending on position. ● Rounding can be used as a way to estimate how large or small a number is. Students should round numbers that have meaning in their lives. A number line can be used to round. ● Understand that place value is based on the patterns of tens where each place value is 10 times the value of the digit to the right of it. ● Decomposing numbers, writing them in expanded form, and thinking about the different place values helps students when it comes to regrouping and subtraction problems. • Example: 1247 can be decomposed into one thousand, two hundreds, four tens, and seven ones or twelve hundreds, two tens, and twenty-seven ones. ● The numbers students work with should have real-world meaning. ● Compare and order using greater than, less than, equal to, or not equal to and corresponding symbols (<, >, = or ≠).	● How can we understand the value of a number by using models and a place value chart to represent them? ● How can we demonstrate how to compose and decompose a whole number? ● How can numbers be manipulated? ● How can I show numbers are related to each other? ● Why are rounding rules necessary? ● When is it useful to estimate how large or small a number is? ● When is it helpful to compare numbers?

Math 3.2 **Number Sense**

The student will identify Roman numerals.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. Students will read and write Roman numerals using I, V, X, L, C, D, and M.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
Vocabulary - numeral, Roman numerals I, V, X, L, C, D, and M.	• Where would I see Roman numerals? • Why is it important to understand how to read Roman numerals?

Standard 3.3 **Number Sense**

The student will demonstrate fractions as parts of a whole.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. Students will represent fractions using models as parts of a whole, parts of collections, and locations on number lines. b. Students will identify, model, and write mixed numbers. c. Students will identify, model, and write proper and improper fractions. d. Students will use models and number lines to identify equivalent fractions. e. Students will compare and order fractions with common numerators or common denominators.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas

vocabulary - fractions, numerator, denominator, equivalent fractions, mixed number, improper fraction, proper fractions, greater than >, less than < and equal to =
● Recognize that the numerator can be bigger than the denominator to have a number larger than 1 whole.
● Recognize that two fractions can be equal to each other.
● Identify if fractions are equivalent by using a number line.
● Benchmark fractions (closer to 1, closer to ½, closer to 0) help to judge the size of fractions and compare and order fractions.
● Visual models of mixed numbers and improper fractions represent that there is more than one whole.
● A fractional part of a whole can be modeled using:
  • Region/area models (pie pieces, pattern blocks, geoboards, drawings, etc.)
  • Set models (chips, counters, cubes, drawings)
  • Length/measurement models (rods, connecting cubes, number lines, rulers, and drawings).
● Students should look for patterns when comparing fractions with the same denominator or fractions with the same numerator.
● Connections to the real world should be made when working with fractions. For example: Using mixed numbers and improper fractions in cooking, road signs, ordering deli meat at the grocery store.
● Using a model of a fraction greater than one, count the fractional parts to name and write as an improper fraction and
	● How are fractions part of a whole?
	● How are fractions used in real-world situations?
	● When are fractions and whole numbers used together in real life?
	● When is it helpful to break things into parts?

a mixed number (e.g. $\frac{1}{4}, \frac{2}{4}, \frac{3}{4}, \frac{4}{4}, \frac{5}{4} = 1\frac{1}{4}$ or $2\frac{1}{3} = \frac{7}{3}$)	

Standard 3.4 **Computation and Estimation**

The student will add and subtract four-digit numerals.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. Students will add four-digit numbers with and without regrouping. b. Students will add using more than two numbers. (Each number being 4 digits or less) c. Students will subtract across zeros with four-digit numbers. d. Students will use the commutative, identity, and associative properties of addition and subtraction. e. Estimate, create, and solve real-world problems using addition and subtraction	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
Vocabulary - addends, sum, minuend, subtrahend, difference, regrouping, commutative property, identity property, associative property ● Recognize that you can take apart and recombine numbers in a variety of ways for finding sums and differences. ● Identify strategies to use to compute sums and differences mentally. ● Estimating a sum or difference can help build number sense and help students determine if their solution is reasonable. ● A variety of methods can be used to solve addition and subtraction problems: manipulatives like base 10 blocks, cubes, and beans, diagrams, symbols, counting up, using doubles, making 10. ● When students develop flexibility of numbers using place value concepts, they will be able to estimate and do the computations more easily. ● Real world context should be used while solving addition and subtraction problems. Emphasis should not be placed upon key words, but instead what piece of information is missing and using problem solving strategies to get to a solution. ● Continue to develop automaticity and fluency of addition and subtraction facts	● Why do I need to add (subtract)? ● How can knowing the addition and subtraction facts help me? ● How do I recognize what strategy to use for a specific problem? ● How can we show how numbers are related to each other?

Standard 3.5 **Computation and Estimation**

The student will multiply and divide into whole numbers.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. Students will demonstrate automaticity and fluency with multiplication and division facts 0-12. b. Students will multiply up to two-digit numbers by a single digit. c. Students will represent multiplication and division in multiple ways. (Using arrays, number lines, equal groups, and area models) d. Students will create real world examples to demonstrate multiplication and division.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
Vocabulary - factor, product, divisor, dividend, quotient, inverse operation, fact family, zero property of multiplication, identity property, commutative property of multiplication ● Recognize what the product is when you multiply by zero. By 1. ● Recognize that repeated addition and multiplication are related. ● Repeated addition is a way to model multiplication. ● Arrays, number lines, equal groups, and area models illustrate multiplication and division concepts and facts. ● Multiplication and division as inverse operations. ● Fact families help to learn multiplication and division facts. ● The property of one in multiplication and division says anything multiplied or divided by one results in the original number. ● The zero property in multiplication says anything multiplied by 0 is 0. ● The commutative property of multiplication should be used to learn facts more easily. Ex) 3 x 6 = 6 x 3	● Why is it important to know what operation to use in different situations? ● How can I relate what I know about skip counting to multiplication? ● How can I use what I know about repeated subtraction, equal sharing and forming equal groups to solve division problems? ● How do patterns help us solve problems? ● How does the commutative property help to make it easier to remember our multiplication facts?

Standard 3.6 **Measurement and Geometry**

The student will demonstrate an understanding of money.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. Students will count up to and make change for five dollars using bills and coins. b. Students will estimate amounts to the nearest dollar. c. Students will write money appropriately as decimals or with a cent sign, not both.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
Vocabulary - penny, nickel, dime, quarters, half dollar, dollar sign, cent sign ● Identify ways to represent the same amount of money using different combinations of coins and bills. ● Identify ways to represent various amounts of money using decimal notation and the symbols for cents or dollars. ● Recognize that you can create efficient and inefficient ways for combining coins and making change. ● Students can count up to make change up to $5.00. ● Estimating helps us determine if we have enough money. ●	● Why is it important to understand the values of coins (bills)? ● Why do we have money? ● How does money relate to patterns?

Math 3.7 **Measurement and Geometry**

The student will estimate and use customary and metric units.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. Students will estimate and measure length to the nearest ½ inch, inch, foot, yard, centimeter, and meter. b. Students will estimate and measure liquid volume in cups, pints, quarts, gallons, milliliters, and liters. c. Students will estimate and measure weight and mass in ounces, pounds, grams, and kilograms. d. Students will estimate, read, and measure temperature to the nearest degree in Fahrenheit and Celsius.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• vocabulary - length, inch, foot, yard, centimeter, meter, liquid volume, cup, pint, quart, gallon, milliliter, liter, capacity, ounces, pounds, grams, kilograms, temperature, degrees, Fahrenheit, and Celsius • Manipulatives and real-world items should be used when measuring length, capacity, liquid volume, and temperature. • Estimation should be used along with taking actual measurements. This will help to give students a better sense of these concepts and the quantities involved in each scenario. • Connections between the unit and other units within the same system can be made. For example: A foot is made up of inches, meters are made up of centimeters etc. •	• What is the relationship between standard and metric measurements? • How do you use weight and measurement in your life? • How do you decide which measurement to use? • How can I measure length, mass, and capacity by using non-standard units? • How do I choose the appropriate tool and unit when measuring? • Why is estimating the measurement of an item important?

Standard 3.8 **Measurement and Geometry**

The student will understand the concept of time.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. Students will tell the time to the nearest minute using analog and digital clocks. b. Students will recognize expressions of time before or after the hour as being the same (quarter past is15, half past is :30, quarter till is :45). c. Students will calculate elapsed time to the nearest hour. d. Students will identify equivalent periods of time (63 minutes = 1 hour and 3 minutes; 17 days = 2 weeks and 3 days).	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
vocabulary - analog, digital, elapsed, seconds, minutes, hours, days, weeks, months, years, calendar. ● Elapsed time is the amount of time that has passed between two given times. ● When students are given the beginning time and an ending time, they should determine the elapsed time in one- hour increments. Given the beginning and elapsed time in one- hour increments they should determine the ending time. Given the ending time and the elapsed time in one-hour increments, students should determine the beginning time. ● Timelines and number lines can be used to help determine elapsed time. ● Equivalent times can be represented. For example, 1 hour is 60 minutes. 1 month is about 30 days. 1 week is 7 days. Quarter past an hour is :15 etc. ● Calendars help us to understand the relationships between days, months, and years.	● What tools and units are used to measure the attributes of time? ● What is the difference between length of time and time of day? ● Why is telling time important? ● How do you use a calendar in daily life? ● How do the different units of time relate to each other? ● How do I use a clock to tell time to the nearest quarter hour? ● How can I tell time using both digital and analog clock faces? How are they similar? How are they different? ●

Standard 3.9 **Measurement and Geometry**

The student will draw, classify, and represent lines and angles.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. Students will identify and draw points, lines, line segments, rays, and angles. b. Students will identify and draw parallel, perpendicular, and intersecting lines. c. Students will identify and draw acute, obtuse, right, and straight angles.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
vocabulary - point, line, line segment, ray, parallel lines, perpendicular lines, acute angle, obtuse angle, right angle, straight angle ● A point is one location in space. ● A line is made up of 2 or more points. It extends infinitely and does not have an endpoint. ● A line segment is part of a line. It has two endpoints and all of the points in between. ● A ray is part of a line. It has one endpoint and extends infinitely in one direction. ● An angle is formed by two rays meeting at a vertex. Anytime two rays or lines intersect they will form an angle. ● Types of angles: o Acute: Angles less than 90 degrees o Obtuse: Angles larger than 90 degrees and less than 180 degrees. o Right: An angle that is 90 degrees o Straight Angle: An angle that is 180 degrees. ● Parallel lines are two lines that never intersect. ● Intersecting lines are two lines that cross. ● Perpendicular lines are two lines that intersect at a 90-degree angle. ● Estimating the measure of angles will help students to develop a deeper understanding of the size of an angle.	● How are position words useful? ● What is the difference between a point, ray, line, line segment? ● How are points, lines, line segments, rays, and angles related? ● How are angles measured? ● How are angles classified? ● Where do we see these lines and angles every day?

Standard 3.10 **Measurement and Geometry**

The student will identify and describe the characteristics of geometric shapes (polygons).

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. Students will identify and name properties of two-dimensional shapes with ten or fewer sides. b. Students will combine and subdivide polygons with three or four sides and name the resulting polygons. (To make figures with 8 or fewer sides) c. Students will explore congruent shapes.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
vocabulary - plane shapes, solid shapes, polygon, square, rectangle, rhombus, parallelogram, trapezoid, triangle, pentagon, hexagon, congruent ● A polygon is a closed figure with at least 3-line segments. ● Polygons can be described based on their attributes. For example, the number of sides, vertices, and angles. ● Polygons: o Triangle- 3 sides o Quadrilateral- 4 sides o Pentagon- 5 sides o Hexagon- 6 sides o Heptagon- 7 sides o Octagon- 8 sides o Nonagon – 9 sides o Decagon – 10 sides ● No more than 3 polygons with 3 or 4 sides should be combined to make a new polygon. ● Students can take a polygon and subdivide it into polygons with less sides. ● Congruent figures have the same size and shape. Non congruent figures do not have exactly the same size and shape. ● When the orientation of a figure changes, the size and shape should not change.	● How can objects be represented and compared using geometric attributes? ● How are the attributes of quadrilaterals similar and different? ● How do the properties of polygons help to classify them? ● How can we determine if two figures are congruent or non-congruent?

Standard 3.11 **Measurement and Geometry**

The student will measure polygons.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. Students will use tiles to measure the perimeter of various polygons. b. Students will count the number of square units needed to cover a given surface to determine the area.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
vocabulary - perimeter, area, square units ● Perimeter is the distance around a figure. ● Area is the number of units needed to cover the inside of a figure. ● Students should use manipulatives to calculate area and perimeter. For example, using square tiles to calculate perimeter and area, using toothpicks, rulers, or string to calculate perimeter. ● Estimating perimeter first will help students to develop a better sense of numbers and measurement.	● What is perimeter and how is it measured? ● How are perimeter and area different? ● Where would area and perimeter be used outside of school?

Standard 3.12 **Probability and Statistics**

The student will read, organize, and analyze data and probability using charts and graphs.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. Students will construct and analyze tally charts, pictographs, and bar graphs. b. Students will use spinners, coins, and die to predict possible outcomes. c. Students will describe the concept of chance in terms of certain, likely, equally likely, unlikely, and impossible.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• Vocabulary - tally chart, scale, interval, pictograph, bar graphs, likely, unlikely, equally likely • Probability is the chance that an event will happen. • To determine probability, begin by listing all of the possible outcomes as a table, chart, or list. • An event can be impossible, likely, unlikely, certain, or equally likely to occur. • To explore probability, students should be participating in hands on activities to actually test out or experiment and find the probability. They can then describe the event as likely, unlikely, or equally likely to occur. • A pictograph uses pictures to represent data. • A bar graph uses bars to show the frequency and compare categorical data. • Graphs should be used to make inferences and predictions. How are the graphs similar? How are the graphs different? What do you think would happen if…? Which had the least? Etc. • Graphs should have titles, labels, and keys. • A pictograph can also help reinforce skip counting if each picture represents more than one count. • Students should use surveys to collect data and create their own graphs.	• How can a chart or graph help you answer a question? • Why do you use different graphs for different information? • How can we predict the likelihood of an event? • Why do we collect data? • How do graphs help to organize data? • How can we use graphs to make inferences and predictions?

Standard 3.13 **Patterns, Functions, and Algebra**

The student will analyze patterns to represent mathematical relationships.

Benchmarks
Key knowledge and skills we want students to know and be able to do

a. Students will identify, describe, create, and extend patterns found in objects, pictures, numbers, and tables.
b. The students will create equations to represent equivalent mathematical relationships. (Using addition and subtraction only)

Essential Knowledge
Key facts, concepts, and ideas needed to successfully meet benchmarks

- Patterns can be repeating patterns or growing patterns and can be shown using words, objects, pictures, numbers, and tables.
- Students should fill in the missing term of a pattern. (Can be an extension of the pattern or a missing part of what is given)
- When given a rule of adding or subtracting, students can complete an input/output table. (Addition and subtraction only)
- Example: Rule: Add 3

Input	Output
3	6
6	9
7	10

- Given an input/output table, students should write the rule. (Addition and subtraction only)
- A repeating pattern is where the terms are repeated.
- In a growing pattern, students must identify the constant that is being added or subtracted each time and then apply it.
- Geometric patterns, numeric patterns, and input/output should all be used to demonstrate patterns.
- An equation is a number sentence where the values on both sides of the equal sign are balanced (equivalent)
- The ≠ (not equal) sign is used to show when one side of the equal sign does not balance the other side.
- Equations can be represented with the balance scale, with equal amounts on both sides.

Examples: 5 + 3 = 10-2 or $223 + 100 \neq 323 + 100$

Essential Questions
Questions to guide student inquiry and focus instruction to uncover big ideas

- What is the pattern?
- Where do we see patterns in our everyday lives?
- How do patterns help to make predictions?
- How are tables used to show patterns?

What does an = sign tell us about a number sentence?

4th Grade

4th Grade

The student will:

Number Sense

- demonstrate an understanding of nine-digit numbers.
- identify prime and composite numbers.
- demonstrate fractions as parts of a whole.
- demonstrate decimals as parts of a whole.

Computation and Estimation

- add and subtract multi-digit numbers.
- add and subtract fractions.
- add and subtract decimals and money.
- multiply and divide multi-digit numbers.

Measurement and Geometry

- estimate and use customary and metric units.
- demonstrate an understanding of the concept of elapsed time.
- identify geometric figures.
- measure polygons.

Probability and Statistics

- read, interpret, organize, and analyze data and probability using charts and graphs.

Patterns, Functions, and Algebra

- use patterns to represent mathematical relationships.

Standard 4.1 **Number Sense**

The student will demonstrate an understanding of nine-digit numbers.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. Students will read, compare, write, and order nine-digit numbers. b. Students will identify place value through the millions period. c. Students will round numbers to the nearest thousands, ten thousands, and hundred thousands up to 999,999.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
Vocabulary - period, digit, expanded form, standard form, word form, value, place value, greater than >, less than < and equal to = ● Build on previous knowledge to recognize that a digit in one place represents ten times what it represents in the place to its right. ● Place value can be used to compare and order numbers. ● Rounding whole numbers is a process for finding the multiple of 10, 100, and so on closest to a given number. ● Rounding numbers can help us to estimate the value of a number and to compare numbers. ● Numbers used for comparing and rounding should be relative to the students' lives. (Real world context)	● How can we understand the value of a number by using models and a place value chart to represent them? ● How can we demonstrate how to compose and decompose a whole number? ● How can we represent numbers in other ways? ● How can I compare and order numbers? ● How can the same numeral have different values? ● What does it mean to round a number? ● What is the difference between digit and a number? ● When do we compare numbers in our everyday lives? ● What does rounding help us to do?

Standard 4.2 **Number Sense**

The student will identify prime and composite numbers.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. Students will define prime and composite numbers. b. Students will identify prime numbers up to 20.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
vocabulary - prime, composite, factors, multiples ● Understanding of math vocabulary above is essential prior knowledge, as is basic fact fluency. ● A prime number is a natural number, other than one, that has exactly two different factors, one and the number itself. ● A composite number is a natural number that has factors other than one and itself. ● The number one is neither prime nor composite because it has only one set of factors and both factors are one. ● Prime and composite numbers can be represented by rectangular arrays. There is only one array that can be made for prime numbers.	● What are the factors? ● How are factors and multiples different? ● How are prime numbers useful in mathematics?

Standard 4.3 **Number Sense**

The student will demonstrate fractions as parts of a whole.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. Students will read, write, compare, and order fractions and mixed numbers with unlike denominators of 12 or less. b. Students will model, identify, and create equivalent fractions. c. Students will use the greatest common factor to simplify fractions to lowest terms. d. Students will model and change improper fractions to mixed numbers and mixed numbers to improper fractions. e. Identify the division statement that represents a fraction with models and in context.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
vocabulary - fractions, numerator, denominator, equivalent fractions, mixed number, improper fraction, proper fractions, simplest form, lowest terms, greatest common factor, least common multiple, greater than >, less than <, equal to =, and not equal to ≠ ● The same fractional amount can be represented by an infinite set of equivalent fractions. ● Equivalent fractions are found by multiplying the numerator and denominator by the same nonzero number, (i.e., $\frac{4}{4} = 1$. ● If two fractions have the same denominator, the fraction with the greater numerator is the greater fraction. If two fractions have the same numerator, the fraction with the lesser denominator is the greater fraction. ● Fractional amounts greater than one can be represented using a whole number and a fraction. Whole number amounts can be represented as fractions. When the numerator and denominator are equal, the fraction equals 1. ● Benchmarks of 0, ½, and 1 can be used to help compare and order fractions. ● Fractions should be used in the context of the students' lives. cooking, road signs, the size of tools, etc. ● Number lines, drawings, and manipulatives such as fraction pieces, pattern blocks, and Cuisenaire rods should be used to represent proper fractions, improper fractions, equivalent fractions, and mixed numbers. ● When we reduce/ simplify a fraction, we do not make the fraction have a smaller value. Instead, we are making it simpler/	● How can I break numbers down into their smallest factors? ● How can two different fractions be equivalent? ● What does the numerator represent if it is bigger than the denominator? ● What does the whole number represent in a mixed number? ● Where in the real world do we use fractions? ● How can we represent fractions in multiple ways?

easier to work with.	

Standard 4.4 **Number Sense**

The student will demonstrate decimals as parts of a whole.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. Students will recognize the place value of decimals to the thousandth place. b. Students will locate decimals on a number line. c. Students will read, write, represent, and identify to the thousandth place. d. Students will round decimals to the nearest whole number and the nearest tenth place. e. Students will compare and order decimals. f. Given a model, write fractions and decimal equivalence (halves, fourths, fifth, and tenths)	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas

vocabulary - decimal, tenth, hundredth, greater than >, less than <, equal to =, and not equal to ≠, thousandths
● Place value can be used to compare and order decimals.
● Decimals and fractions are ways to represent parts of a whole.
● Decimal numeration is just an extension of whole number numeration.
● Relationships among dollars, dimes, and pennies are a good model for decimal numeration.
● Any decimal less than one should be written with a leading zero. For example: write three tenths as 0.3.
● Base 10 blocks, number lines, and grid paper can be used to visually represent decimals.
● Read, write, represent, and identify to the thousandth place.
  • Modeling, reading, and writing decimals as an extension of the base-ten system.
  • Writing decimals in expanded form and expanded notation.
  • Writing decimals as equivalent fractions to the hundredth place.
● Base-ten models concretely relate fractions to decimals (10-by-10 grids, meter sticks, number lines, decimal squares, decimal circles, money)
	● What is a decimal number?
	● What strategies can be used to solve estimation problems with decimals?
	● How are fractions and decimals alike?
	● How can I relate commonly used fractions to decimals?
	● Where do I use decimals in the real world?

Standard 4.5 **Computation and Estimation**

The student will add and subtract multi-digit numbers.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. Students will add multi-digit numbers (up to 100,000s) with and without regrouping. b. Students will subtract multi-digit (up to 100,000s) numbers with and without regrouping. c. Students will identify and use the commutative, identity, and associative properties of addition. d. Estimate, create and solve single and multi-step practical problems using addition and subtraction	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
Vocabulary - addend, sum, minuend, subtrahend, difference, regrouping, commutative property, identity property, associative property ● The development of computational fluency relies on quick access to number facts. There are patterns and relationships that exist in the facts. These relationships can be used to learn and retain the facts. ● Estimation can be used to determine the approximation for and then to verify the reasonableness of sums and differences of whole numbers. ● An estimate tells about how much or about how many. Students should understand if their actual answer will be more or less than the estimate depending on if they rounded up or down. ● The properties of the operations are "rules" about how numbers work and how they relate to one another. Students should utilize these properties to further develop flexibility and fluency in solving problems but do not necessarily need to use the formal terms or name the properties.	● Why do I need to add (subtract)? ● How can knowing the addition and subtraction facts help me? ● How do I take apart and recombine numbers in a variety of ways for finding sums and differences? ● How do I recognize what strategy to use for a specific problem? ● What strategies do I use to compute sums and differences mentally?

Standard 4.6 **Computation and Estimation**

The student will add and subtract fractions.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. Students will model adding fractions and mixed numbers with denominators of 2, 3, 4, 5, 6, 8, 10 without regrouping. b. Students will model subtracting fractions and mixed numbers with denominators of 2, 3, 4, 5, 6, 8, 10 without regrouping. c. Students will estimate, add, and subtract fractions with like and unlike denominators. d. Students will express the sums and differences of fractions in simplest forms.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
Vocabulary - sum, difference, numerator, denominator, greatest common factor, least common multiple, equivalent, simplest form, lowest terms ● When adding and subtracting fractions with like denominators, you are adding or subtracting portions of the same size. You can add or subtract the numerators without changing the denominators. ● When adding and subtracting fractions with unlike denominators, the portions must be expressed as a fraction with the same denominator. This is done by finding the least common multiple. ● A common factor is a number that both can be divided by. The greatest common factor can be used to express a fraction in simplest form. ● Estimation keeps the focus on the meaning of the numbers and operations, encourages reflective thinking, and helps build informal number sense with fractions. Students can reason with benchmarks to get an estimate without using an algorithm.	● How can I use models to show how fractional parts are combined or separated? ● How can I decompose a fraction? ● When adding or subtracting fractions, what does the denominator represent? What do I do with the denominator? ● What is the simplest form of a fraction? ● How can I use factors and multiples to solve fraction problems? ● Where in the real world do we add and subtract fractions?

Standard 4.7 **Computation and Estimation**

The student will add and subtract decimals and money.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. Students will model and add and subtract decimals through the thousandth place. b. Estimate, create and solve single-step practical problems using addition and subtraction of decimals and money.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
Vocabulary - sum, difference, decimals, denomination ● Money should be used as one real world application when adding and subtracting decimals. ● Manipulatives can be used as students are learning how to add and subtract decimals. (Pretend money, hundreds charts, base 10 blocks)	● Why is it important to count money? ● Why is it important to make change? ●

Standard 4.8 **Computation and Estimation**

The student will multiply and divide by multi-digit numbers.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. Students will multiply up to three- digit numbers by two-digit numbers. b. Students will divide two- and three-digit dividends by one digit. c. Students will interpret the remainder in context of the problem. d. Students will identify and use the commutative, identity, zero, and associative properties of multiplication. e. Students will estimate, create, and solve single and multi-step practical problems using multiplication and division	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• Students should demonstrate automaticity and fluency with multiplication and division facts 0-12. • Basic facts and place value patterns can be used to find products when one factor is 10 or 100. • Using an expanded algorithm where numbers are broken apart using place value and the parts used to find partial products, then partial products added together can help students understand the size of the final product. • The standard algorithm is a shortcut for the expanded algorithm. Regrouping is used rather than showing all partial products. • The expanded algorithm can be extended to multiplying by two-digit numbers. • Products can be estimated by using front-end estimation of the larger factor. • Basic facts and place value patterns can be used to divide multiples of 10 and 100 by one-digit numbers. • Substituting compatible numbers is an efficient technique for estimating quotients. • The remainder when dividing must be less than the divisor. • The nature of the question asked determines how to interpret and use the remainder. • Using compatible numbers to divide will help students with partial quotients and to determine a reasonable estimate. • To multiply multiple digits by multiple digits, students can use partial products, an array model, and the area model. Vocabulary - factor, product, multiples, compatible numbers, divisor,	• What patterns can I use to help with multiplication of large numbers? • What strategies can I use to multiply multi-digit numbers? • How can mental math and estimation be helpful in multiplying large numbers? • What strategies can I use to divide multi-digit numbers? How can mental math and estimation be helpful in dividing large numbers?

dividend, quotient, remainder, commutative property, identity property, zero property, associative property	

Standard 4.9 **Measurement and Geometry**

The student will estimate and use customary and metric units.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. Students will estimate and measure length to the nearest ⅛ inch, ¼ inch, ½ inch, inch, foot, yard, centimeter, millimeter, and meter. b. Students will identify equivalent measures of length, weight, and mass when given the measure of one unit. c. Students will estimate and measure mass and weight in ounces, pounds, grams, and kilograms.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• vocabulary - length, inch, foot, yard, fluid ounces, cup, pint, quart, gallon, capacity, ounces, pounds, temperature, degrees, Fahrenheit • Capacity is a measure of the amount of liquid a container can hold. • The weight of an object is a measure of how heavy the object is and how much gravity is pushing on an object. • Mass is a measure of the quantity of matter in an object. Weight and mass are different measures. • Length, capacity, weight, mass, and temperature can be estimated and measured in different systems (customary, metric) and using different units that are related to each other. • Relationships between customary measurement units can be expressed as a function (e.g., 12 inches = 1 foot). • Estimating measurements really helps students to develop a sense of understanding of the measurement and to gain a deeper understanding. Students may use benchmark items in the estimation process.	• How do you use weight and measurement in your life? • How do you decide which measurement to use? • How can I measure length, mass, and capacity by using non-standard units? • How do I choose the appropriate tool and unit when measuring •

Standard 4.10 **Measurement and Geometry**

The student will demonstrate an understanding of the concept of elapsed time.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. Students will use time applications to solve elapsed time within a 12-hour period.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• vocabulary - analog, digital, elapsed, seconds, minutes, hours, days, weeks, months, years, calendar. • Time can be expressed in different units that are related to each other (quarter past is :15, half past is :30, quarter till is :45). • equivalent periods of time (63 minutes = 1 hour and 3 minutes; 17 days = 2 weeks and 3 days) • Elapsed time cannot always be solved with an addition or subtraction problem because it is not a base ten system. • Elapsed time can be found by counting on from the beginning time or counting back from the ending time.	• How do the different units of time relate to each other? • How do I use a clock to tell time to the nearest quarter hour? • How can I tell time using both digital and analog clock faces? • What strategies can I use to understand how much time has elapsed? • How can a quarter past an hour, half past an hour, and a quarter till relate to fractions?

Standard 4.11 **Measurement and Geometry**

The student will identify geometric figures.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. Students will classify quadrilaterals and polygons by their sides and angles. b. Students will classify triangles: equilateral, scalene, isosceles, right, acute, and obtuse. c. Students will explore congruence, similarity, line symmetry, and rotational symmetry in two-dimensional figures. (In reference to transformations) d. Students will predict and describe the result of reflection, translation, and rotation of two-dimensional shapes. (Not on a coordinate plane) e. Students will compare and contrast the characteristics and properties of two-dimensional shapes and their corresponding three-dimensional solids using the number of angles, vertices, edges, and faces as well as the shape of faces.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
● vocabulary - polygon, square, rectangle, rhombus, parallelogram, trapezoid, equilateral triangle, scalene triangle, isosceles triangle, right triangle, acute triangle, obtuse triangle, circle, pentagon, hexagon, sphere, cone, square pyramid, triangular pyramid, rectangular prism, cube, cylinder, symmetry, congruent, similar, reflection, rotation, translation, two-dimensional, three-dimensional, angles, vertices, edges, faces, plane shapes, solid shapes ● Two-dimensional or plane shapes can be classified by the presence or absence of parallel or perpendicular lines, or the presence or absence of angles of a specified size. ● In solid shapes, a vertex is the point at which three or more edges meet. ● An edge is the line segment where two faces of a solid figure intersect. ● Congruent figures have the same size and shape. Congruent sides are the same length. ● A line of symmetry is a line that cuts across a figure such that the figure can be folded along the line into matching parts. ● Quadrilaterals are 2-D figures that have 4 sides. They can be classified into: ○ Kite: Quadrilateral where the 2 adjacent sides are congruent. ○ Trapezoid: Quadrilateral with 1 set of parallel sides ○ Parallelograms: Quadrilaterals with 2 sets of parallel sides ■ Rectangle: Parallelogram with 4 right angles	● How can objects be represented and compared using geometric attributes? ● Where would you find symmetry? ● How can I identify and describe solid figures by describing the faces, edges, sides? How can I put shapes together and take them apart to form other shapes?

■ Rhombus: Parallelogram with 4 equal sides Square: Parallelogram with 4 right angles and 4 equal sides. 2-D figures have corresponding 3-D figures. They have characteristics in common.	

Standard 4.12

Measurement and Geometry

The student will measure polygons.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. Students will derive and use the formula for the perimeter of polygons. b. Students will derive and use the formula for area of squares and rectangles and express the answer in squared units. c. Students will measure the volume of rectangular prisms using cubes. (Not the formula)	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• vocabulary - perimeter, area, volume • Perimeter is the path or distance around any plane figure. • To determine the perimeter of any polygon, determine the sum of the lengths of the sides. • Area is the surface included within a plane figure. Area is measured by the number of square units needed to cover a surface or plane figure. • The formulas for the area of a square and the area of a rectangle. - Area of a square = side length × side length - Area of rectangle = length × width • Perimeter and area should always be labeled with the appropriate unit of measure. • Students should solve real world problems involving area and perimeter. They should begin by making an estimate of what the perimeter, area, and volume will be. • Volume is the amount of space inside an object. Students should explore filling objects using cubes to determine the volume.	• How can patterns be used to determine standard formulas for area and perimeter? • How is area used outside of school? • How is perimeter used outside of school? •

Standard 4.13 **Statistics, Probability, and Data Analysis**

The student will read, interpret, organize, and analyze data and probability using charts and graphs.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. Students will collect, organize, represent, and interpret data in line graphs, and bar graphs. b. Students will compare two different representations of the same data. c. Students will use spinners, coins, and dice to determine probability and predict results. d. Students will represent probability as a fraction.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• vocabulary - data set, line graph, bar graph, probability • Data analysis helps describe data, recognize patterns or trends, and make predictions. • Line graphs display data that changes continuously over time. This allows overall increases or decreases to be seen more readily. • Bar graphs can be used to compare data easily and see relationships. They provide a visual display comparing the numerical values of different categories. The scale of a bar graph may affect how one perceives the data. • Probability can be represented as a fraction where the numerator represents the number of ways an event can occur, and the denominator represents the total possible outcomes. This fraction can be simplified.	• How can a chart or graph help you answer a question? • Why do you use different graphs for different information?

Standard 4.14 **Patterns, Functions, and Algebra**

The student will use patterns to represent mathematical relationships.

Benchmarks
Key knowledge and skills we want students to know and be able to do

a. Students will find the pattern rule and complete the pattern for whole numbers. (Given input/output table)
b. Students will recognize and demonstrate the meaning of equality in an equation.

Essential Knowledge
Key facts, concepts, and ideas needed to successfully meet benchmarks

- vocabulary - variable, equation, expression
- Mathematical relationships can be expressed using equations.
- An expression is a representation of a quantity. It is made up of numbers, variables, and/or computational symbols. It does not have an equal symbol (e.g., 8, 15 × 12).
- An equation represents the relationship between two expressions of equal value (e.g., 12 × 3 = 72 ÷ 2).
- The equal symbol (=) means that the values on either side are equivalent (balanced). A balanced scale can be used to show this.
- The not equal symbol (≠) means that the values on either side are not equivalent (not balanced).
- Identifying the missing operational signs in equations helps students to determine what operation is needed to keep the equation balanced.
- Students should fill in the missing term of a pattern. (Can be an extension of the pattern or a missing part of what is given)
  - When given a rule of adding, subtracting, multiplying, or dividing, students can complete an input/output table.)
  - Example: Rule: Add 3

Input	Output
3	6
6	9
7	10

  - Given an input/output table, students should write the rule. They can begin to express the rule with a variable. x + 3

Essential Questions
Questions to guide student inquiry and focus instruction to uncover big ideas

- How do patterns help us to make predictions?
- How does an equation relate to a balance scale?

5th Grade

5th Grade

The student will:

Number Sense

- identify prime and composite numbers.
- demonstrate fractions as parts of a whole.
- demonstrate decimals as parts of a whole.

Computation and Estimation

- add and subtract fractions and mixed numerals.
- add and subtract decimals.
- multiply and divide into whole numbers.
- multiply and divide decimals and fractions.

Measurement and Geometry

- demonstrate an understanding of elapsed time.
- analyze and measure two- and three-dimensional shapes.
- analyze, compare, and classify triangles.
- read, interpret, and graph on a coordinate plane.

Probability and Statistics

- read, interpret, organize, and analyze data and probability using charts and graphs.

Patterns, Functions, and Algebra

- demonstrate an understanding of patterns, relations, and equations represented in mathematical relationships.

Standard 5.1 **Number Sense**

The student will identify prime and composite numbers.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. Students will define prime and composite numbers. b. Students will identify prime numbers up to 100. c. Students will use a factor tree to find the prime factorization of a composite number. d. Students will find the greatest common factor (GCF) of two numbers.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
vocabulary - prime, composite, factorization, multiple, natural numbers base ● Understanding of math vocabulary above is essential prior knowledge, as is basic fact fluency. ● A prime number is a natural number, other than one, that has exactly two different factors, one and the number itself. ● A composite number is a natural number that has factors other than one and itself. ● The number one is neither prime nor composite because it has only one set of factors and both factors are one. ● Prime and composite numbers can be represented by rectangular arrays. There is only one array that can be made for prime numbers. ● Prime factors are the basic building blocks of numbers. Prime factorization of a composite number helps to break the number apart to identify the prime numbers that make it up.	● What are factors (multiples)? ● How can numbers be broken down into their smallest factors? ● How do you find the prime factors and multiples of a number?

Standard 5.2 **Number Sense**

The student will demonstrate fractions as parts of a whole.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. Students will represent and identify equivalencies among fractions and decimals, with and without models. b. Students will compare and order fractions and mixed numbers.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
vocabulary - fractions, numerator, denominator, equivalent fractions, mixed number, improper fraction, proper fractions, simplest form, lowest terms, greatest common factor, greater than >, less than < and equal to = ● Benchmarks of 0, ½, and 1 can be used to help compare and order fractions. ● Fractions should be used in the context of the students' lives: cooking, road signs, the size of tools, etc. ● Number lines, drawings, and manipulatives such as fraction pieces, pattern blocks, and Cuisenaire rods should be used to represent proper fractions, improper fractions, equivalent fractions, and mixed numbers. ● Students should focus on determining equivalent decimals of familiar fractions with the following denominations: • Hundredths, thirds, eighths, and factors of 100. ● Compare and order from greatest to least or least to greatest nom than four decimals, fractions, mixed numbers with denominators of twelve or less.	● How can two different fractions be equivalent? ● What does the numerator represent if it is bigger than the denominator? ● What does the whole number represent in a mixed number? ● Where do we use mixed numbers outside of school? ● When would it be important to compare fractions?

Standard 5.3 **Number Sense**

The student will demonstrate decimals as parts of a whole.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. Students will round numbers to the nearest tenth, hundredth, or thousandth place. b. Students will change terminating decimals to fractions and fractions to decimals (if the denominator is a factor of 100). c. Students will compare and order decimals.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• vocabulary - decimal, tenth, hundredth, thousandth, terminating decimals, repeating decimals, greater than >, less than < and equal to = • Decimals should be used in a real-world context such as money and measurement as often as possible. • Place value, number lines, benchmarks, and manipulatives such as base 10 blocks can be used to compare and order decimals. • Decimals and fractions are ways to represent parts of a whole. A fraction with a denominator of 10 or 100 can be written as a decimal by using place value. Example: 3/10 is "three tenths" which is .3 A fraction that does not have a denominator of 10 or 100 should be made into an equivalent fraction that has a denominator of 10 or 100 and then written as a decimal. • Base 10 blocks, number lines, meter sticks, and grid paper can be used to visually represent decimals and their equivalent fractions and to help compare decimals. • Students will use the same rules for rounding whole numbers when rounding decimals. A strong understanding of each place value will help with rounding. • Students should be shown decimals that terminate (end) such as .42 as well as decimals that repeat such as $.0.\overline{33}$. The bar over the number represents the digit or digits that will repeat infinitely. • Rounding decimals helps students to be able to estimate and develop deeper number sense as to the value of the number.	• What is a decimal number? • What strategies can be used to solve estimation problems with decimals? • How are fractions and decimals alike? • How can I relate commonly used fractions to decimals?

Standard 5.4 **Computation and Estimation**

The student will add and subtract fractions and mixed numerals.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. Students will add and subtract fractions including mixed numbers with like and unlike denominators. b. Students will express the sums and differences of fractions in simplest terms. c. Estimate, create, and solve single-step practical problems using addition and subtraction of fractions	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
Vocabulary - sum, difference, numerator, denominator, greatest common factor, least common multiple, equivalent, simplest form, lowest terms, mixed number, ● To add and subtract fractions with unlike denominators, students should find the lowest common denominator. To do this, they can use equivalent fractions or find the least common multiple. ● Estimating a reasonable answer will help to improve students' number sense and understanding of the fractions and problem. ● Students should be adding and subtracting fractions using a real-world context. ● Adding and subtracting fractions and mixed numbers can be modeled using pictures and manipulatives. (Arrays, pattern blocks, fraction bars, Cuisenaire rods, grid paper, measuring cups)	● How can I use models to show how fractional parts are combined or separated? ● How can I decompose a fraction? ● When adding or subtracting fractions, what does the denominator represent? What do I do with the denominator? ● What is the simplest form of a fraction? ● How can I use factors and multiples to solve fraction problems? ● Where do I add and subtract fractions/ mixed numbers in the real world?

Standard 5.5 **Computation and Estimation**

The student will add and subtract decimals.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. Students will add and subtract decimals with and without regrouping through the thousandth place. b. Estimate, create and solve single and multi-step practical problems using addition and subtraction of decimals.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
Vocabulary - sum, difference, decimals, denominations ● Students should be adding and subtracting decimals in a real-world context. ● Models should be used to represent adding and subtracting decimals. (Grid paper, number lines, money) ● Estimating helps students to focus on the context of the problem and the meaning of the numbers. When estimating is used prior to solving, students can determine the reasonableness of their answer.	● Why is it important to count money? ● Why is it important to make change? ● Where do we add and subtract decimals in the real world? ● How is knowing place value important to adding and subtracting decimals? ● How does knowledge of rounding decimals help to estimate the sum or difference of decimals?

Standard 5.6 **Computation and Estimation**

The student will multiply and divide into whole numbers.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. Students will multiply up to three digits by three-digit numbers. b. Students will divide multi digit dividends by one- and two-digit divisors (dividends should be limited to 4 or less digits). c. Estimate, create, and solve single and multi-step practical problems using addition, subtraction, multiplication, and division	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
Vocabulary - factor, product, multiples, compatible numbers, divisor, dividend, quotient, remainder, fraction, divisibility, commutative property, identity property of multiplication, zero property for multiplication, associative property, distributive property ● Using compatible numbers can help with estimating and solving division problems through partial quotients. ● Division problems should include zeros in the dividend. ● Students may be introduced to the divisibility rules for 2, 3, 4, 5, 6, 8, 9, and 10 to help solve long division problems. ● The commutative, identity, zero, associative, and distributive properties of multiplication help us to solve multiplication problems. ● The remainder of a real-world division problem should be interpreted in the context of the problem.	● What patterns can I use to help with multiplication of larger numbers? ● What strategies can I use to multiply multi-digit numbers? ● How can mental math and estimation be helpful in multiplying large numbers? ● What strategies can I use to divide multi-digit numbers? ● How can mental math and estimation be helpful in dividing large numbers?

Math 5.7 **Computation and Estimation**

The student will multiply and divide decimals and fractions.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. Students will multiply decimals up to the hundredth place. b. Students will divide decimals (up to the hundredth place) by one- and two-digit whole numbers. c. Students will multiply whole numbers by fractions using models. d. Students will divide a whole number by a fraction in problems where the numerator is a factor. e. Estimate, create and solve single and multi-step practical problems using multiplication and division of decimals.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
Vocabulary - factor, product, multiples, compatible numbers, divisor, dividend, quotient, remainder, reciprocal fractions ● When students are multiplying and dividing decimals it should be related to a real-world context involving money, measurement, etc. ● Models should be used when introducing multiplying and dividing fractions and decimals. Students need to conceptualize the concept before moving on to the computation using algorithms. Models can include manipulatives such as base-10 blocks, Cuisenaire rods, grid paper, arrays, and number lines. ● Estimating a sum or product will help students to develop the number sense and understanding of multiplying and dividing fractions and decimals. Their knowledge of place value and rounding should help them to make a reasonable estimate. ● Fractions should be written in simplest form.	● How is multiplying and dividing decimals similar to multiplying and dividing whole numbers? ● How do models help to represent multiplying and dividing fractions and decimals? ● Where outside of the classroom would we need to multiply or divide fractions and decimals? ● Why does multiplying two numbers not always result in a larger number?

Standard 5.8 **Measurement and Geometry**

The student will demonstrate an understanding of elapsed time.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. Students will use time applications (elapsed time) to solve problems.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• vocabulary - analog, digital, elapsed, seconds, minutes, hours, days, weeks, months, years, calendar. • Elapsed time cannot always be solved with an addition or subtraction problem because it is not a base ten system. • Elapsed time can be found by counting on from the beginning time or counting back from the ending time.	• How do the different units of time relate to each other? • What strategies can I use to understand how much time has elapsed? • How can I use elapsed time in my everyday life?

Standard 5.9 **Measurement and Geometry**

The student will analyze and measure two- and three-dimensional geometric shapes.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. Students will identify and apply formulas for area and perimeter for quadrilaterals (squares, rectangles) and triangles. b. Students will identify the effects of combining basic shapes. (The area and perimeter of combining a triangle and rectangle) c. Students will identify three-dimensional figures by observing the faces, vertices, and edges. d. Students will create a three-dimensional figure given a geometric net. e. Students will find the volume of a cube and rectangular prism.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas

• Vocabulary - polygon, square, rectangle, rhombus, parallelogram, trapezoid, equilateral triangle, scalene triangle, isosceles triangle, right triangle, acute triangle, obtuse triangle, circle, pentagon, hexagon, sphere, cone, square pyramid, triangular pyramid, rectangular prism, cube, cylinder, symmetry, congruent, similar, reflection, rotation, translation, two-dimensional, three-dimensional, geometric net, angles, vertices, edges, faces, coordinate plane
• Triangles can be classified by their angles or lengths of their sides:
  ○ Length of sides:
  • Equilateral: A triangle with 3 equal sides
  • Isosceles: A triangle with 2 equal sides
  • Scalene: A triangle with no equal sides
  ○ Angles:
  • Obtuse: A triangle with 1 obtuse angle
  • Right: A triangle with 1 right angle
  • Acute: A triangle with 3 acute angles
• The area of a triangle is half of the area of a rectangle that has the same base and height. Students should use geoboards, grid paper, or other manipulatives to derive the formula of a triangle.
• 3D- Figures:
  ○ A face is a flat surface of the figure.
  ○ An edge is where two faces meet.
  ○ A vertex of a three-dimensional figure is the point where three or more edges meet.
  ○ The volume of any three-dimensional figure is a measure of capacity. It is measured in cubic units.
	• How can objects be represented and compared using geometric attributes?
	• Where would you find symmetry?
	• How can I identify and describe solid figures by describing the faces, edges, sides?
	• How can patterns be used to determine standard formulas for area and perimeter?
	• What happens when we transform a figure? Where do we see transformations in the real world?
	• How is a coordinate plane similar to a map?

○ The volume of a rectangular prism and cube can be found by multiplying the length, width, and height of the cube (*V=lw•h)* - Students should use cubes to derive the formula for volume ○ The net of a 3-D figure is the 2-dimensional shape that can be folded to make that 3-D shape.	

Standard 5.10 **Measurement and Geometry**

The student will analyze, compare, and classify triangles.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. Classify triangles as right, acute, or obtuse. b. Classify triangles as equilateral, scalene, or isosceles. c. Compare and contrast the properties of triangles. d. Identify congruent sides and right angles using geometric markings to denote properties of triangles. e. Use models to prove that the sum of the interior angles of a triangle is 180 degrees and use that relationship to determine an unknown angle measure in a triangle.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• Angles can be classified as right, acute, obtuse, or straight according to their measures. • A triangle can be classified as right, acute, or obtuse according to the measure of its largest angle. • Triangles may also be classified according to the measure of their sides, e.g., scalene (no sides congruent), isosceles (at least two sides congruent) and equilateral (all sides congruent). • An equilateral triangle (with three congruent sides) is a special case of an isosceles triangle (which has at least two congruent sides). • Triangles can be classified by the measure of their largest angle and by the measure of their sides (i.e., an isosceles right triangle). • Congruent sides are denoted with the same number of hatch (or hash) marks on each congruent side. • A right-angle measures exactly 90 degrees. • An acute angle measures greater than zero degrees but less than 90 degrees • An obtuse angle measures greater than 90 degrees but less than 180 degrees. • A straight angle measures exactly 180 degrees. • A right triangle has one right angle. • An obtuse triangle has one obtuse angle. • An acute triangle has three acute angles. • A scalene triangle has no congruent sides. • An isosceles triangle has at least two congruent sides.	•

• An equilateral triangle has three congruent sides. All angles of an equilateral triangle are congruent and measure 60 degrees.	

Standard 5.11

Measurement and Geometry

The student will read, interpret, and graph on a coordinate plane.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. Identify the components of the coordinate plane. b. Identify and read coordinates on the coordinate plane. c. Graph (plot) ordered pairs on the coordinate plane. d. Graph (plot) and interpret multiple related ordered pairs on the coordinate plane. e. Interpret trends lines on the coordinate plane. f. Determine the distance between two vertical or horizonal points on a coordinate plane. g. use the coordinate plane to solve real-world and mathematical problems.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• On a coordinate plane, ordered pairs are represented by (x, y) • The axes on a coordinate plane divide it into four sections called quadrants. • The x-axis is horizontal, the y-axis is vertical. • Where the x and y axis intersect is called the origin. It is at the ordered pair (0,0). • Graphing on a coordinate plane is similar to reading a map. • Coordinate Plane is suggested to be taught during the unit on understanding of integers. • Explain the difference between coordinate GRID locations (the "box" created by the intersection of rows and column, such as on a map) versus coordinate PLANE locations (where two lines intersect). The coordinate plane uses and exact POINT location.	• How are the axes of a coordinate plane similar to a number line? • Where do we use the concepts of a coordinate plane in the real world? • On a coordinate plane, how are points on a horizontal line related? Vertical line? • How do you determine the distance a point is from an axis or another point?

Standard 5.12 **Statistics, Probability, and Data Analysis**

The student will read, interpret, organize, and analyze data and probability using charts and graphs.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. Students will construct, interpret, and compare data on double bar graphs and line graphs. b. Students will calculate the mean, median, mode, and range of a set of data. c. Students will represent data using line plots and stem and leaf plots to analyze the data to determine the mean, median, mode, and range. d. Students will predict the probability of outcomes of simple experiments and test the predictions. e. Students will demonstrate an understanding that the measure of the likelihood of an event can be represented by a number from 0 to 1.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas

• vocabulary - mean, median, mode, range, data set, line graph, bar graph, line plot, probability.
• Measures of central tendency help us to analyze a set of data:
  ○ The mean is the average of the data and can be discussed as "fair share."
  ○ The median is the middle of the data when ordered from least to greatest.
  ○ The mode is the number that occurs the most often.
  ○ The range is the difference between the largest and smallest number in a set of data.
• Line plots are graphs where numerical data is represented with a number line and x's to mark the frequency. Students can use a line plot to determine the data points and calculate the mean, median, mode, and range.
• Line graphs and bar graphs can be used to compare data and make inferences.
• Probability can be written as fraction as the number of ways an event can occur over the total possible outcomes.
• Students can determine the probability of an event and then test it out using manipulatives.
• An event can be impossible, unlikely, likely, or certain. Probability can range from 0-1.
	• How can a chart or graph help you answer a question?
	• Why do you use different graphs for different information?
	• When is it better to use the mean to compare data? Median?

Standard 5.13 **Patterns, Functions, and Algebra**

The student will demonstrate an understanding of patterns, relations, and equations as represented. in mathematical relationships.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. Students will find the pattern rule and complete the pattern for whole numbers, decimals, and fractions. (Given an input output table) b. Students will identify and use order of operations to evaluate and simplify numerical expressions with three functions excluding exponents. c. Students will model, write, and solve equations using a variable. (No more than 1 step whole numbers) d. Students will use a variable to represent a verbal expression involving one operation. (Ex: four less than a number is the same as x -4)	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• Mathematical relationships can be expressed using equations and variables. Given a mathematical statement, you can solve for the variable. Ex) 4 + x = 10 x = 6 because an equation needs to be balanced with the same total on each side, so 4 + 6 = 10 would make the equation balanced. • Equations should be modeled with algebra tiles, balances, mobiles, etc. • An expression is a representation of a quantity. It is made up of numbers, variables, and/or computational symbols. It does not have an equal symbol (e.g., 8, 15 × 12). • Given the expression Five more than a number, students should write 5 + x. • Students should fill in the missing term of a pattern. (Can be an extension of the pattern or a missing part of what is given) • When given a rule of adding, subtracting, multiplying, or dividing, students can complete an input/output table.)	• How do patterns help us to make predictions? • When outside of school do we need to solve for an unknown value? Why is it important to have the order of operations?

- Example: Rule: Add 3

Input	Output
3	6
6	9
7	10

- Given an input/output table, students should write the rule. They can begin to express the rule with a variable. x + 3
- Decimals and fractions should be used when creating patterns as well. Order of operations is a method to simplify an expression. We use PEMDAS in order to do this. First, simplify within the parenthesis, then do any exponents (exponents should not be in a PEMDAS problem in 5th grade), then multiply or divide from left to right, then add or subtract from left to right.
- Example order of operation problems with 3 functions
  (4 + 6) - 3
  $9 - 2 + 6 \bullet 2$
  $4 \bullet 8 + 12 \div 2$

6th Grade

6th Grade

The student will:

Number Sense

- represent and evaluate positive exponents.
- calculate and apply perfect squares and square roots without the use of a calculator.
- demonstrate an understanding of integers within the Real Number System.

Computation and Estimation

- add, subtract, multiply, and divide integers without the use of a calculator.
- simplify expressions without the use of a calculator.
- convert and compare between fractions and decimals without the use of a calculator.
- multiply and divide fractions and mixed numerals without the use of a calculator.
- multiply and divide decimals without the use of a calculator.

Measurement and Geometry

- read, interpret, and graph on a coordinate plane.
- classify 2-dimensional figures.
- calculate the perimeter and area of figures.

Probability and Statistics

- determine and analyze the measures of center.
- represent and analyze data using graphs.
- determine the theoretical and experimental probabilities of a simple event.

Patterns, Functions, and Algebra

- identify and apply the properties of Real Numbers.
- model, translate, and solve one-step equations.
- model, translate, and solve one-step inequalities.
- represent the relationship between two quantities as a ratio.
- solve practical problems using proportional reasoning.

Standard 6.1 **Number Sense**

The student will represent and evaluate positive exponents.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. Describe exponents as repeated multiplication. b. Write a number in exponential, expanded, and standard form. c. Represent real-world situations using exponents. d. Investigate and describe positive exponents for powers of ten	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• In exponential notation, the base is the number that is multiplied, and the exponent represents the number of times the base is used as a factor. In 6^3, 6 is the base and 3 is the exponent (e.g., $6^3 = 6 \cdot 6 \cdot 6$) • Any real number other than zero raised to the zero power is 1. • Zero to the zero power (0^0) is undefined. • The examination of patterns in place value of the powers of 10 leads to the development of scientific notation in prealgebra.	• How can patterns be used to make predictions? • What patterns exist between powers of ten in exponential and standard form?

Standard 6.2 **Number Sense**

The student will calculate and apply perfect squares and square roots without the use of a calculator.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. Evaluate and memorize squaring the numbers 1-20 b. Understand and derive the square roots of perfect squares less than 400. c. Evaluate and memorize perfect square roots 1-400 d. Apply the area formula of a square as $A = s^2$	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• Determine square roots of perfect squares by using grid paper, square tiles, tables, and calculators. • A perfect square is a whole number whose square root is an integer. ($36 = 6 \times 6 = 6^2$). Zero (a whole number) is a perfect square. • Perfect squares may be represented geometrically as the areas of squares the length whose sides are whole numbers (1 x 1; 2 x 2; 3 x 3, etc.)	• What determines if a number is a perfect square, or a non-perfect square? • How is squaring a number similar to taking the square root of a number? How are they different? • What is the relationship between a geometric square, a perfect square, and a square root? • How does the area of a square relate to a perfect square?

Standard 6.3 **Number Sense**

The student will demonstrate an understanding of integers within the Real Number System.

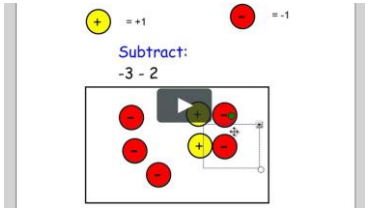
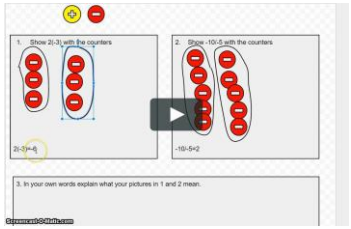
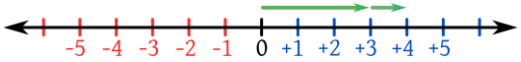
Benchmarks Key knowledge and skills we want students to know and be able to do	
a. Model Integers and describe using real-life applications (deposit, withdraw, gain, loss, rise, drop, descend, ascend) b. Compare and Order Integers using a number line and mathematical symbols (<, >, ≤, ≥, =) (Graph Integers on vertical and horizontal number lines) c. Identify and describe Absolute Value of Integers d. Estimate the value of an integer in a real-life situation.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• Integers are whole numbers and their opposites. • Zero has no opposite and is neither positive nor negative. • Integers are used in real life situations such as temperature changes, balancing a checking account, golf, timelines, football yardage, and altitude. • Absolute Value of a number is the distance from zero and is always positive. • Absolute Value is represented by the symbol | | for example: |-6| = 6 • The Absolute Value of zero is zero. • Integers are represented on the number lines and are explored using manipulatives such as two-color counters, drawings, and tiles. • On a conventional number line, numbers to the left are always smaller than the numbers to the right.	• What does it mean to deposit or withdraw money in a bank? • How does a number line help to compare two integers? • Are negative integers always less than positive integers? Justify your answer. • Why do we use the absolute value of a number when talking about distance? • How does the opposite of *n* differ from the absolute value of *n*?

Standard 6.4 **Computation and Estimation**

The student will add, subtract, multiply and divide integers without the use of a calculator.

Benchmarks
Key knowledge and skills we want students to know and be able to do

a. Model addition, subtraction, multiplication, and division of integers using concrete manipulatives and pictorial representations. (Colored counters, number lines, algebra tiles)
b. Add, subtract, multiply, and divide two integers that result in an integer.
c. Solve practical problems involving addition, subtraction, multiplication, and division with integers.
d. Estimate the value of a real-world problem that involves operations with integers.

Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• Formulate rules for adding, subtracting, multiplying, and dividing integers by discovering patterns using number lines, and manipulatives such as two-color counters, drawings, and algebra tiles. • Sums, differences, products, and quotients of integers are either positive, negative, undefined or zero. • Use modeling and multiple strategies when multiplying and dividing (lattice, partial products, area model, partial quotients, traditional, etc.) • Zero divided by a number is 0. • A number divided by 0 is undefined. •  •  • 	• How does addition and subtraction of whole numbers relate to addition and subtraction of integers? • How does using zero pairs help with modeling integers? • When is a product or quotient positive/negative? • What is a real-world situation where you have to add, subtract, multiply or divide with either positive or negative numbers?

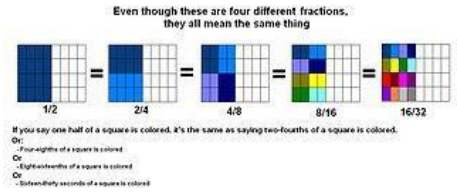
Standard 6.5 **Computation and Estimation**

The student will simplify expressions without the use of a calculator.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. Use the order of operations to simplify a numeric expression. (4 or less steps, no embedded parenthesis) b. Identify parts of an expression c. Translate between verbal phrases and algebraic expressions. d. Use substitution to simplify algebraic expressions (this can also be related and connected with verifying solutions when solving equations)	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
● The order of operations is as follows: ○ First, Grouping symbols. If there are multiple grouping symbols the innermost symbol must come first. ○ Second, evaluate exponents. ○ Third, multiply and divide in order from left to right. ○ Fourth, add and subtract in order from left to right. ● Expressions should contain 4 or less steps and no embedded parentheses. ● Grouping symbols include brackets, parenthesis, braces, and fraction bars. ● Substitution is replacing a variable with a given value. The order of operations is then used to determine the value of the expression. ● Verbal phrases (such as increased, decreased, product, difference, less than, more than, quotient, sum, etc..) can be translated into expressions. ● identify parts of an expression terms, coefficient, constant, variable.	● Why do we use the order of operations? ● Why do we need to do multiplication and division/ addition and subtraction from left to right? ● If there are two different addition problems, is it okay to do the second one first? If so, what property allows you to do so?

Standard 6.6 **Computation and Estimation**

The student will convert and compare between fractions and decimals without the use of a calculator.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. Represent and model equivalencies among decimals and fractions (proper and improper) and mixed numbers that have denominators that are 12 or less or factors of 100. b. Convert to determine equivalencies among decimals and fractions (proper and improper) and mixed numbers. (Denominators that are less than 12 or a factor of 100) c. Compare and order no more than four positive rational numbers, expressed as fractions (proper or improper), mixed numbers, and decimals (decimals through thousandths, fractions with denominators of 12 or less of factors of 100). Ordering may be in ascending or descending order.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• Fractions and decimals are ways to represent the same number and generally involve having part of a number. • Equivalent relationships among fractions and decimals may be determined by using manipulatives and pictorial representations (fraction bars, base ten blocks, fraction circles, number lines, pattern blocks, cubes, decimal squares, shaded figures, 100 grids, geoboards). • Fractions and decimals can be represented with pictures and on number lines. • Equivalent decimals can be found by dividing the numerator by the denominator. • To compare fractions and decimals, benchmarks such as 0, ½, and 1 whole can be used.  	• How can a model help show the relationship between equivalent fractions and decimals? • Why is it helpful to know equivalent forms of fractions and decimals? • When is it best to use a fraction? When is it best to use a decimal?

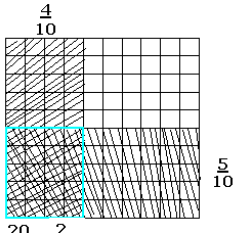
Standard 6.7 **Computation and Estimation**

The student will multiply and divide fractions and mixed numbers without the use of a calculator.

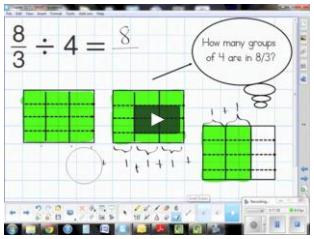
Benchmarks Key knowledge and skills we want students to know and be able to do	
a. Model multiplying and dividing fractions. b. Multiply and divide fractions (proper and improper) and mixed numbers (positive and negative). c. Solve single-step and multi-step real world problems involving multiplication and division of fractions and mixed numbers that include denominators of 12 or less. d. Express answers in the simplest form. e. Estimate the product or quotient of fractions given a practical situation.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
● When the numerator and denominator have no common factors other than 1, then the fraction is in simplest form. ● Models for representing multiplication and division of fractions may include arrays, paper folding, repeated addition, repeated subtraction, fraction strips, fraction rods, pattern blocks, and area models. ● Use rounding of fractions and estimation to develop computational strategies. ○ Example: ○ $2\frac{7}{8} \cdot \frac{3}{4}$ is about $\frac{3}{4}$ of 3, so the answer is between 2 and 3.	● When does multiplying fractions and mixed numbers generate a product larger than the factors? Smaller than the factors? ● When does dividing fractions and mixed numbers generate a quotient larger or smaller than the dividend or divisor? Where are mixed numbers used in the real world?

- When multiplying a whole number by a fraction such as $6 \cdot \frac{1}{2}$, the meaning is the same as with multiplication of whole numbers: 6. groups the size of $\frac{1}{2}$ of the whole.
- When multiplying a fraction by a fraction such as $\frac{2}{4} \cdot \frac{3}{3}$, it is the part. of a part.
- When multiplying a fraction by a whole number such as $\frac{1}{2} \cdot 6$, we are trying to determine a part of the whole.
- Understand the difference between "multiply then simplify" and "simplify then multiply."
- The reciprocal of a fraction is the multiplicative inverse.
- In order to find the reciprocal of a mixed number it must be converted to an improper fraction first.
- To divide with fractions or mixed numbers you multiply by the reciprocal.

Model Multiplying Fractions:



Model Dividing Fractions:



Standard 6.8 **Computation and Estimation**

The student will multiply and divide decimals without the use of a calculator.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. Multiply decimals with decimals. b. Divide decimals by decimals. c. Solve multistep practical problems involving multiplication and division with decimals (divisors are limited to a three-digit number, with decimal divisors limited to hundredths. d. Estimate the product or quotient when given a practical situation.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• Estimation is important to help determine the reasonableness of an answer. Students can round the decimals to make an estimate mentally. • Use modeling and multiple strategies when multiplying and dividing decimals (lattice, partial products, area model, traditional, etc...). • Understanding the placement of the decimal point is important when determining the products with decimals. • Understanding the placement of the decimal point is important when determining quotients of decimals. Examining patterns with successive decimals provides meaning, such as dividing the dividend by 4, by 0.4, and by 0.04. • Answers should not go beyond the thousandth place. • Students should understand what a repeating decimal is and how to use proper notations. (Example: $\frac{1}{3}$=0. 333… or $0.\overline{3}$) • Examples of practical situations solved by using estimation strategies include shopping for groceries, buying school supplies, budgeting an allowance, and sharing the cost of a pizza or the prize money from a contest. • Example of estimating: At the store, a pack of gum costs $5.10. If I bought 3 packs, about how much will it cost?	• How do you use decimals in real life? • Why is estimating important when using decimals in real life? • Why is understanding decimals important when understanding money? • When would you <u>not</u> need the decimal portion of the quotient? When would you round up? When would you round down?

Standard 6.9 **Measurement and Geometry**

The student will read, interpret, and graph on a coordinate plane.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. accurately plot ordered pairs in Quadrant 1 of the coordinate plane. b. recognize and apply transformations, such as translations, reflection, and rotation. c. investigate and describe the results of combining and subdividing polygons. d. Apply transformations to polygons to determine congruence. e. Recognize that translations, reflections, and rotations preserve congruency. f. Identify the image of a polygon resulting from a single transformation (translation, reflection, or rotation). g. Investigate and describe the results of combining and subdividing polygons. h. Compare and contrast the characteristics of a given polygon that has been subdivided with the characteristics of the resulting parts.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas

• Coordinate Plane: Students should be able to plot points on a coordinate plane using ordered pairs (x, y). They should be able to relate a coordinate plane to a map and apply it to real world problems.
• A plane shape can go through transformations which is where the figure changes position and/or direction, but does not change in shape or size (it stays congruent)
  o Translation is a slide.
  o Rotation is a turn.
  o Reflection is a flip.
  o Line Symmetry: The line that divides a figure into two mirror images, or the line that a figure reflects over.
  o Rotational Symmetry: The point at which a figure rotates around.
• A transformation of a figure (preimage) changes the size, shape, or position of the figure to a new figure (image). Transformations can be explored using mirrors, paper folding, and tracing.
• Congruent figures have the same size and shape.
• A translation is a transformation in which an image is formed by moving every point on the preimage the same distance in the same direction.
• A reflection is a transformation in which an image is formed by reflecting the preimage over a line called the line of reflection. All	

corresponding points in the image and preimage are equidistant from the line of reflection. • A rotation is a transformation in which an image is formed by rotating the preimage about a point called the center of rotation. The center of rotation may or may not be on the preimage. • The resulting figure of a translation, reflection, or rotation is congruent to the original figure. • The orientation of figures does not affect congruency or noncongruence. • A polygon is a closed plane figure composed of at least three-line segments that do not cross. • Two or more polygons can be combined to form a new polygon. Students should be able to identify the figures that have been combined. • A polygon that can be divided into more than one basic figure is said to be a composite figure (or shape). Students should understand how to divide a polygon into familiar figures using concrete materials (e.g., pattern blocks, tangrams, geoboards, grid paper, paper (folding), etc.). • Congruent sides are denoted with the same number of hatch (or hash) marks on each congruent side. For example, a side on a polygon with two hatch marks is congruent to the side with two hatch marks on a congruent polygon or within the same polygon.	

Standard 6.10 **Measurement and Geometry**

The student will classify 2-dimensional figures.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. Classify triangles by angle and length of sides. b. Classify and describe the properties of quadrilaterals. c. Determine the interior and exterior angles of polygons (can be incorporated into an equations unit).	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
● Triangles are polygons with 3 sides and can be classified by: ○ Angles: ■ Obtuse Triangle ■ Acute Triangle ■ Right Triangle ○ Length of Sides: ■ Equilateral ■ Isosceles ■ Scalene ● Quadrilaterals are polygons with 4 sides. ● Properties of quadrilaterals include the number of parallel sides, angle measures, number of congruent sides, lines of symmetry, and the relationship between the diagonals. Types of Quadrilaterals: ● Parallelogram is a quadrilateral with opposite sides that are parallel. Opposite sides are parallel and congruent. Opposite angles are congruent. ○ Types of parallelograms: ■ Rectangles: Have four right angles ■ Rhombus: Four congruent sides ■ Square: Four right angles and four congruent sides. ● Trapezoids are quadrilaterals with one set of parallel sides. ● Kite: Two sets of adjacent sides are congruent ● The interior angles of a triangle have a sum of 180 degrees. The interior angles of a quadrilateral have a sum of 360 degrees. Students should be able to find the measure of a missing angle given information about the other angles. (This could be taught while solving 1 step equations)	● Describe the two ways to classify triangles? ● How are the different types of quadrilaterals similar? How are they different? ● How can solving equations relate to finding the interior or exterior angle of a triangle or quadrilateral?

• The sum of the exterior angles of any polygon is 360 degrees. Given information about the exterior angles, students should be able to find the missing value. (This could be taught when solving 1 step equations)	

Standard 6.11 **Measurement and Geometry**

The student will calculate the perimeter and area of figures.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. Find the perimeter of composite figures. (Does not include circles and can be on a grid) b. Determine the missing side of a polygon given the perimeter. c. Find the area of triangles, rectangles, and squares. d. Make a reasonable estimate and solve practical problems involving perimeter and area of triangles, rectangles, and squares.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
● Area is the space inside of a shape. It is written as square units. ● Perimeter is the distance around a shape. ● The perimeter is the summation of the sides. ● The perimeter of a rectangle is $P = 2l + 2w$ ● The area of a rectangle is length x width. ● Rectangles have equivalent opposite sides. ● The area of square is $A=s^2$ ● Squares have all sides equivalent. ● The area of a triangle is $A = \frac{1}{2}bh$ ● A composite figure is a shape made of two or more shapes. ● Using properties of shapes, students should determine lengths of missing sides. ○ For example, the pool has a perimeter of 20 and a length of 5. What is the width?	● How can we derive the formula for area and perimeter? ● How is the area of a triangle related to the area of a rectangle? ● How can we use area and perimeter to solve real world problems? ● How can you decompose a figure to determine the area and perimeter?

Standard 6.12 **Statistics, Probability and Data Analysis**

The student will determine and analyze the measures of center.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. Determine the mean, median, and mode of a data set. b. Represent the mean of a data set graphically as the balance point. c. Determine how adding, removing, or changing a data value will affect the measures of center. d. Use graphs to determine the measures of center and range (line plots, and stem and leaf plots)	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• Measures of center are types of averages of a data set. Mean, median, and mode are helpful when describing the average for different situations. • Mean may be most appropriate when working with data that has no major outliers. ○ The mean can be defined as the point on a number line where the data distribution is balanced. • Median may be most appropriate when the data set has outliers. • Mode is helpful when there are identical values in the data set, or the data is categorical (non-numerical).	• When is the mean the best descriptor of the average of a set of data? Median? Mode? • What happens to the measures of center when a single piece of data is added, removed, or changed? • X

Standard 6.13 **Statistics, Probability and Data Analysis**

The student will represent and analyze data using graphs.

Benchmarks Key knowledge and skills we want students to know and be able to do
a. Represent data in a line plot and stem-and-leaf plot. b. Make observations and inferences about data shown in graphs (line plots, stem-and-leaf, and circle graphs) c. Compare graphs with the same data represented in bar graphs, pictographs, stem-and-leaf plots, and line plots. d. Calculate mean, median, mode, and range given a graph. (Stem-and-leaf plot and line plot)

Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• To collect data for any problem situation, an experiment can be designed, a survey can be conducted, or other data-gathering strategies can be used. The data can be organized, displayed, analyzed, and interpreted to solve the problem. • There are two types of data: categorical and numerical. Categorical data can be sorted into groups or categories while numerical data are values or observations that can be measured. • The way data is displayed often depends on what someone is trying to communicate. • All graphs must include a title, number labels for data categories, and a key. The key is essential to explain how to read the graph. A title is essential to explain what the graph represents. • A scale should be chosen that is appropriate for the data values being represented. • Comparisons, predictions, and inferences are made by examining the characteristics of a data set displayed in a variety of graphical representations to draw conclusions. • The information displayed in different graphs may be examined to determine how data are or are not related, differences between characteristics (comparisons), trends that suggest what new data might be like (predictions), and/or "what could happen if" (inferences). • A line plot is used for categorical and discrete numerical data and is used to show the frequency of data on a number line. It is a simple way to organize data. • A bar graph is used for categorical and discrete numerical data	• How do graphs help me organize my data? • How do people use data to influence others? • Is it possible to manipulate data to change the way the data is perceived? • How does the type of data influence the choice of graph? • How can a graph help you infer or draw conclusions about a given set of data? How can you interpret and compare data sets using data displays?

(e.g., number of months or number of people with a particular eye color) and is used to show comparisons. ● A pictograph is mainly used to show categorical data. Pictographs are used to show frequency and compare items. However, the use of partial pictures can give misleading information. Mean, median, mode, and range can be calculated given a graph	

Standard 6.14 **Statistics, Probability and Data Analysis**

The student will determine the theoretical and experimental probabilities of a simple event.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. Investigate and describe the difference between theoretical and experimental probability. b. Determine the theoretical probability of an event (does not include compound probability). c. Determine the experimental probability of an event. d. Describe the law of large number through experimental and theoretical probability	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• If all outcomes of an event are likely, the probability of an event occurring is equal to the ratio of desired outcomes to the total number of possible outcomes. • The probability of an event occurring can be represented as a ratio, fraction, decimal, and percentage. • A probability of 0 means the event will never occur. • A probability of 1 means an event will always occur. • The theoretical probability of an event is the expected probability. • Probability is calculated by the number of outcomes over the total number of possible outcomes. • Experimental probability, as the number of trials increases, the experimental probability gets closer to the theoretical probability. • An event can be described as impossible, unlikely, likely, or certain.	• How are experimental and theoretical probability similar and different? • How does increasing the number of trials affect experimental probability? • How can we use probability to make predictions? • How does probability help us to determine if a game is fair?

Standard 6.15 **Patterns, Functions, and Algebra**

The student will identify and apply the properties of Real Numbers.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. Use the properties of real numbers, where appropriate, to further develop flexibility and fluency in problem solving. b. Apply the properties as you begin learning to solve one step equations.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• Commutative property of Addition: a + b = b + a • Commutative property of Multiplication: a * b = b * a • Associative property of Addition: (a + b) + c = a + (b + c) • Associative property of Multiplication: (a * b) * c = a * (b * c) • Additive Identity is zero (0) because any number added to zero is the number: 5 + 0 = 5 • Multiplicative Identity is one (1) because any number multiplied by one is the number: 8 * 1 = 8 • There are no identity elements for subtraction and division. • Inverse property of Addition: a + (-a) = 0 • Inverse property of Multiplication: ⅔ * 3/2 = 1 • Multiplicative Property of Zero: Any number multiplied by 0 = 0 • Properties of Equality are taught with one-step equations: ○ Subtraction Property of Equality 5 + x = 10 -5 -5 x = 5 ○ Addition Property of Equality -5 + x = 10 +5 +5 x = 15 ○ Multiplication Property of Equality $\frac{X}{2} = 4$ *2 *2 X = 8 ○ Division Property of Equality $\frac{3x}{3} = \frac{6}{3}$ x = 2	• Does order matter in Addition and Multiplication? • Does order matter in Subtraction and Division? How do properties allow us to change the order in Addition and Multiplication?

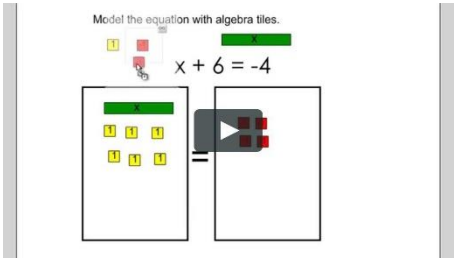
Standard 6.16 **Patterns, Functions, and Algebra**

The student will model, translate, and solve one-step equations.

Benchmarks
Key knowledge and skills we want students to know and be able to do

a. Represent real-world scenarios using one-step equations and give a reasonable estimate for the solution.
b. Model equations using algebra tiles and diagrams.
c. Solve one-step equations using inverse operations and the properties of equality (to include fractions, decimals, and integers).
d. Translate verbal expressions into one-step equations.

Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas

• An equation is a mathematical sentence stating that two expressions are equal.
• A variable is a symbol used to represent an unknown quantity.
• The solution to an equation is a value that makes it true.
• Substitution can be used to confirm if a solution is true.
• One - Step equations include $4g = 8$, $5h = -3$, 9 = -3x, and $x - 8 = 2$
• Represent equations with chips, algebra tiles, balance scales, tape diagrams, and weights.
• Properties of Equality (additive and multiplicative inverses, subtraction, addition, multiplication, and division properties of equality) can be used to solve equations.
  ○ Zero has no multiplicative inverse. Division by zero is not a possible mathematical operation. It is undefined.
  ○ Multiplicative property of zero: $a \cdot 0 = 0$and $0 \cdot a = 0$.
  ○ Addition property of equality: If a = b, then $a + c = b + c$.
  ○ Subtraction property of equality: If $a = b$, then $a - c = b - c$.
  ○ Multiplication property of equality: If $a = b$, then $a \cdot c = b \cdot c$Division property of equality: If $a = b$and $c \neq 0$ then $\frac{a}{c} = \frac{b}{c}$.
• Substitution property: If a = b then b can be substituted for a in any expression, equation, or inequality.
• Give the students written phrases containing math vocabulary and biblical numbers, i.e. "A number, k, is increased by the number of Apostles." The students should translate the phrases into algebraic expressions, i.e., k + 12.
	• How can models, pictures, and scales be used to represent equations?
	• How can substitution be used to verify solutions?
	How are operations (addition and subtraction/ multiplication and division) related to each other?
	 

Standard 6.17 **Patterns, Functions, and Algebra**

The student will model, translate, and solve one-step inequalities.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. Represent a practical situation with an inequality and give a reasonable estimate for the solution. b. Write an inequality two different ways (e.g., x < -5 or -5 > x) using symbols given the graph. c. Determine if a number is a part of the solution from an inequality or graph. d. Solve one-step inequalities using inverse operations and the properties of inequality not involving multiplication and division of negative numbers.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• Represent real-world scenarios with inequalities. • The solution set to an inequality is the set of all numbers that make the inequality true. • Inequalities using the < or > symbols are represented on a number line with an open circle on the number and a shaded line over the solution set. • Inequalities using the or ≥ symbols are represented on a number line with a closed circle on the number and shaded line in the direction of the solution set. • Students should represent inequalities with variables on either side and understand that x > 7 and 7 < x represent the same relationship. • One- Step equations include: $4g < 2, 5h >- 15,$ 9 > 3x, and $x - 8 < 9$	• How can you represent an inequality with a model? • When are inequalities used in the real world? • How can I tell if a solution is graphed with an open or closed circle? • How can I tell if a number is part of a solution when reading the description, looking at an inequality, or looking at a graph? • Why do I flip the inequality symbol when I divide by a negative? •

Standard 6.18 **Patterns, Functions, and Algebra**

The student will represent the relationship between two quantities as a ratio.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. Represent a ratio in the following ways: $\frac{a}{b}$, *a* to *b*, and *a*:*b*. b. Create a relationship in words when given a ratio. c. Model a ratio in multiple ways.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• A ratio is a comparison between two values. • A ratio can be written in these ways: $\frac{a}{b}$, *a* to *b*, and *a*:*b*. • A ratio can be represented as part to whole, part to part, or whole to whole. • The order of the values in a ratio should be written directly related to the order they are compared. • Ratios can be modeled with expressions, tape diagrams, double number lines, and tables. • Ratios can be used with recipes, constant speed, mixing colors, and measurement conversions.	• How do ratios help to compare two quantities? • Why are ratios important in cooking or making paint?

Standard 6.19 **Patterns, Functions, and Algebra**

The student will solve practical problems using proportional reasoning.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. Write a proportion as equivalent ratios using scaling and models. b. Determine if a proportional relationship exists when given a ratio table, practical problem, graph, or verbal expression. c. Identify the unit rate/constant of proportionality of a proportional relationship when given a ratio table, graph, practical problem, equation, or verbal expression for whole numbers. d. Solve for the missing value when given a ratio table, two similar figures, practical problem, or verbal expression. e. Determine if a figure is a scaled copy (similar figure). f. Create a scaled copy of a figure. g. Make a reasonable estimate to the solution of a practical problem that uses proportional reasoning.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• A proportion is a statement of two equal ratios. It exists when two quantities are multiplied by a constant (constant of proportionality) • A ratio table is a table of values that represents a proportional relationship and includes pairs of equivalent ratios. • An equation can be written from the ratio table. • In a proportional relationship, one quantity is a constant multiple of the other (scaled factor, constant of proportionality, unit rate) • A rate is a ratio that compares two quantities measured in different units. • A unit rate is a rate with a denominator of 1. • Proportions are used every day. For example, in constant speed, recipe conversions, scale drawings and models, map reading, reducing, and enlarging, measurement conversions, recipes, and monetary conversions. • We can represent proportional relationships with the equation y=kx • Corresponding angles of a figure and a similar figure/scaled copy have the same measure. • Corresponding sides of a figure and a similar figure/scaled copy have the same scale factor.	• What is a proportional relationship? • Where do we see proportional relationships in our everyday lives? • What strategies can we use to solve for a missing value in a proportion? • What can happen if a relationship is not kept proportional?

6th/7th Grade

The student will:

Number Sense

- represent and evaluate exponents.
- determine and apply perfect squares, square roots, perfect cubes, and cube roots without the use of a calculator.
- demonstrate an understanding of integers within the Real Number System.

Computation and Estimation

- add, subtract, multiply, and divide integers without the use of a calculator.
- simplify expressions without the use of a calculator.
- convert and compare between fractions, decimals, and percents without the use of a calculator.
- multiply and divide fractions and mixed numerals without the use of a calculator.
- multiply and divide decimals without the use of a calculator.
- solve practical problems using rational numbers without the use of a calculator.

Measurement and Geometry

- read, interpret, and graph on a coordinate plane.
- classify 2-dimensional figures.
- find the circumference and area of a circle.

Probability and Statistics

- determine the theoretical and experimental probabilities of an event.
- represent and analyze data using graphs.
- analyze and interpret data using measures of center.

Patterns, Functions, and Algebra

- identify and apply the properties of Real Numbers.
- model, translate, and solve one- and two-step equations.
- model, translate, solve, and graph inequalities.
- represent the relationship between two quantities as a ratio.
- solve practical problems using proportional reasoning.

Standard 6/7.1 **Number Sense**

The student will represent and evaluate exponents.

Benchmarks Key knowledge and skills we want students to know and be able to do	
The student will a. Represent exponents as repeated multiplication. b. Write a number in exponential, expanded, and standard form. c. Investigate and describe the negative and positive exponents for powers of ten. d. Represent a power of 10 with a negative exponent in fraction and decimal form. e. Represent real-world situations using exponents	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• In exponential notation, the base is the number that is multiplied, and the exponent represents the number of times the base is used as a factor. In 6^3, 6 is the base and 3 is the exponent (e.g., $6^3 = 6 \cdot 6 \cdot 6$) • Any real number other than zero raised to the zero power is 1. • Zero to the zero power (0^0) is undefined. • Negative exponents for powers of 10 are used to represent numbers between 0 and 1. (e.g.,$10^{-3} = \frac{1}{10^3} = 0.001$). • Negative exponents for powers of 10 can be investigated through patterns such as: $10^2 = 100$ $10^1 = 10$ $10^0 = 1$ $10^{-1} = \frac{1}{10} = 0.1$ $10^{-2} = \frac{1}{100} = 0.01$ • The examination of patterns in place value in the powers of 10 leads to the development of scientific notation in Prealgebra.	• How can patterns be used to make predictions? • What patterns exist between powers of ten in exponential and standard form?

Standard 6/7.2 **Number Sense**

The student will determine and apply perfect squares, square roots, perfect cubes, and cube roots without the use of a calculator.

Benchmarks Key knowledge and skills we want students to know and be able to do	
The student will: a. Understand and derive the square roots of perfect squares less than 400. b. Evaluate and memorize perfect squares 1-20 c. Evaluate and memorize perfect cubes 1-5 d. Evaluate and memorize perfect square roots 1-400 e. Evaluate and memorize perfect cube roots 1-125 f. Apply the area formula of a square as $A = s^2$	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• Determine square roots of perfect squares by using grid paper, square tiles, tables, and calculators. • Determine cube roots of perfect cubes by using grid paper, cubes, tables, and calculators. • A perfect square is a whole number whose square root is an integer (36 = 6 x 6 = 6^2). • Zero (a whole number) is a perfect square. • Perfect squares may be represented geometrically as the areas of squares the length whose sides are whole numbers (1 x 1; 2 x 2; 3 x 3, etc.)	• What determines if a number is a perfect square/cube, or a non-perfect square/cube? • What is the difference between squaring a number and finding the square root of a number? • What is the relationship between a geometric square, a perfect square, and a square root? • How does the area of a square relate to a perfect square?

Standard 6/7.3 **Number Sense**

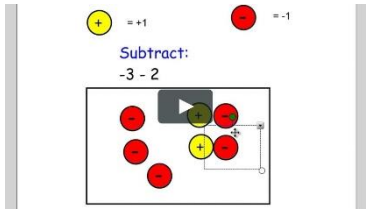
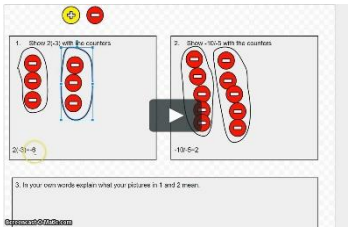
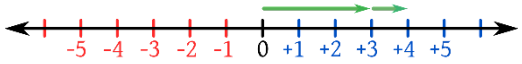
The student will demonstrate an understanding of Integers within the Real Number System.

Benchmarks Key knowledge and skills we want students to know and be able to do	
The student will: a. Model Integers and describe using real-life applications (deposit, withdraw, gain, loss, rise, drop, descend, ascend) b. Compare and Order Integers using a number line and mathematical symbols (<, >, ≤, ≥, =) (Graph Integers on vertical and horizontal number lines) c. Identify and describe Absolute Value of Integers d. Estimate the value of an integer in a real-life situation.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• Integers are whole numbers and their opposites. • Zero has no opposite and is neither positive nor negative. • Integers are used in real life situations such as temperature changes, balancing a checking account, golf, timelines, football yardage, and altitude. • Absolute Value of a number is the distance from zero and is always positive. • Absolute Value is represented by the symbol I I, (I-6I = 6) • The Absolute Value of zero is zero. • Integers are represented on the number line (vertical and horizontal) and are explored using manipulatives such as two-color counters, drawings, and tiles. • On a conventional number line, numbers to the left are always smaller than the numbers to the right.	• What does it mean to deposit or withdraw money in a bank? • How does a number line help to compare two integers? • Are negative integers always less than positive integers? Justify your answer. • Why do we use the absolute value of a number when talking about distance? • How does the opposite of *n* differ from the absolute value of *n*?

Standard 6/7.4 **Computation and Estimation**

The student will add, subtract, multiply, and divide integers without the use of a calculator.

Benchmarks Key knowledge and skills we want students to know and be able to do
The student will: a. Model addition, subtraction, multiplication, and division of integers using pictorial representations or concrete manipulatives. b. Add, subtract, multiply, and divide two integers. c. Solve practical problems involving addition, subtraction, multiplication, and division with integers. d. Estimate the value of a real-world problem that involves operations with integers.

Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• Formulate rules for adding, subtracting, multiplying, and dividing integers by discovering patterns using number lines and manipulatives such as two-color counters, drawings, and algebra tiles. • Sums, differences, products, and quotients of integers are either positive, negative, undefined or zero. • Use modeling and multiple strategies when multiplying and dividing decimals (lattice, partial products, area model, traditional, etc...).   	• How does addition and subtraction of whole numbers relate to addition and subtraction of integers? • How does using zero pairs help with modeling integers? • When is a product or quotient positive/negative? • What is a real-world situation where you have to add, subtract, multiply or divide with either positive or negative numbers?

Standard 6/7.5 **Computation and Estimation**

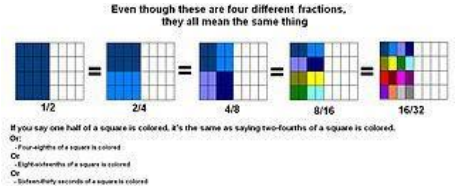
The student will simplify expressions without the use of a calculator.

Benchmarks Key knowledge and skills we want students to know and be able to do	
The student will: a. Use the order of operations to simplify a numeric expression. Grouping symbols include brackets, parenthesis, braces, absolute value, division bars, and embedded parenthesis. a. Identify parts of an expression b. Translate between verbal phrases and algebraic expressions. c. Use substitution to simplify algebraic expressions	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
● The order of operations is as follows: ○ First, Grouping symbols. If there are multiple grouping symbols the innermost symbol must come first. ○ Second, evaluate exponents. ○ Third, multiply and divide in order from left to right. ○ Fourth, add and subtract in order from left to right. ● Grouping symbols include brackets, parenthesis, braces, and division bars. ● Substitution is replacing a variable with a given value. The order of operations is then used to determine the value of the expression. ● Verbal phrases (such as increased, decreased, product, difference, less than, more than, quotient, sum, etc..) can be translated into expressions. ● identify parts of an expression terms, coefficient, constant, variable ● Give the students written phrases containing math vocabulary and biblical numbers, i.e. "A number, k, is increased by the number of Apostles." The students should translate the phrases into algebraic expressions, i.e., k + 12.	● Why do we use the order of operations? ● Why do we need to multiplication and division/ addition and multiplication from left to right? ● If there are two different addition problems is it okay to do the second one first? If so, what property allows you to do so?

Standard 6/7.6 **Computation and Estimation**

The student will convert and compare between fractions, decimals and percents without the use of a calculator.

Benchmarks Key knowledge and skills we want students to know and be able to do
The student will: a. Represent and model equivalencies among decimals, percents, fractions (proper and improper) and mixed numbers that have denominators that are 12 or less or factors of 100. b. Convert to determine equivalencies among decimals, percents, fractions (proper and improper) and mixed numbers. c. Compare and order no more than four positive and negative rational numbers, expressed as fractions (proper or improper), mixed numbers, decimals, and percents (decimals through thousandths, fractions with denominators of 12 or less of factors of 100). Ordering may be in ascending or descending order.

Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• Fractions, decimals, and percentages are three ways to represent the same number and generally involve having part of a number. • Equivalent relationships among fractions, decimals, and percents may be determined by using manipulatives and pictorial representations (fraction bars, base ten blocks, fraction circles, number lines, pattern blocks, cubes, decimal squares, shaded figures, 100 grids, geoboards). • Fractions, decimals, and percentages can be represented with pictures and on number lines. • Percent means "per 100" and can be written as a fraction with a denominator of 100. • A number followed by a percent symbol (%) is equivalent to a fraction with that number as the numerator and with 100 as the denominator (30% = 30/100; 139% = 139/100) • Percents can be expressed as decimals (38% = 38/100 = 0.38; 139% = 139/100 = 1.39; .5% = 5/1000 = 0.005) • Some fractions can be rewritten as equivalent fractions with denominators of powers of 10, and can be represented as decimals or percentages (⅗ = 6/10 = 10/100 = 0.60 = 60%). • To compare fractions, decimals, and percents benchmarks such as 0, ½, and 1 whole can be used.	• How can a model help show the relationship between fractions, decimals, and percentages? • Why is it helpful to know equivalent forms of fractions, decimals, and percentages? • When is it best to use a fraction? When is it best to use a decimal? When is it best to use a percent? • Why and when is a decimal not always an exact representation? 

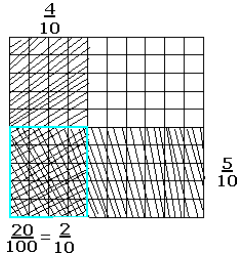
Standard 6/7.7 **Computation and Estimation**

The student will multiply and divide fractions and mixed numbers without the use of a calculator.

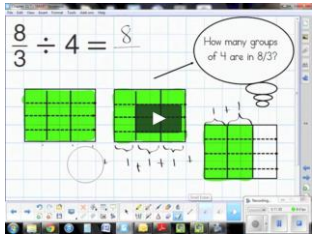
Benchmarks Key knowledge and skills we want students to know and be able to do	
The student will: a. Model multiplying and dividing fractions. b. Multiply and divide fractions (proper and improper) and mixed numbers (positive and negative. c. Solve single-step and multi-step real world problems involving multiplication and division of fractions and mixed numbers that include denominators of 12 or less. d. Express answers in the simplest form. e. Estimate the product or quotient of fractions given a practical situation.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• When the numerator and denominator have no common factors other than 1, then the fraction is in simplest form. • Models for representing multiplication and division of fractions may include arrays, paper folding, repeated addition, repeated subtraction, fraction strips, fraction rods, pattern blocks, and area models. • Use estimation to develop computational strategies. o Example: o $2\frac{7}{8} \cdot \frac{3}{4}$ is about $\frac{3}{4}$ of 3, so the answer is between 2 and 3. • When multiplying a whole number by a fraction such as $6 \cdot \frac{1}{2}$, the meaning is the same as with multiplication of whole numbers: 6 groups the size of $\frac{1}{2}$ of the whole. • When multiplying a fraction by a fraction, such as $\frac{2}{3} \bullet \frac{3}{4}$, it is the part of a part.	• When does multiplying fractions and mixed numbers generate a product larger than the factors? Smaller than the factors? • When does dividing fractions and mixed numbers generate a quotient larger or smaller than the dividend or divisor? • Where are mixed numbers used in the real world?

- When multiplying a fraction by a whole number, such as $\frac{1}{2} \cdot 6$, we are
  trying to determine a part of the whole.
- Understand the difference between "multiply then simplify" and "simplify then multiply."
- The reciprocal of a fraction is the multiplicative inverse.
- In order to find the reciprocal of a mixed number it must be converted to an improper fraction first.

- To divide with fractions or mixed numbers you multiply by the reciprocal. Model
- Multiplying Fractions:



- Model Dividing Fractions:



Standard 6/7.8 **Computation and Estimation**

The student will multiply and divide decimals without the use of a calculator.

Benchmarks Key knowledge and skills we want students to know and be able to do	
The student will: a. Multiply decimals with decimals. b. Divide decimals by decimals. c. Solve multistep practical problems involving multiplication and division with decimals (divisors are limited to a three-digit number, with decimal divisors limited to hundredths. d. Estimate the product or quotient when given a practical situation.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• Estimation is important to help determine the reasonableness of an answer. Students can round decimals to calculate an estimation mentally. • Use modeling and multiple strategies when multiplying and dividing decimals (lattice, partial products, area model, traditional, etc...). • Understanding the placement of the decimal point is important when determining the products with decimals. • Understanding the placement of the decimal point is important when determining quotients of decimals. Examining patterns with successive decimals provides meaning, such as dividing the dividend by 4, by 0.4, and by 0.04. • Answers should not go beyond the thousandth place. • Students should understand what a repeating decimal is and how to use proper notations. (Example: $\frac{1}{3}$ =0. 333...) • Examples of practical situations solved by using estimation strategies include shopping for groceries, buying school supplies, budgeting an allowance, and sharing the cost of a pizza or the prize money from a contest. • Example of estimating: At the store, a pack of gum costs $5.10. If I bought 3 packs, about how much will it cost? Or a pack of six sodas costs $3.78. About how much will 1 soda cost?	• How do you use decimals in real life? • Why is estimating important when using decimals in real life? • Why is understanding decimals important when understanding money? • When would you <u>not</u> need the decimal portion of the quotient? When would you round up? When would you round down?

Standard 6/7.9 **Computation and Estimation**

The student will solve practical problems using rational numbers without the use of a calculator.

Benchmarks Key knowledge and skills we want students to know and be able to do	
The student will: a. Solve single-step and multistep practical problems involving addition, subtraction, multiplication, and division of fractions of mixed numbers. b. Solve multistep practical problems involving addition, subtraction, multiplication, and division of decimals. c. Determine a reasonable estimate of the solution before solving.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• Solving multistep problems in the context of practical situations enhances interconnectedness and proficiency with estimation strategies. • Use modeling and multiple strategies when solving addition, subtraction, multiplication, and division of rational numbers. • Estimation is important to help determine the reasonableness of an answer. • Examples of practical situations solved by using estimation strategies include shopping for groceries, buying school supplies, budgeting an allowance, budgeting using debit and credit cards, making change for a register, and sharing the cost of a pizza or the prize money from a contest. • When estimating, students can round fractions and decimals to determine a reasonable answer. • The set of rational numbers includes the set of all numbers that can be expressed as fractions in the form $\frac{a}{b}$ where *a* and *b* are integers and *b*. does not equal zero. The decimal form of a rational number can be expressed as a terminating or repeating decimal. A few examples of rational numbers are: 25, $\frac{1}{4}$, -2.3, 82, 75%, 4. $\overline{59}$.	• Where do we use fractions, decimals, and percentages in our everyday lives? • Describe a time where it would be more beneficial to use fractions? Decimals? Percents? • How can we use mental math to estimate the solution? • How do we know if our solution is logical?

• Proper fractions, improper fractions, and mixed numbers are terms often used to describe fractions. A proper fraction is a fraction whose numerator is less than the denominator. An improper fraction is a fraction whose numerator is equal to or greater than the denominator. An improper fraction may be expressed as a mixed number. A mixed number is written with two parts: a whole number. and a proper fraction (e.g., $3\frac{5}{}$). A fraction can have a positive or negative value. • Solve single-step and multistep practical problems that involve addition and subtraction with fractions (proper or improper) and mixed numbers, with and without regrouping, which include like and unlike denominators of 12 or less. Answers are expressed in simplest form. • Fractions may be positive or negative. • Solve multistep practical problems involving addition, subtraction, multiplication, and division with decimals. • Decimals may be positive or negative. • Divisors are limited to a three-digit number, with decimal divisors limited to hundredths. • Solving problems in the context of practical situations enhances interconnectedness and proficiency with estimation strategies. Practical problems involving rational numbers in grades six and seven provide students the opportunity to use problem solving to apply computation skills involving positive and negative rational numbers expressed as integers, fractions, and decimals, along with the use of percents within practical situations.	

Standard 6/7.10 **Measurement and Geometry**

The student will read, interpret, and graph on a coordinate plane.

Benchmarks Key knowledge and skills we want students to know and be able to do	
The student will: a. Identify the components of the coordinate plane. b. Identify coordinates on the coordinate plane. c. Plot ordered pairs on the coordinate plane. d. Determine the distance between two points on a coordinate plane. (That are vertical or horizontal from one another)	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• On a coordinate plane, ordered pairs are represented by (x, y) • The axes on a coordinate plane divide it into four sections called quadrants. • The x-axis is horizontal, the y-axis is vertical. • Where the x and y axis intersect is called the origin. It is at the ordered pair (0,0). • Graphing on a coordinate plane is similar to reading a map. • Coordinate Plane is suggested to be taught during the unit on understanding of integers.	• How are the axes of a coordinate plane similar to a number line? • Where do we use the concepts of a coordinate plane in the real world? • On a coordinate plane, how are points on a horizontal line related? Vertical line? • How do you determine the distance a point is from an axis or another point? (That are horizontal or vertical from one another)

Standard 6/7.11 **Measurement and Geometry**

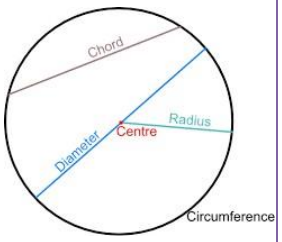
The student will classify 2-dimensional figures.

Benchmarks Key knowledge and skills we want students to know and be able to do	
The student will: a. Classify triangles by angle and length of sides. b. Classify and describe the properties of quadrilaterals. c. Determine the interior and exterior angles of polygons. (Can be incorporated into an equations unit)	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
● Triangles are polygons with 3 sides and can be classified by: ○ Angles: ■ Obtuse Triangle ■ Acute Triangle ■ Right Triangle ○ Length of Sides: ■ Equilateral ■ Isosceles ■ Scalene ● Quadrilaterals are polygons with 4 sides. ● Properties of quadrilaterals include the number of parallel sides, angle measures, number of congruent sides, lines of symmetry, and the relationship between the diagonals. Types of Quadrilaterals: ● Parallelogram is a quadrilateral with opposite sides that are parallel. Opposite sides are parallel and congruent. Opposite angles are congruent. ○ Types of parallelograms: ■ Rectangles: Have four right angles ■ Rhombus: Four congruent sides ■ Square: Four right angles and four congruent sides. ● Trapezoids are quadrilaterals with one set of parallel sides. ● Kite: Two sets of adjacent sides are congruent The interior angles of a triangle have a sum of 180 degrees. The interior angles of a quadrilateral have a sum of 360 degrees. Students should be able to find the measure of a missing angle given	● Describe the two ways to classify triangles? ● How are the different types of quadrilaterals similar? How are they different? ● How can solving equations relate to finding the interior or exterior angle of a triangle or quadrilateral?

information about the other angles. (This can be taught when solving equations) • The sum of the exterior angles of any polygon is 360 degrees. Given information about the exterior angles, students should be able to find the missing value. (This can be taught when solving equations)	

Standard 6/7.12 **Measurement and Geometry**

The student will find the circumference and area of a circle.

Benchmarks Key knowledge and skills we want students to know and be able to do	
The student will: a. Derive π (pi) b. Find the circumference of a circle given the radius or diameter of a circle. c. Calculate the area of a circle given the radius or diameter of a circle. d. Find the radius or diameter of a circle given the circumference or area. e. Estimate and solve practical problems involving area and circumference of a circle.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• Pi is a ratio that compares the circumference of a circle to its diameter. Common approximations of π are 3.14, $\frac{22}{7}$, or the pi button on the calculator. • The diameter of a circle is twice the length of the radius. • The circumference of a circle can be found using the formula: • $C = 2\pi r$ or $C = \pi d$ where *r* is the radius and *d* is the diameter. • The area of a circle can be found using the formula: $A = \pi r^2$ 	• When would you want to represent the circumference or area of a circle in terms of π? When would it be better to have your answer rounded? • How can the formulas be manipulated in order to find the radius or diameter if the circumference or radius is known?

Standard 6/7.13 **Probability and Statistics**

The student will determine the theoretical and experimental probabilities of an event.

Benchmarks Key knowledge and skills we want students to know and be able to do	
a. Investigate and describe the difference between theoretical and experimental probability. b. Determine the theoretical probability of an event. c. Determine the experimental probability of an event. d. Calculate probability of independent and dependent events. (With and without replacement with no more than 3 events occurring)	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• If all outcomes of an event are likely, the probability of an event occurring is equal to the ratio of desired outcomes to the total number of possible outcomes. • The probability of an event occurring can be represented as a ratio, fraction, decimal, and percentage. • A probability of 0 means the event will never occur. • A probability of 1 means an event will always occur. • The theoretical probability of an event is the expected probability. • Probability is calculated by the number of outcomes over the total number of possible outcomes. • Experimental probability, as the number of trials increases, the experimental probability gets closer to the theoretical probability. • An event can be described as impossible, unlikely, likely, or certain.	• How are experimental and theoretical probability similar and different? • How does increasing the number of trials affect experimental probability? • How can we use probability to make predictions? • How does probability help us to determine if a game is fair?

Standard 6/7.14 **Probability and Statistics**

The student will represent and analyze data using graphs.

Benchmarks Key knowledge and skills we want students to know and be able to do	
The student will a. Represent data in a circle graph, line plot, histogram, and stem and leaf plot. b. Make observations and inferences about data shown in graphs, pictographs, and line plots, circle graphs, stem and leaf, and histograms. c. Compare graphs with the same data represented in bar graphs, pictographs, and line plots, stem and leaf, circle graphs, and histograms. d. Determine the mean, median, mode, and range given different graphs.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• To collect data for any problem situation, an experiment can be designed, a survey can be conducted, or other data-gathering strategies can be used. The data can be organized, displayed, analyzed, and interpreted to solve the problem. • There are two types of data: categorical and numerical. Categorical data can be sorted into groups or categories while numerical data are values or observations that can be measured. • The way data is displayed often depends on what someone is trying to communicate. • All graphs must include a title, percent or number labels for data categories, and a key. The key is essential to explain how to read the graph. A title is essential to explain what the graph represents. • A scale should be chosen that is appropriate for the data values being represented. • Comparisons, predictions, and inferences are made by examining the characteristics of a data set displayed in a variety of graphical representations to draw conclusions.	• How do graphs help me organize my data? • How do people use data to influence others? • Is it possible to manipulate data to change the way the data is perceived? • How does the type of data influence the choice of graph? • How can a graph help you infer or draw conclusions about a given set of data? How can you interpret and compare data sets using data displays?

• The information displayed in different graphs may be examined to determine how data are or are not related, differences between characteristics (comparisons), trends that suggest what new data might be like (predictions), and/or "what could happen if" (inferences). ● Circle graphs are used for data showing a relationship of the parts to the whole. Circle graphs are not useful for representing data with large numbers of categories. ● When making circle graphs, teachers should be reasonable about the selection of data values. The number of data values can affect how a circle graph is constructed (e.g., 10 out of 25 would be 40%, but 7 out of 9 would be 77.7%, making the construction of a circle graph more complex). Students should have experience constructing circle graphs, but the focus should be placed on the analysis of circle graphs. ● Students are *not* expected to construct circle graphs by multiplying the percentage of data in a category by 360° to determine the central angle measure. Limiting comparisons to fraction parameters noted will assist students in constructing circle graphs. ● A line plot is used for categorical and discrete numerical data and is used to show the frequency of data on a number line. It is a simple way to organize data. ● A bar graph is used for categorical and discrete numerical data (e.g., number of months or number of people with a particular eye color) and is used to show comparisons. ● A pictograph is mainly used to show categorical data. Pictographs are used to show frequency and compare items. However, the use of partial pictures can give misleading information. ● A histogram is used when data can be characterized using consecutive intervals are best displayed in a histogram.	

Standard 6/7.15 **Probability and Statistics**

The student will analyze and interpret data using measures of the center.

Benchmarks Key knowledge and skills we want students to know and be able to do	
The student will: a. Find the measures of central tendency (mean, median, and mode) b. Calculate the measure of variation (range) c. Explain reasoning determining if data is misleading. d. Identify if data is quantitative or qualitative	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
Measures of center are types of averages for a data set. Mean, median, and mode are measures of center. • Mean may be appropriate for sets of data where there are no values much higher or lower than those in the rest of the data set. • Median is a good choice when data sets have a couple of values much higher or lower than most of the others. • Mode is a good descriptor to use when the set of data has some identical values, when data is non-numeric (categorical) or when data reflects the most popular item. • The mean can be defined as the point on a number line where the data distribution is balanced. The mean is determined by the summation of all data points divided by the quantity of data points. • The median is the middle value of a data set in ranked order. If there are an odd number of pieces of data, the median is the middle value in ranked order. If there is an even number of pieces of data, the median is the numerical average of the two middle values. • The mode is the piece of data that occurs most frequently. If no value occurs more often than any other, there is no mode. • The student should be able to recognize an outlier that is much larger or much smaller than other data points.	• How does removing or adding a piece of data affect the mean, median, mode, or range? • How does an outlier affect the data? • When is it more beneficial to use mean? Median? Mode? Range?

• Range is a measure of variation. It is calculated by finding the difference between the largest and smallest data point. • The student will be able to determine if a measure of center is misleading. • Use graphs to determine the measures of center and range.	

Standard 6/7.16 **Patterns, Functions, and Algebra**

The student will identify and apply the properties of Real Numbers.

Benchmarks Key knowledge and skills we want students to know and be able to do
The student will: a. Use the properties of real numbers, where appropriate, to further develop flexibility and fluency in problem solving. b. Apply the properties as you begin learning to solve equations.

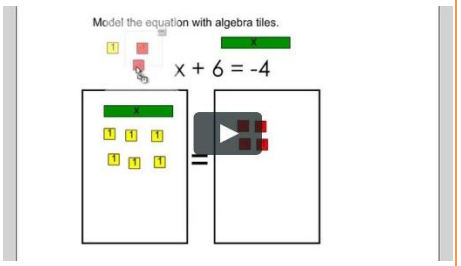
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• Commutative property of Addition: a + b = b + a • Commutative property of Multiplication: a * b = b * a • Associative property of Addition: (a + b) + c = a + (b + c) • Associative property of Multiplication: (a * b) * c = a * (b * c) • Additive Identity is zero (0) because any number added to zero is the number: 5 + 0 = 5 • Multiplicative Identity is one (1) because any number multiplied by one is the number: 8 * 1 = 8 • There are no identity elements for subtraction and division. • Inverse property of Addition: a + (-a) = 0 • Inverse property of Multiplication: ⅔ * 3/2 = 1 • Multiplicative Property of Zero: Any number multiplied by 0 = 0 • Properties of Equality are taught with one-step equations: ○ Subtraction Property of Equality 5 + x = 10 -5 -5 x = 5 ○ Addition Property of Equality -5 + x = 10 +5 +5 x = 15 ○ Multiplication Property of Equality X = 4 2 *2 *2 X = 8 ○ Division Property of Equality 3x = 6 3 3 X = 2	• Does order matter in Addition and Multiplication? • Does order matter in Subtraction and Division? • How do properties allow us to change the order in Addition and Multiplication?

Standard 6/7.17 **Patterns, Functions, and Algebra**

The student will model, translate, and solve one and two step equations.

Benchmarks Key knowledge and skills we want students to know and be able to do
The student will: a. Represent real-world scenarios using one-step equations and give a reasonable estimate for the solution. b. Model equations using algebra tiles and diagrams. c. Solve one-step equations using inverse operations and the properties of equality. d. Translate verbal expressions into one-step equations.

Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas

• An equation is a mathematical sentence stating that two expressions are equal.
• A variable is a symbol used to represent an unknown quantity.
• The solution to an equation is a value that makes it true.
• Substitution can be used to confirm if a solution is true.
• One - Step equations include $\frac{3}{4}g = 2$, $5h$ = -3, 9 = -3x, and $x - 8 = 2.3$
• Two - Step equations include $\frac{3}{4}g + 1 = 2$, $5h$ =− 3, 9 = -3x -4, and $8x - 8 = 2.3$
• Represent equations with chips, algebra tiles, balance scales, and weights.
• Properties of Equality (additive and multiplicative inverses, subtraction, addition, multiplication, and division properties of equality) can be used to solve equations.
  ○ Zero has no multiplicative inverse. Division by zero is not a possible mathematical operation. It is undefined.
  ○ Multiplicative property of zero: $a \cdot 0 = 0$and $0 \cdot a = 0$.
  ○ Addition property of equality: If $a = b$, then $a + c = b + c$.
  ○ Subtraction property of equality: If $a = b$, then $a - c = b - c$.
  Multiplication property of equality: If $a = b$, then $a \cdot c = b \cdot c$Division property of equality: If $a = b$ and $c \neq 0$ then $\frac{a}{c} = \frac{b}{c}$.
• Substitution property: If $a = b$ then *b* can be substituted for *a* in any expression, equation or inequality.
 
	• How can models, pictures, and scales be used to represent equations?
	• How can substitution be used to verify solutions?
	• How are operations (addition and subtraction/ multiplication and division) related to each other?

Standard 6/7.18 **Patterns, Functions, and Algebra**

The student will model, translate, solve, and graph inequalities.

Benchmarks Key knowledge and skills we want students to know and be able to do	
The student will: a. Represent a practical situation with an inequality and give a reasonable estimate for the solution. b. Write an inequality two different ways (e.g., x < -5 or -5 > x) using symbols given the graph. c. Determine if a number is a part of the solution from the graph or inequality. d. Solve one-step and two- step inequalities using inverse operations and the properties of inequality.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• Represent real-world scenarios with inequalities. • The solution set to an inequality is the set of all numbers that make the inequality true. • Inequalities using the < or > symbols are represented on a number line with an open circle on the number and a shaded line over the solution set. • Inequalities using the or ≥ symbols are represented on a number line with a closed circle on the number and shaded line in the direction of the solution set. • Students should represent inequalities with variables on either side and understand that x > 7 and 7 < x represent the same relationship. • One - Step equations include $4g-3<2$; $5h>-15$; 9 > -3x+6; and $\frac{1}{3}x - 8 < 9$	• How can you represent an inequality with a model? • When are inequalities used in the real world? • How can I tell if a solution is graphed with an open or closed circle? • How can I tell if a number is part of a solution when reading the description, looking at an inequality, or looking at a graph? • Why do I flip the inequality symbol when I divide by a negative?

Standard 6/7.19 **Patterns, Functions, and Algebra**

The student will represent the relationship between two quantities as a ratio.

Benchmarks Key knowledge and skills we want students to know and be able to do	
The student will: a. Represent a ratio in the following ways: $\frac{a}{b}$, *a* to *b*, and *a*:*b*. b. Create a relationship in words when given a ratio. c. Model a ratio in multiple ways.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• A ratio is a comparison between two values. • A ratio can be written in these ways: $\frac{a}{b}$, *a* to *b*, and *a*:*b*. • A ratio can be represented as part to whole, part to part, or whole to whole. • The order of the values in a ratio should be written directly related to the order they are compared. • Ratios can be modeled with expressions, tape diagrams, double number lines, and tables. • Ratios can be used with recipes, constant speed, mixing colors, and measurement conversions.	• How do ratios help to compare two quantities? • Why are ratios important in cooking or making paint?

Standard 6/7.20 **Patterns, Functions, and Algebra**

The student will solve practical problems using proportional reasoning.

Benchmarks Key knowledge and skills we want students to know and be able to do	
The student will: a. Write a proportion as equivalent ratios using scaling and models. b. Determine if a proportional relationship exists when given a ratio table, practical problem, graph, or verbal expression. c. Identify the unit rate/constant of proportionality of a proportional relationship when given a ratio table, graph, equation, practical problem, or verbal expression for whole numbers. d. Solve for the missing value when given a ratio table, two similar figures, practical problem, or verbal expression. e. Determine if a figure is a scaled copy (similar figure). f. Create a percent proportion to solve for the missing percent, part, or whole. g. Use proportions to calculate measurement conversions between customary and metric systems. h. Make a reasonable estimate to the solution of a practical problem that uses proportional reasoning.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• A proportion is a statement of two equal ratios. It exists when two quantities are multiplied by a constant (constant of proportionality) • A ratio table is a table of values that represents a proportional relationship and includes pairs of equivalent ratios. • In a proportional relationship, one quantity is a constant multiple of the other (scaled factor, constant of proportionality, unit rate) • A rate is a ratio that compares two quantities measured in different units. • A unit rate is a rate with a denominator of 1. • Proportions are used every day. For example, in constant speed, recipe conversions, scale drawings and models, map reading, reducing, and enlarging, measurement conversions, recipes, and monetary conversions. • We can represent proportional relationships with the equation y=kx • Corresponding angles of a figure and a similar figure/scaled copy have the same measure.	• What is a proportional relationship? • Where do we see proportional relationships in our everyday lives? • What strategies can we use to solve for a missing value in a proportion? • What can happen if a relationship is not kept proportional?

• Corresponding sides of a figure and a similar figure/scaled copy have the same scale factor. • A percent proportion should be written as part/whole= %/100. This will help develop the skills for solving percent of change, tip, tax, etc. in prealgebra.	

7th Grade

7th Grade

The student will:

Number Sense

- represent exponents.
- determine and apply perfect squares, square roots, perfect cubes, and cube roots without the use of a calculator.

Computation and Estimation

- apply integer operations to solve real-world problems.
- convert and compare between fractions, decimals, and percents without the use of a calculator.
- solve practical problems using rational numbers without the use of a calculator.
- simplify expressions without the use of a calculator.

Measurement and Geometry

- find the circumference and area of a circle.
- calculate volume and surface area of 3-dimensional figures.

Probability and Statistics

- determine the probability of independent and dependent events.
- represent and analyze data using graphs.

Patterns, Functions, and Algebra

- justify the properties of Real Numbers.
- model, translate, and solve two-step equations.
- model, translate, solve, and graph inequalities.
- solve practical problems using proportional reasoning.

Standard 7.1

Number Sense

The student will represent exponents.

Benchmarks Key knowledge and skills we want students to know and be able to do	
The student will: a. Describe exponents as repeated multiplication. b. Write a number in exponential, expanded, and standard form. c. Investigate and describe the negative and positive exponents for powers of ten. d. Represent a power of 10 with a negative exponent in fraction and decimal form. e. Represent real-world situations using exponents	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
In exponential notation, the base is the number that is multiplied, and the exponent represents the number of times the base is used as a factor. In 6^3, 6 is the base and 3 is the exponent (e.g., $6^3 = 6 \cdot 6 \cdot 6$) Any real number other than zero raised to the zero power is 1. Zero to the zero power (0^0) is undefined. Negative exponents for powers of 10 are used to represent numbers between 0 and 1. (e.g.,$10^{-3} = \frac{1}{10^{-3}} = 0.001$). Negative exponents for powers of 10 can be investigated through patterns such as: $10^2 = 100$ $10^1 = 10$ $10^0 = 1$ $10^{-1} = \frac{1}{10} = 0.1$ $10^{-2} = \frac{1}{100} = 0.01$ • The examination of patterns in place value in the powers of 10 leads to the development of scientific notation in prealgebra.	• How can patterns be used to make predictions? • What patterns exist between powers of ten in exponential and standard form?

Standard 7.2 **Number Sense**

The student will calculate and apply perfect squares, square roots, perfect cubes, and cube roots without the use of a calculator.

Benchmarks Key knowledge and skills we want students to know and be able to do	
The student will: a. Evaluate and memorize perfect squares 1-20 b. Evaluate and memorize perfect cubes 1-5 c. Understand and derive the square roots of perfect squares less than 400. d. Evaluate and memorize perfect square roots 1-400 e. Evaluate and memorize perfect cube roots 1-125 f. Apply the area formula of a square as $A = s^2$	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• Determine square roots of perfect squares by using grid paper, square tiles, tables, and calculators. • Determine cube roots of perfect cubes by using grid paper, cubes, tables, and calculators. • A perfect square is a whole number whose square root is an integer (36 = 6 x 6 = 6^2). Zero (a whole number) is a perfect square. • Perfect squares may be represented geometrically as the areas of squares the length whose sides are whole numbers (1 x 1; 2 x 2; 3 x 3, etc.)	• What is a perfect square? • What is a perfect cube? • What is the difference between squaring a number and finding the square root of a number? • What is the relationship between a geometric square, a perfect square, and a square root?

Standard 7.3 **Estimation and Computation**

The student will apply integers operations to solve real-world problems.

Benchmarks Key knowledge and skills we want students to know and be able to do	
The student will: a. Add, subtract, multiply, and divide integers. b. Apply integer rules to real world problems. c. Estimate the value of a real-world problem that involves operations with integers.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• Sums, differences, products, and quotients of integers are either positive, negative, undefined or zero. • Adding integers with the same sign, add the absolute values and keep the sign. • Adding integers with different signs, subtract the absolute value and keep the sign of the larger absolute value. • Subtracting integers is the same thing as adding the opposites. • Multiplying and dividing two integers with the same signs results in a positive integer. • Multiplying and dividing two integers with different signs results in a negative integer • Apply integers to real world problems.	• How does addition and subtraction of whole numbers relate to addition and subtraction of integers? • When is a product or quotient positive/negative? • What is a real-world situation where you have to add, subtract, multiply or divide with either positive or negative numbers?

Standard 7.4 **Estimation and Computation**

The student will convert and compare between fractions, decimals and percents without the use of a calculator.

Benchmarks Key knowledge and skills we want students to know and be able to do	
The student will: a. Represent and model equivalencies among decimals, percents, fractions (proper and improper) and mixed numbers that have denominators that are 12 or less or factors of 100. b. Convert to determine equivalencies among decimals, percents, fractions (proper and improper) and mixed numbers. c. Compare and order no more than six positive and negative rational numbers, expressed as fractions (proper or improper), mixed numbers, decimals, and percents (decimals through thousandths, fractions with denominators of 12 or less of factors of 100). Ordering may be in ascending or descending order.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• Fractions, decimals, and percentages are three ways to represent the same number and generally involve having part of a number. • Equivalent relationships among fractions, decimals, and percents may be determined by using manipulatives and pictorial representations (fraction bars, base ten blocks, fraction circles, number lines, pattern blocks, cubes, decimal squares, shaded figures, 100 grids, geoboards). • Fractions, decimals, and percentages can be represented with pictures and on number lines. • Percent means "per 100" and can be written as a fraction with a denominator of 100. • A number followed by a percent symbol (%) is equivalent to a fraction with that number as the numerator and with 100 as the denominator (30% = 30/100; 139% = 139/100) • Percents can be expressed as decimals (38% = 38/100 = 0.38; 139% = 139/100 = 1.39; .5% = 5/1000 = 0.005) • Some fractions can be rewritten as equivalent fractions with denominators of powers of 10, and can be represented as decimals or percentages (⅗ = 6/10 = 10/100 = 0.60 = 60%). • To compare fractions, decimals, and percents benchmarks such as 0, ½, and 1 whole can be used.	• How can a model help show the relationship between equivalent fractions, decimals, and percentages? • Why is it helpful to know equivalent forms of fractions, decimals, and percentages? When is it best to use a fraction? When is it best to use a decimal? When is it best to use a percent?

Standard 7.5 **Estimation and Computation**

The student will solve practical problems using rational numbers without the use of a calculator.

Benchmarks Key knowledge and skills we want students to know and be able to do	
The student will: a. Solve single-step and multistep practical problems involving addition, subtraction, multiplication, and division of fractions of mixed numbers. b. Solve multistep practical problems involving addition, subtraction, multiplication, and division of decimals. c. Determine a reasonable estimate of the solution before solving.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• Solving multistep problems in the context of practical situations enhances interconnectedness and proficiency with estimation strategies. • Use modeling and multiple strategies when solving addition, subtraction, multiplication, and division of rational numbers. • Estimation is important to help determine the reasonableness of an answer. • Examples of practical situations solved by using estimation strategies include shopping for groceries, buying school supplies, budgeting an allowance, budgeting using debit and credit cards, making change for a register, and sharing the cost of a pizza or the prize money from a contest. • When estimating, students can round to the nearest whole number, tenth, or hundredth to determine a reasonable answer. • The set of rational numbers includes the set of all numbers that can be expressed as fractions in the form $\frac{a}{b}$ where *a* and *b* are integers and *b* does not equal zero. The decimal form of a rational number can be expressed as a terminating or repeating decimal. A few examples of rational numbers are: $25, \frac{1}{4}$, -2.3, 82, 75%, 4.59. • Proper fractions, improper fractions, and mixed numbers are terms often used to describe fractions. A proper fraction is a fraction whose numerator is less than the denominator. An improper fraction is a fraction whose numerator is equal to or greater than the denominator. An improper fraction may be expressed as a mixed	• Where do we use fractions, decimals, and percentages in our everyday lives? • Describe a time where it would be more beneficial to use fractions? Decimals? Percents? • How can we use mental math to estimate the solution? • How do we know if our solution is logical?

number. A mixed number is written with two parts: a whole number. and a proper fraction (e.g., $3\frac{5}{}$). A fraction can have a positive or negative value. ● Solve single-step and multistep practical problems that involve addition and subtraction with fractions (proper or improper) and mixed numbers, with and without regrouping, which include like and unlike denominators of 12 or less. Answers are expressed in simplest form. ● Fractions may be positive or negative. ● Solve multistep practical problems involving addition, subtraction, multiplication, and division with decimals. ● Decimals may be positive or negative. ● Divisors are limited to a three-digit number, with decimal divisors limited to hundredths. Solving problems in the context of practical situations enhances interconnectedness and proficiency with estimation strategies. Practical problems involving rational numbers in grades six and seven provide students the opportunity to use problem solving to apply computation skills involving positive and negative rational numbers expressed as integers, fractions, and decimals, along with the use of percents within practical situations.	

Standard 7.6 **Estimation and Computation**

The student will simplify expressions without the use of a calculator.

Benchmarks Key knowledge and skills we want students to know and be able to do	
The student will: a. Use the order of operations to simplify a numeric expression. Grouping symbols include brackets, parenthesis, braces, absolute value, division bars, and embedded parenthesis. b. Identify parts of an expression c. Translate between verbal phrases and algebraic expressions. d. Use substitution to simplify algebraic expressions	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
● The order of operations is as follows: ○ First, Grouping symbols. If there are multiple grouping symbols the innermost symbol must come first. ○ Second, evaluate exponents. ○ Third, multiply and divide in order from left to right. ○ Fourth, add and subtract in order from left to right. ● Grouping symbols include brackets, parenthesis, braces, absolute value, division bars, and embedded parenthesis. ● Substitution is replacing a variable with a given value. The order of operations is then used to determine the value of the expression. ● Verbal phrases (such as increased, decreased, product, difference, less than, more than, quotient, sum, etc..) can be translated into expressions. ● Identify parts of an expression terms, coefficient, constant, variable ● Give the students written phrases containing math vocabulary and biblical numbers, i.e. "A number, k, is increased by the number of Apostles." The students should translate the phrases into algebraic expressions, i.e., k + 12.	● Why do we use the order of operations? ● Why do we need to complete multiplication and division/ addition and multiplication from left to right? ● If there are two different addition operations, is it okay to do the second one first? If so, what property allows you to do so?

Standard 7.7 **Measurement and Geometry**

The student will find the circumference and area of a circle.

Benchmarks Key knowledge and skills we want students to know and be able to do	
The student will: a. Derive π (pi) b. Find the circumference of a circle given the radius or diameter of a circle. c. Calculate the area of a circle given the radius or diameter of a circle. d. Find the radius or diameter of a circle given the circumference or area. e. Estimate and solve practical problems involving area and circumference of a circle.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• Pi is a ratio that compares the circumference of a circle to its diameter. • Common approximations of π are 3.14, $\frac{22}{7}$, or the pi button on the calculator. • The diameter of a circle is twice the length of the radius. • The circumference of a circle can be found using the formula: • $C = 2\pi r$ or $C = \pi d$ where r is the radius and d is the diameter. • The area of a circle can be found using the formula: $A = \pi r2$	• When would you want to represent the circumference or area of a circle in terms of π? When would it be better to have your answer rounded? • How can the formulas be manipulated in order to find the radius or diameter if the circumference or radius is known?

Standard 7.8 **Measurement and Geometry**

The student will calculate volume and surface of 3-dimensional figures.

Benchmarks Key knowledge and skills we want students to know and be able to do	
The student will a) Identify parts of a three-dimensional figure, including edge, face, vertices. b) Construct the front, side, and top view of a three-dimensional figures. c) Construct the three-dimensional figures given the front, side, and top view. d) Determine the volume and surface area of cubes and rectangular prisms using manipulatives and formulas. e) Make a reasonable estimate and solve practical problems involving the volume and surface area of cubes and rectangular prisms.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• A face is a flat surface of the figure. • An edge is where two faces meet. • A vertex of a three-dimensional figure is the point where three or more edges meet. • Use models, such as cubes, to construct three-dimensional figures. Use the figures to determine the front, side, and top view of the figure. • Use the front, side, and top views of the figure to construct the three-dimensional figure. • The volume of any three-dimensional figure is a measure of capacity. It is measured in cubic units. • The volume of a cube can be found by multiplying the length, width, and height of the cube *(V=lwh=s^3)* • The volume of a rectangular prism is found by multiplying the area of the base, *B*, by the height of the prism (*V=lwh=Bh*) • The surface area of a prism is the sum of the areas of all of the surfaces. It is measured in square units. Nets can be used as a tool to help students see the faces of a cube or prism. • A cube is a prism made of six congruent square faces. (*SA = 6s^2)* • A rectangular prism is made up of six rectangles - two that have measures of the length and width of the base, two that have the measures of the length of the base and the height, and two that have the width of the base and the height. The surface area is the sum of the areas of the six surfaces (*SA=2lw+2lh+2wh)*	• How many faces, edges, or vertices does a particular three-dimensional figure have? • When would we find the volume of a figure? • When would it be helpful to find the surface area of a figure? • What is the relationship between how we determine the volume of a cube or rectangular prism? • In practical problems, can students determine if they are finding the volume or surface area of a figure? •

Standard 7.9 **Probability and Statistics**

The student will determine the probability of independent and dependent events.

Benchmarks Key knowledge and skills we want students to know and be able to do	
The student will: a. Calculate probability of independent and dependent events. (With and without replacement with no more than 3 events occurring)	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• If all outcomes of an event are likely, the probability of an event occurring is equal to the ratio of desired outcomes to the total number of possible outcomes. • The probability of an event occurring can be represented as a ratio, fraction, decimal, and percentage. • A probability of 0 means the event will never occur. • A probability of 1 means an event will always occur. • Probability is calculated by the number of outcomes over the total number of possible outcomes. • The theoretical probability of an event is the expected probability. • The experimental probability gets closer to the theoretical probability as the number of trials increases. • An event can be described as impossible, unlikely, likely, or certain.	• How are experimental and theoretical probability similar and different? • How does increasing the number of trials affect experimental probability? • How can we use probability to make predictions? • How does probability help us to determine if a game is fair?

Standard 7.10 **Probability and Statistics**

The student will represent and analyze data using graphs.

Benchmarks Key knowledge and skills we want students to know and be able to do	
The student will: a. Represent data in a circle graph and histogram. b. Make observations and inferences about data shown in line plots, circle graphs, histograms, and stem-and-leaf plots. c. Compare graphs with the same data represented in bar graphs, line plots, circle graphs, histograms, and stem-and-leaf plots. d. Determine the mean, median, mode, and range given different graphs. (Line plots and stem and leaf plots)	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• To collect data for any problem situation, an experiment can be designed, a survey can be conducted, or other data-gathering strategies can be used. The data can be organized, displayed, analyzed, and interpreted to solve the problem. • There are two types of data: categorical and numerical. Categorical data can be sorted into groups or categories while numerical data are values or observations that can be measured. • The way data is displayed often depends on what someone is trying to communicate. • All graphs must include a title, percent or number labels for data categories, and a key. The key is essential to explain how to read the graph. A title is essential to explain what the graph represents. • A scale should be chosen that is appropriate for the data values being represented. • Comparisons, predictions, and inferences are made by examining the characteristics of a data set displayed in a variety of graphical representations to draw conclusions.	• How do graphs help me organize my data? • How do people use data to influence others? • Is it possible to manipulate data to change the way the data is perceived? • How does the type of data influence the choice of graph? • How can a graph help you infer or draw conclusions about a given set of data? • How can you interpret and compare data sets using data displays? • How would my graph and data change if I added another data point? Took away a data point?

● The information displayed in different graphs may be examined to determine how data are or are not related, differences between characteristics (comparisons), trends that suggest what new data might be like (predictions), and/or "what could happen if" (inferences). ● Circle graphs are used for data showing the relationship of the parts to the whole. Circle graphs are not useful for representing data with large numbers of categories. ● When making circle graphs, teachers should be reasonable about the selection of data values. The number of data values can affect how a circle graph is constructed (e.g., 10 out of 25 would be 40%, but 7 out of 9 would be 77.7%, making the construction of a circle graph more complex). Students should have experience constructing circle graphs, but the focus should be placed on the analysis of circle graphs. ● Students are ***not*** expected to construct circle graphs by multiplying the percentage of data in a category by 360° in order to determine the central angle measure. Limiting comparisons to fraction parameters noted will assist students in constructing circle graphs. ● A line plot is used for categorical and discrete numerical data and is used to show the frequency of data on a number line. It is a simple way to organize data. ● A bar graph is used for categorical and discrete numerical data (e.g., number of months or number of people with a particular eye color) and is used to show comparisons. ● A pictograph is mainly used to show categorical data. Pictographs are used to show frequency and compare items. However, the use of partial pictures can give misleading information. ● A histogram is used when data can be characterized using consecutive intervals. ● Data can be used from line plots, bar graphs, and stem and leaf plots to determine the mean, median, mode, and range.	

Standard 7.11 **Patterns, Functions, and Algebra**

The student will justify the properties of Real Numbers.

Benchmarks Key knowledge and skills we want students to know and be able to do	
The student will: a. Use the properties of real numbers, where appropriate, to further develop flexibility and fluency in problem solving. b. Apply the properties as you begin learning to solve equations.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• Commutative property of Addition: a + b = b + a • Commutative property of Multiplication: a * b = b * a • Associative property of Addition: (a + b) + c = a + (b + c) • Associative property of Multiplication: (a * b) * c = a * (b * c) • Additive Identity is zero (0) because any number added to zero is the number: 5 + 0 = 5 • Multiplicative Identity is one (1) because any number multiplied by one is the number: 8 * 1 = 8 • There are no identity elements for subtraction and division. • Inverse property of Addition: a + (-a) = 0 • Inverse property of Multiplication: ⅔ * 3/2 = 1 • Multiplicative Property of Zero: Any number multiplied by 0 = 0 • Properties of Equality are taught with one-step equations: ○	• Does order matter in Addition and Multiplication? • Does order matter in Subtraction and Division? • How do properties allow us to change the order in Addition and Multiplication?

Standard 7.12 **Patterns, Functions, and Algebra**

The student will model, translate, and solve two-step equations.

Benchmarks Key knowledge and skills we want students to know and be able to do	
The student will: a. Represent real-world scenarios using two- step equations and give a reasonable estimate for the solution. b. Model equations using algebra tiles and diagrams. c. Solve two- step equations using inverse operations and the properties of equality. (Including fractions, decimals, and integers) d. Translate verbal expressions into two-step equations.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• An equation is a mathematical sentence stating that two expressions are equal. • A variable is a symbol used to represent an unknown quantity. • The solution to an equation is a value that makes it true. • Substitution can be used to confirm if a solution is true. • Two - Step equations include $\frac{3}{4}g + 1 = 2$; $5h = -3$; 9 = -3x -4; $8x - 8 = 2.3$; and $\frac{x+3}{2} = 4$. • Represent equations with chips, algebra tiles, balance scales, and weights. • Properties of Equality (additive and multiplicative inverses, subtraction, addition, multiplication, and division properties of equality) can be used to solve equations. o Zero has no multiplicative inverse. Division by zero is not a possible mathematical operation. It is undefined. o Multiplicative property of zero: $a \cdot 0 = 0$and $0 \cdot a = 0$. o Addition property of equality:	• How can models, pictures, and scales be used to represent equations? • How can substitution be used to verify solutions? • How are operations (addition and subtraction/ multiplication and division) related to each other?

If $a = b$, then $a + c = b + c$.

- Subtraction property of equality:

  If $a = b$, then $a - c = b - c$.

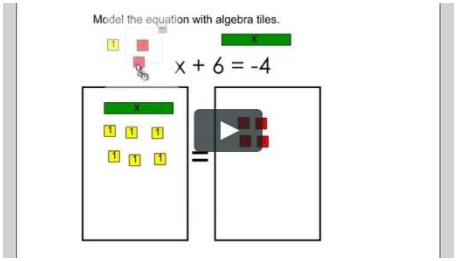
- Multiplication property of equality:

  If $a = b$, then $a \cdot c = b \cdot c$

- Division property of equality:

  If $a = b$and $c \neq 0$ then $\frac{a}{c} = \frac{b}{c}$.

- Substitution property: If $a = b$ then *b* can be substituted for *a* in any expression, equation, or inequality.



Standard 7.13 **Patterns, Functions, and Algebra**

The student will model, translate, solve, and graph inequalities.

Benchmarks Key knowledge and skills we want students to know and be able to do	
The student will: a. Represent a practical situation with an inequality and give a reasonable estimate for the solution. b. Write an inequality two different ways (e.g., x < -5 or -5 > x) using symbols given the graph. c. Determine if a number is a part of the solution given a graph or inequality. d. Solve one and two step inequalities using inverse operations and the properties of inequality.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• Represent real-world scenarios with inequalities. • When solving an inequality, if both sides are multiplied or divided by a negative number, the inequality sign must be flipped. • The solution set to an inequality is the set of all numbers that make the inequality true. • Inequalities using the < or > symbols are represented on a number line with an open circle on the number and a shaded line over the solution set. • Inequalities using the or ≥ symbols are represented on a number line with a closed circle on the number and shaded line in the direction of the solution set. • Students should represent inequalities with variables on either side and understand that x > 7 and 7 < x represent the same relationship. • One - Step and Two- Step inequalities include • $4g - 3 < 2$; $5h >- 15$; 9 > -3x+6 ; and $1/3x - 8 < 9$	• How can you represent an inequality with a model? • When are inequalities used in the real world? • How can I tell if a solution is graphed with an open or closed circle? • How can I tell if a number is part of a solution when reading the description, looking at an inequality, or looking at a graph? • Why do I flip the inequality symbol when I divide by a negative?

Standard 7.14 **Patterns, Functions, and Algebra**

The student will solve practical problems using proportional reasoning.

Benchmarks Key knowledge and skills we want students to know and be able to do	
The student will: a. Apply ratios to single and multi-step practical problems. b. Solve for missing values using proportional relationships. c. Determine the constant of proportionality and write an equation when given a ratio table, graph, equation, and verbal expressions using whole numbers. d. Apply and create scale figures using proportional relationships. e. Create a percent proportion to solve for the missing percent, part, or whole. f. Use proportions to calculate measurement conversions between customary and metric systems. g. Make a reasonable estimate to the solution of a practical problem that uses proportional reasoning	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• A proportion is a statement of two equal ratios. It exists when two quantities are multiplied by a constant (constant of proportionality) • A ratio table is a table of values that represents a proportional relationship and includes pairs of equivalent ratios. • In a proportional relationship, one quantity is a constant multiple of the other (scaled factor, constant of proportionality, unit rate) • Given a relationship is proportional, solve for a missing value using cross multiplication and scaling. • The graph of a proportional relationship can be created by using a ratio table or the constant of proportionality. • Proportions are used every day. For example, in constant speed, recipe conversions, scale drawings and models, map reading, reducing, and enlarging, measurement conversions, recipes, and monetary conversions. • A constant of proportional can be found and used to write an equation in the form of the equation y=kx ○ Example:	• What is a proportional relationship? • Where do we see proportional relationships in our everyday lives? • What strategies can we use to solve for a missing value in a proportion? What can happen if a relationship is not kept proportional?

input	output
1	4
2	8
3	12

Constant of proportionality is 4. The equation is y = 4x

- Corresponding angles of a figure and a similar figure/scaled copy have the same measure.
- Corresponding sides of a figure and a similar figure/scaled copy have the same scale factor.

A percent proportion should be written as part/whole= %/100. This will help develop the skills for solving percent of change, tip, tax, etc. in prealgebra.

Prealgebra

Prealgebra

The student will:

Number Sense

- classify and graph real numbers.
- estimate and determine square roots.

Computation and Estimation

- add, subtract, multiple, and divide rational numbers to solve real-world problems.
- represent scientific notation.
- compare and order real numbers.

Measurement and Geometry

- apply angle relationships.
- apply Pythagorean Theorem.
- calculate the perimeter and area of composite figures.
- apply transformations, including translations, reflections, and dilations, give a polygon on the coordinate plane.
- derive and use the formulas for volume and surface area.

Probability and Statistics

- analyze scatter plots.
- create and analyze a box plot.
- determine the probability of independent and dependent events.

Patterns, Functions, and Algebra

- identify and apply the properties of Real Numbers.
- evaluate expressions.
- simplify algebraic expressions.
- solve equations with rational numbers.
- solve and graph inequalities.
- solve practical problems involving percents.
- represent functions as ordered pairs, tables, graphs, and equations and identify the parts of the function for discrete points.
- identify the slope/rate of change given a practical problem or graph.

Standard PA.1 **Number Sense**

The student will classify and graph real numbers.

Benchmarks Key knowledge and skills we want students to know and be able to do	
The student will: a. Classify rational, irrational, integers, whole numbers, and natural numbers. b. Sort real numbers into their appropriate category using a Venn Diagram	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas

• The subsets of real numbers include natural numbers (counting numbers), whole numbers, integers, rational and irrational numbers.
• Numbers can belong to more than one subset of real numbers. The attributes of one subset can be contained in whole or in part in another subset.
  ○ Example: 6 is a natural number, a whole number, an integer, and a rational number.
• Relationships between the subsets of the real number system can be shown using graphic organizers (such as Venn Diagrams), number lines and other representations.
• The set of natural numbers is the set of counting numbers {1, 2, 3, …} and is represented by the letter N.
• The set of whole numbers includes the set of natural numbers and zero (0, 1, 2, 3, …} and is represented by the letter W.
• The set of integers includes the set of whole numbers and their opposites { …-3, -2, -1, 0, 1, 2, 3, …} and is represented by the letter Z.
  ○ Zero has no opposite and is neither positive nor negative.
• The set of rational numbers includes the set of all numbers that can be expressed as fractions in the form a/b where *a* and *b* are integers and b does not equal zero. It is represented by the letter Q.
  ○ The decimal form of a rational number can be expressed as a terminating or repeating decimal.
  ○ Examples of rational numbers include:
  $\sqrt{25}, \frac{1}{4}, -2.3, 75\%, 4.\overline{59}$
• The set of irrational numbers is the set of all non-repeating, non-terminating decimals and is represented by the letter I.
	• Describe the relationships among the subsets of the real number system with graphic organizers.
	• Explain why a number is classified in a particular subset.
	• Provide examples and non-examples of each subset of the real number system.
	• Recognize and explain the following:
	  ○ the sum or product of two rational numbers is rational.
	  ○ the sum of a rational number and an irrational number is irrational.
	  ○ The product of a nonzero rational number and an irrational number is zero.
	  ○ an irrational number subtracted by the same irrational number will be a rational number (zero)
	an irrational number divided by the same irrational number will be a rational number (one)

○ It cannot be written in fraction form. ○ Examples of irrational numbers include: $\sqrt{2},\ \pi,\ 1.454554555\ldots$ The real number system contains all rational and irrational numbers and is represented by the letter R.	

Standard PA.2 **Number Sense**

The student will be able to estimate and determine square roots.

Benchmarks
Key knowledge and skills we want students to know and be able to do

a. Determine both the positive and negative square roots of a given perfect square between 1 and 400. (Students in 6th grade Prealgebra will be learning this for the first time)
b. Estimate and determine two consecutive integers between which a square root lies.

Essential Knowledge
Key facts, concepts, and ideas needed to successfully meet benchmarks

- A perfect square is a whole number whose square root is an integer.
- The square of a given number is any number which, when multiplied by itself, equals the given number.
- Both the positive and negative roots of whole numbers, except zero, can be determined.
  - The square root of zero is zero and the value is neither positive nor negative.
  - Zero (a whole number) is a perfect square.
- The positive and negative square root of any whole number other than a perfect square lies between two consecutive integers.

  $\sqrt{42}$ *lies between* 6 *and* 7 *because* $6^2=36$ *and* $7^2=49$

  $-\sqrt{5}$ *lies between* -3 *and* -2 *because* $(-3)^2=9$ *and* $(-2)^2=4$
- The symbol $\sqrt{x}$ may be used to represent a positive (principal) square root and the $-\sqrt{x}$ may be used to represent a negative root.
- The square root of a whole number that is not a perfect square is an irrational number. An irrational number cannot be expressed exactly as a fraction $\frac{a}{b}$, where b does not equal 0.
- Square root symbols may be used to represent solutions to equations. in the form $x^2=p$

  If $x^2=49$, *then x is* $\sqrt{49}=7$ *or* -7 *and* $-\sqrt{49}=-7$

  If $x^2=11$, *then x is* $\sqrt{11}$ *or* $-\sqrt{11}$
- Students can use grid paper and estimation to determine what is needed to build a perfect square.
  - The square root of a positive number is usually defined as the side length of a square with the area equal to the given number.
  - If it is not a perfect square, the area provides a means for

Essential Questions
Questions to guide student inquiry and focus instruction to uncover big ideas

- Estimate and identify two consecutive integers between which the positive or negative square root of a given number lies. Numbers are limited to natural numbers from 1 to 400.
- How can we identify where a square root lies on a number line?
- What ways can we describe nonperfect squares?

estimation. ● Non perfect squares are irrational numbers	

Standard PA.3 **Computation and Estimation**

The student will add, subtract, multiply, and divide rational numbers to solve real-world problems.

(Students in 6th grade Prealgebra will need a review on operations with rational numbers- including integers)

Benchmarks Key knowledge and skills we want students to know and be able to do	
The student will: a. Add, subtract, multiply, and divide rational numbers. b. Apply rational number operations to real world experiences. c. Estimate the solution to a given real world problem.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
● Add, subtract, multiply, and divide integers in real world problems. ● Add, subtract, multiply, and divide positive and negative fraction and mixed numbers in real world problems. ● Add, subtract, multiply, and divide positive and negative decimals to solve real world problems. ● Use operations with rational numbers to solve real world problems	● How do we use operations with rational numbers in our everyday lives? ● When do we use decimals in the real world? When do we use fractions in the real world? When do we use percentages in the real world? ● How can we estimate a real-world problem? ● How can estimation help us determine a solution in and out of the classroom?

Standard PA.4 **Computation and Estimation**

The student will represent a number in scientific notation.

Benchmarks Key knowledge and skills we want students to know and be able to do	
The student will: a. Convert between scientific notation and standard form. b. Compare and order numbers using scientific notation.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• Scientific notation is used to write very large and small numbers. • Negative exponents for powers of 10 allow us to write a number between 0 and 1. • A number written in scientific notation should be written as a number between 1-10 times 10 to a power.	• Who uses scientific notation outside of the classroom? Why? • What types of numbers have a negative exponent? Positive? • Does a negative exponent make the number negative? • How does scientific notation relate to powers of 10?

Standard PA.5 **Computation and Estimation**

The student will compare and order real numbers.

(6th graders in Prealgebra will need to learn how to convert fractions, decimals, and percents)

Benchmarks Key knowledge and skills we want students to know and be able to do	
The student will: a. Graph real numbers on a number line (to include scientific notation, fractions, decimals, percents, cube roots, and square roots) c. Compare and order real numbers (to include scientific notation, fractions, decimals, percents, cube roots, and square roots)	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
● Real numbers can be represented as integers, fractions (proper or improper), decimals, percents, numbers written in scientific notation, radicals, and irrational numbers. It is useful to convert numbers to be compared and/or ordered to one representation (such as fractions, decimals or percents) ● Vertical and horizontal number lines can be used when ordering. ● Benchmarks (0, ½, and 1) can be used to help compare numbers. ● Terms used to describe fractions: ○ Proper fractions: a fraction whose numerator is less than the denominator. ○ Improper fractions: a fraction whose numerator is equal to or greater than the denominator. ○ Mixed numbers are written in two parts: a whole number and a proper fraction. ○ Fractions can have a positive or negative value. ● Scientific notation is used to represent very large or very small numbers. ○ A number written in scientific notation is the product of two factors: a decimal greater than or equal to one but less than 10 multiplied by a power of 10. $4.3\times 10^{5}=430,000$ *and* $4.3\times 10^{-5}=0.000043$ ● Compare and order no more than five real numbers expressed as integers, fractions (proper or improper), decimals, mixed numbers, percents, numbers written in scientific notation, radicals, and pi. ○ Radicals may include positive and negative square roots of values from 0 to 400. ○ Ordering may be in ascending or descending order.	● How can comparing fractions, decimals, and percents be used in our lives? ● What strategies can you use to compare real numbers? ● How are fractions, decimals, and percents similar? How are they different? How can we use rounding and benchmarks to estimate fractions and decimals?

• Use rational approximations of irrational numbers (to the nearest hundredth) to compare and order and locate values on a number line. • Radicals may include positive and negative square roots of values from 0 to 400 yielding an irrational number.	

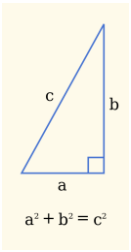
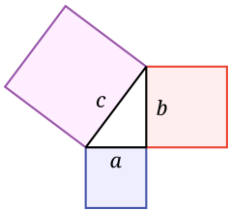
Standard PA.6 **Measurement and Geometry**

The student will apply angle relationships.

Benchmarks Key knowledge and skills we want students to know and be able to do	
Students will be able to: a. Identify complementary, supplementary, vertical, and adjacent angles from a diagram/picture. b. Find a missing angle measure given one angle measure in an angle pair. c. Use a protractor to measure an angle up to 360 degrees. d. Use angle relationships to find the measure of exterior and interior angles of polygons.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• Adjacent angles share a vertex and one side. • Supplementary angles are any two angles whose measures add to 180°. The two angles do not have to be adjacent. • Complementary angles are any two angles whose measures add to 90°. The two angles do not have to be adjacent. • Vertical angles are a pair of nonadjacent angles formed by two intersecting lines. They share a common vertex and are congruent. • Angle relationships can be taught along with solving equations as well.	• How are complementary and supplementary angles similar? How are they different? • Where do we see and use complementary, supplementary, vertical, and adjacent angles outside of school? • How does knowing the relationships of angles help us to figure out the measures of angles?

Standard PA.7 **Measurement and Geometry**

The student will apply Pythagorean Theorem.

Benchmarks Key knowledge and skills we want students to know and be able to do	
Students will be able to: a. Verify the Pythagorean Theorem b. Use the Pythagorean Theorem to determine the missing side of a right triangle. c. Use the Converse of the Pythagorean Theorem to determine if the triangle is a right triangle. d. Apply the Pythagorean Theorem to practical problems	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• The hypotenuse of a right triangle is the longest side of the triangle and is opposite the right angle. • The legs of a right triangle form the right angle. • The Pythagorean Theorem states that the sum of the squares of the two legs of a right triangle is equal to the square of the hypotenuse: $a^2 + b^2 = c^2$.   • The converse of the Pythagorean Theorem allows you to determine if a triangle is a right triangle, give the measure of its three sides. The converse of the Pythagorean Theorem states that if the square of the longest side of a triangle is equal to the sum of the squares of the other two sides, then the triangle is a right triangle. • Pythagorean triples are whole number triples that are the measures of the sides of right triangles. They can be helpful in setting up and solving problems. Some commonly used Pythagorean Triples include (3,4,5), (5, 12, 13), and their multiples.	• How can you determine the third side of a right triangle if you are given the length of two sides? • How can you use the Pythagorean Theorem to determine if a triangle is a right triangle given the measure of the three sides?

Standard PA.8 **Measurement and Geometry**

The student will calculate the perimeter and area of composite figures.

Benchmarks Key knowledge and skills we want students to know and be able to do	
Students will be able to: a. Find the perimeter and area of composite figures. b. Determine the missing side of a polygon given the perimeter. c. Find the area of triangles, rectangles, and squares. d. Make a reasonable estimate and solve practical problems involving perimeter and area of triangles, rectangles, squares, and composite figures.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
● Area is the space inside of a shape. It is written as square units. ● Perimeter is the distance around a shape. ● Perimeter is the summation of the sides. ● The perimeter of a rectangle is $P = 2l + 2w$ ● The area of a rectangle is length x width. ● Rectangles have equivalent opposite sides. ● The area of square is $A=s^2$ ● Squares have all sides equivalent. ● The area of a triangle is $A = \frac{1}{2}bh$ ● A composite figure is a shape made of two or more shapes. ● Area of composite figures can be found by breaking the figure into shapes we can calculate the area for (squares, rectangles, triangles) and then finding the sum of each of the total pieces. ● Using properties of shapes, students should determine lengths of missing sides. ○ For example, the pool has a perimeter of 20 and a length of 5. What is the width?	● How can we derive the formula for area and perimeter? ● How is the area of a triangle related to the area of a rectangle? ● How can we use area and perimeter to solve real world problems? ● How can you decompose a figure to determine the area and perimeter?

Standard PA.9 **Measurement and Geometry**

The student will apply transformations, including translations, reflections, and dilations, given a polygon. on the coordinate plane.

Benchmarks Key knowledge and skills we want students to know and be able to do	
The student will: a. Given a preimage, identify the coordinates and sketch the image of a polygon that has been translated on the coordinate plane. b. Given a preimage, identify the coordinates and sketch the image of a polygon that has been reflected over the x-axis or y-axis. c. Given a preimage, identify the coordinates and sketch the image of a polygon that has been dilated with the center of the dilation being the origin. d. Perform a combination of reflections and translations.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
● A transformation of a figure called the preimage changes the size, shape, or position of a new figure called the image. ● The size or shape of a preimage is not changed when a translation or reflection occurs. The preimage and image are congruent. ● A translation occurs when every point of the preimage is moved the same distance in the same direction. ● A reflection is a transformation in which an image is made by reflecting the preimage over a line. The line is called the line of reflection. All corresponding points of the preimage and image are equidistant from the line of reflection. ● Dilation is a transformation in which an image is formed by reducing or enlarging the preimage by a scale factor from a center of dilation. In Pre-Algebra, the center of dilation will be limited to the origin. The preimage and image of a dilation are similar but not congruent. The center of dilation does not have to be on the preimage. ● When dilating a preimage, the scale factors should be limited to $\frac{1}{4}$, $\frac{1}{3}$, $\frac{1}{2}$, 2, 3, or 4. ● The results may be different when first translating and then reflecting compared to reflecting and then translating. ● Tessellations can be used to rotate and reflect geometric figures	● For what transformations are the preimage and image congruent? ● What are some examples of when transformations are used?

Standard PA.10 **Measurement and Geometry**

The student will derive and use the formulas for volume and surface area.

Benchmarks Key knowledge and skills we want students to know and be able to do	
The student will: a) Identify parts of a three-dimensional figure, including edge, face, vertices. b) Construct the front, side, and top view of three-dimensional figures. c) Construct the three-dimensional figures given the front, side, and top view. d) Determine the volume and surface area of cubes and rectangular prisms, and cylinders . e) Estimate and solve practical problems involving the volume and surface area of cubes, rectangular prisms, and cylinders.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• A face is a flat surface of the figure. • An edge is where two faces meet. • A vertex of a three-dimensional figure is the point where three or more edges meet. • Use models, such as cubes, to construct three-dimensional figures. Use the figures to determine the front, side, and top view of the figure. • Use the front, side, and top views of the figure to construct the three-dimensional figure. • The volume of any three-dimensional figure is a measure of capacity. It is measured in cubic units. • The volume of a cube can be found by multiplying the length, width, and height of the cube (*V=lwh=s^3)* • The volume of a rectangular prism is found by multiplying the area of the base, *B*, by the height of the prism (*V=lwh=Bh*) • The surface area of a prism is the sum of the areas of all of the surfaces. It is measured in square units. Nets can be used as a tool to help students see the faces of a cube or prism. • A cube is a prism made of six congruent square faces. (*SA = 6s^2)* • A rectangular prism is made up of six rectangles - two that have measures of the length and width of the base, two that have the measures of the length of the base and the height, and two that have the width of the base and the height. The surface area is the sum of the areas of the six surfaces (*SA=2lw+2lh+2wh)* • A cylinder can be represented as a net that contains two circles (the bases) and one rectangular region (the curved surface of the cylinder) whose length is the circumference of the circular base	• How many faces, edges, or vertices does a particular three-dimensional figure have? • When would we find the volume of a figure? • When would it be helpful to find the surface area of a figure? • What is the relationship between how we determine the volume of a cube or rectangular prism? • In practical problems, how do you know if you are finding the volume or surface area of a figure? • If I change one of my dimensions, how does that affect volume? Surface area? If I double all of my dimensions, how does that affect volume? Surface area?

and whose width is the height of the cylinder. The surface area of the cylinder is the sum of the area of the two circles and the rectangle representing the curved surface $SA = 2\pi r^2 + 2\pi rh$. The volume of a cylinder is computed by $V = \pi r^2 h = Bh$, where B is the area of the base	

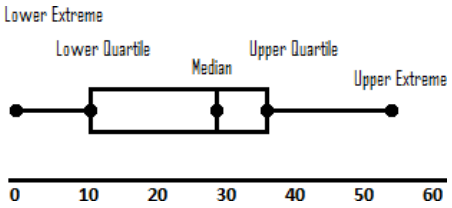
Standard PA.11 **Probability and Statistics**

The student will analyze scatterplots.

Benchmarks Key knowledge and skills we want students to know and be able to do.	
The student will: a. Collect data to create a scatterplot. b. Analyze the type of relationship shown in the scatterplot. c. Draw in the line of best fit. d. Use the scatterplot to make inferences and predictions.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• Scatterplots show the relationship between two sets of data. • Scatterplots can have positive, negative, or no relationship. • A line of best fit can be drawn through the scatterplot to help make predictions about the data. • A scatterplot may show a relationship between the independent and dependent variable; however, it might not be linear, and does not imply causation.	• How do scatterplots visually show if two sets of data are related? • What does a point on the scatterplot represent? • How does the line of best fit help us to make predictions?

Standard PA.12 **Probability and Statistics**

The student will create and analyze a box plot.

Benchmarks Key knowledge and skills we want students to know and be able to do	
The student will: a. Collect numerical data and create a box plot. b. Analyze and make inferences about data shown in a box plot. c. Compare two sets of data using boxplots	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• A box plot is a way to represent numerical data. • Box plots show the spread and the center of the data. • Range (difference in the extremes) and interquartile range (difference between upper and lower quartile) can be calculated from box plots. • The median represents the middle half of the data. • The whiskers represent the extremes of the data. • 25% of the data is represented in each quartile. • Box plots show us where the data is concentrated. •  •	• How does a box plot show us the spread of the data? • What information can be compared when given two boxplots? • What observations can we make from a boxplot?

Standard PA.13 **Probability and Statistics**

The student will determine the probability of independent and dependent events.

Benchmarks Key knowledge and skills we want students to know and be able to do	
The student will: a. Determine the probability of independent and dependent events. b. Determine the theoretical and experimental probabilities of an event occurring	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• Tree- Diagrams can be used to visually represent probability. • A simple event is one event (rolling a dice) • Events can be likely, not likely, certain, or impossible. • Probability is the ratio of the likelihood an event will occur to the total possible outcomes. • Probability can be written as a fraction, decimal, or percentage. • Two events can be either independent or dependent events. • If the outcome of one event is not impacted by the other event, then they are independent events. The probability of the second event will not change regardless of what happens in the first event. • If the outcome of the second event is impacted by the first event, then they are dependent events. The probability of the second event will change based on the outcome of the first event. • The theoretical probability of an event is the expected probability. • Experimental probability is the actual results of the experiment. It is the ratio of the number of times an event actually occurs to the total number of trials. As the number of trials increases, the experimental probability gets closer to the theoretical probability.	• How are independent and dependent events similar? How are they different? • How are theoretical and experimental probability different? • How does probability help us make predictions? • Where do we use probability in the real world? • How does the outcome of the first event affect the probability of the second event in dependent probability? • In experimental probability, how does doing the experiment more affect the probability?

Standard PA.14 **Patterns, Functions and Algebra**

The student will identify and apply the properties of Real Numbers.

Benchmarks Key knowledge and skills we want students to know and be able to do	
The student will: a. Use the properties of real numbers, where appropriate, to further develop flexibility and fluency in working with numbers and problem solving. b. Apply the properties of Real Numbers when solving equations. (Identify the property from a specific step when solving, not an entire chart)	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• A number divided by zero is undefined. • Distributive Property 5(x +3) = 5x + 15. • Commutative property of Addition: a + b = b + a • Commutative property of Multiplication: a * b = b * a • Associative property of Addition: (a + b) + c = a + (b + c) • Associative property of Multiplication: (a * b) * c = a * (b * c) • Subtraction and division are neither commutative nor associative. • Additive Identity is zero (0) because any number added to zero is the number: 5 + 0 = 5 • Multiplicative Identity is one (1) because any number multiplied by one is the number: 8 * 1 = 8 • There are no identity elements for subtraction and division. • Inverse property of Addition: a + (-a) = 0 • Inverse property of Multiplication: ⅔ * 3/2 = 1 • Multiplicative Property of Zero: Any number multiplied by 0 = 0 • Properties of Equality are taught with one-step equations: ○ Subtraction Property of Equality 5 + x = 10 -5 -5 x = 5 ○ Addition Property of Equality -5 + x = 10 +5 +5 x = 15 ○ Multiplication Property of Equality X = 4 2 *2 *2 X = 8	• Does order matter in Addition and Multiplication? • Does order matter in Subtraction and Division? • How do properties allow us to change the order in Addition and Multiplication? How do the properties allow us to do computation mentally more easily?

○ Division Property of Equality 3x = 6 3 3 X = 2 Example of identifying the property when solving: 2x + 4 = 6.	

Standard PA.15 **Patterns, Functions, and Algebra**

The student will evaluate expressions.

Benchmarks Key knowledge and skills we want students to know and be able to do	
The student will: a. Translate between verbal phrases and algebraic and numeric expressions. b. Use order of operations to simplify numerical expressions. **Problems should include absolute value symbols, square root symbols, fraction bars, and brackets as grouping symbols.** c. Use substitution to simplify algebraic expressions. Apply the properties of real numbers while evaluating numerical expressions (Exponents are limited to whole numbers and bases are limited to integers. Square roots are limited to perfect squares, Cube roots are limited to perfect cubes).	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas

• An expression is a representation of a quantity. It may contain numbers, variables, and/or operation symbols. It does not have an "equal sign (=)" (e.g.,34, 5x, 140 - 38.2, -18 · 21, (5 + 2x) · 4). An expression cannot be solved.
• A numerical expression contains only numbers, the operations symbols, and grouping symbols.
• Expressions are simplified using the order of operations.
• The order of operations is as follows:
  ○ First, complete all operations within grouping symbols*. If there are grouping symbols within other grouping symbols, do the innermost operation first.
  ○ Second, evaluate all exponential expressions.
  ○ Third, multiply and/or divide in order from left to right.
  ○ Fourth, add and/or subtract in order from left to right.
*Parentheses ( ), brackets [ ], braces {}, absolute value (i.e., -7),square root symbols, cube root symbols, and the division bar should be treated as grouping symbols.
• Absolute Value is the distance between a number and zero. It is a grouping symbol.
• Division Bars are a grouping symbol. When following the order of operations, the numerator and denominator must first be simplified.
• Square Root symbols are a grouping symbol.
	• How is an algebraic expression different from a numerical expression?
	• Why do we need to follow the order of operations when simplifying expressions?
	How do scientists use evaluating when working with formulas? What are some formulas they might be working with?

• An algebraic expression contains numbers, operations, and variables. algebraic expressions are evaluated by substituting numbers for variables and applying the order of operations to simplify the resulting numeric expression	

Standard PA.16 **Patterns, Functions, and Algebra**

The student will simplify algebraic expressions.

Benchmarks Key knowledge and skills we want students to know and be able to do	
The student will: a. Model an algebraic expression using algebra tiles. b. Use the properties of real numbers to simplify an algebraic expression. c. Identify parts of an expression	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• An expression consists of numbers, variables, operations, and grouping symbols. • A constant represents a known value in an algebraic expression. • A variable represents an unknown quantity. • A term is separated by an operation. Example) 5x + 3. 5x and 3 are both terms. • A coefficient is the number used to multiply the variable. Example) 5x means "5 times x" 5 is the coefficient. • A variable without a coefficient has a coefficient of 1. • The distributive property allows you to multiply a sum by multiplying each of the addends individually and then adding those products. • Like terms are terms that have the same variable and exponent. • Simplifying an expression means writing an expression in the most efficient way. This involves using the distributive property to get rid of parenthesis and combining all like terms. • The commutative property, associative property, and distributive property allow you to change the order, regroup, and remove parenthesis in order to combine like terms. • Algebra tiles can be used to represent an algebraic expression visually.	• How do simplifying expressions help us solve equations more efficiently? • How do the properties apply to simplifying an expression?

Standard PA.17 **Patterns, Functions and Algebra**

The student will solve equations with rational numbers.

Benchmarks Key knowledge and skills we want students to know and be able to do	
The student will: a. Use algebra tiles to model an equation. b. Solve multi step equations involving rational numbers (include distributive property) c. Solve equations with variables on both sides. d. Use equations to estimate and solve real world problems. e. Confirm algebraic solutions	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• An expression contains variables, numbers, and operations; it does not have an equal sign. • An equation is a mathematical statement where two expressions are equal. • Real world problems can be represented by an equation. • The properties of real numbers and properties of equality help to justify the steps in solving an equation. • When solving an equation use opposite/inverse operation. • An equation needs to stay balanced, what you do to one side of the equal sign, you must do to the other. • To check a solution to an equation, use the substitution property to plug it into the equation. • Examples of equations: ○ $3x + 6 = 4x - 5$ ○ $-2(x - 6) = 3x + 2x - 3$ ○ $\frac{1}{2}x + \frac{2}{3}x = 8$ ○ $\frac{x-4}{2} = 6$	• How do equations represent scenarios in our lives? How can equations help us to solve real world problems? • How can a model be used to represent and solve an equation?

Standard PA.18 **Patterns, Functions and Algebra**

The student will solve and graph inequalities.

Benchmarks Key knowledge and skills we want students to know and be able to do	
The student will: a. Solve multi step inequalities (include distributive property) b. Solve inequalities with variables on both sides. c. Graph solutions to inequalities d. Apply inequalities to real-life problems (this should include estimating, writing the inequality, and solving)	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• When both sides of an inequality are multiplied or divided by a negative number, the inequality symbol is flipped. • An inequality may have multiple values that can be substituted to make the inequality true. • The graph of inequality visually represents the set of solutions. •  • If a solution is also equal to, when graphing the circle is filled in. If it is just greater than or less than, an open circle is used. • Inequalities can be used to solve real life problems.	• How is an inequality different from an equation? • How does the graph of inequality help us to visualize the solutions to the inequality? • Why does the inequality symbol need to be flipped when we multiply or divide by a negative number? • How can an inequality represent a real-life situation?

Standard PA.19 **Patterns, Functions and Algebra**

The student will solve practical problems involving percents.

Benchmarks Key knowledge and skills we want students to know and be able to do	
The student will: a. Find the percent of a number. b. Calculate simple interest and the new balance. c. Solve practical problems involving tax, tip, mark ups, discounts, commission, percent error, scaled copies, and percent of change. d. Use proportions to calculate measurement conversions between customary and metric systems. e. Use mental math to determine a reasonable estimate of a practical problem.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• A proportional relationship is made of equivalent ratios. • Percent means "per 100" It is a ratio with a denominator of 100. • Simple interest is solved by using the formula I= prt where I is interest, p is principle, r is rate, and t is time in years. • Tip, mark ups, tax, and commission get added to the total. Discounts get subtracted from the total. • Percent of increase and percent of decrease are types of percent of change. • Proportion and percent problems can be solved in multiple ways including using the constant of proportionality with an equation or writing a proportion and cross multiplying. • Estimating percentage problems will help students to develop a better number sense and understanding. For example: Your bill at a restaurant is $72.00. If you want to tip, about how much would you give?	• When and why are percentages used to describe change in relation to an initial amount? • Where do we use percent of change in the real world? • How is percent of change related to tip, tax, commission, markups, discounts, percent error, and scaled copies? • How can understanding simple interest help you to make good financial choices in the future? • How are slope, constant of proportionality, and unit rate all connected?

Standard PA.20 **Patterns, Functions, and Algebra**

The student will represent functions as ordered pairs, tables, graphs, and equations and identify the parts. of the function for discrete points.

Benchmarks Key knowledge and skills we want students to know and be able to do	
The student will: a. Determine if a given relation is a function. b. Make a table to graph linear functions. c. Identify the domain, range, independent, and dependent variables given a table, ordered pairs, discrete points, or real-world example. (For relations and functions- not in set builders' notation) d. Write an equation/function rule given a table or pattern.	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• A function is a relation where every input has only one output. • Students should know how to graph points on the coordinate plane. • The graph of an equation is the visual representation of all of the solutions of the equation. • The values in the table are values that make the equation true. • There are an infinite number of solutions to a linear function. They only need to find a few (3 - 5) in order to graph the linear function. • Students should pick x values and find what the corresponding y value has to be to create a table. • Input, Independent Variable and Domain represent the x values of the relation. • Range, Output, and Dependent Variable represent the y values of the relation.	• How does a graph help you to visualize the function? • What is the relationship between the equation, table, and graph of the linear function? • What functions do we see in our everyday lives? • How can we use a table to determine the rule/equation of the function?

Standard PA.21 **Patterns, Functions, and Algebra**

The student will identify the slope/rate of change given a practical problem or graph.

(This does not include slope formula)

Benchmarks Key knowledge and skills we want students to know and be able to do	
The student will: a. Use real world problems to identify the rate of change. b. Use the graph of a real-world problem to identify the rate of change. c. Identify the slope as positive, negative, zero slope (horizontal line), or undefined (vertical line).	
Essential Knowledge Key facts, concepts, and ideas needed to successfully meet benchmarks	**Essential Questions** Questions to guide student inquiry and focus instruction to uncover big ideas
• Slope can be described as a rate of change. • The slope of a line represents a constant rate of change in the dependent variable when the independent variable changes by a constant amount. • Slope and rate of change is also called the constant of proportionality which is the constant ratio between two proportional quantities. Ex) Annie ran 15 miles over 3 days at cross country. If she ran the same amount each day, what was her rate of miles per day? • When given a graph of a real-world situation, determine the rate of change. (Can be connected to unit rate) • Given a graph representing a drive to work or a race, compare the rate of change occurring between different intervals.  • Slope can be described as negative, positive, zero slope (horizontal line), or undefined (vertical line). • The larger the absolute value of the slope, the steeper the line is. The closer the slope is to 0, the flatter the line is.	• What does the slope represent given a practical problem? • How can you compare the slopes of lines? • How is slope related to rate of change and unit rate?

High School - Algebra 1

Standard A.1:The student will apply principles of ORDER OF OPERATIONS.

a. Use the order of operations to simplify numerical expressions (with and without grouping symbols).
b. Use the order of operations to simplify variable expressions.
c. Evaluate algebraic expressions.
d. Translate phrases into variable expressions.
e. Translate word sentences into equations.
f. Define and use opposites and absolute values.
g. Define and use the equality properties.
h. Define and use number properties to simplify expressions: closure, commutative, associative properties distributive properties, identity properties, property of reciprocals, property of opposites, property of opposites of a sum.

Standard A.2: The student will apply principles of REAL NUMBERS.

a. Identify real numbers on a number line.
b. Add, subtract, multiply and divide rational and irrational numbers.
c. Estimate square roots.
d. Identify the locations of square roots within the real number set.
e. Add, subtract, multiply and divide monomials with rational and irrational coefficients.

Standard A.3: The student will apply concepts of LINEAR FUNCTIONS.

a. Solve equations using addition, subtraction, multiplication, and division.
b. Solve multi-step equations to include word problems and literal equations.
c. Solve equations with the variable on both sides.
d. Solve equations using area/perimeter formulas of geometric figures.
e. Solve equations involving formulas for: age, cost-income-value, uniform motion, percent, work, mixture problems.

STANDARD A.4: The student will apply concepts of PROPORTIONAL REASONING.

a. Solve problems using ratio and proportion.
b. Use proportions and similar triangles to reduce and enlarge figures.
c. Solve percent problems using ratio and proportion.
d. Solve direct, inverse, and joint variation problems.
e. Solve percent problems using ratio and proportion.

Standard A.5: The student will investigate RELATIONS AND FUNCTIONS.

a. Compare and contrast concepts of relations and functions.
b. Determine the domain and range using graphs, ordered pairs and symbolic expressions.
c. Define a function through the use of tables and graphs.

Standard A.6: The student will apply concepts of LINEAR FUNCTIONS.

a. Determine whether a point lies on a given line.
b. Graph lines from an xy table of values.
c. Identify and graph vertical and horizontal lines to include the concept of zero and undefined slope.
d. Define and determine the slope of a line.
e. Graph lines using the slope-intercept form of an equation.
f. Graph parallel and perpendicular lines and identify their slope relations.
g. Write linear equations in point-slope, slope-intercept, and standard form.

Standard A.7: The student will apply concepts of LINEAR INEQUALITIES.

a. Solve simple inequalities using addition, subtraction, multiplication, and division.
b. Solve multi-step inequalities to include those with the variable on both sides.
c. Solve combined inequalities.
d. Solve equations and inequalities involving absolute value.
e. Graph linear inequalities to include one or two variables.

Standard A.8: The students will apply concepts of the systems of EQUATIONS/INEQUALITIES.

a. Use graphs to solve systems of linear equations.
b. Use the substitution method to solve systems of linear equations.
c. Use addition or subtraction (elimination method) to solve systems of linear equations in two variables.
d. Use multiplication with the addition or subtraction (elimination method) to solve systems of linear equations in two variables.
e. Use systems of linear equations in two variables to solve wind and water current problems.
f. Graph systems of inequalities.
g. Solve linear systems containing one or two variables algebraically, to include Inequalities.

Standard A.9: The student will perform OPERATIONS ON POLYNOMIALS

a. Add and subtract polynomials.
b. Multiply polynomials, to include horizontal and vertical form.
c. Understand and apply rules of exponents involving monomials.

Standard A.10: The student will use factoring to SIMPLY NOMINALS.

a. Simplify quotients of monomials using the greatest common factor
b. Divide polynomials by monomials.
c. Factor polynomials using the greatest common factor.
d. Find the product of two binomials mentally.
e. Factor differences of two squares.
f. Factor perfect square trinomials.
g. Factor trinomials whose quadratic coefficients are one.
h. Factor trinomials whose quadratic coefficients are greater than one.
i. Factor by grouping terms.

Standard A.11: The student will apply concepts of QUADRATIC FUNCTIONS.

a. Use the general properties of the parent graph of a parabola to include the horizontal shift, vertical shift and stretch factor.
b. Graph quadratic equations.
c. Solve quadratic equations by graphing.
d. Solve quadratic equations by factoring, to include the zero-product property.
e. Solve application problems by writing and factoring quadratic equations.
f. Solve quadratic equations by using the quadratic formula.
g. Solve quadratic equations by completing the square.

Standard A.12: The student will apply concepts of other NONLINEAR FUNCTIONS.

a. Plot cubic functions.
b. Plot exponential functions.
c. Plot the square root functions.
d. Plot the rectangular hyperbolic (a.k.a. the reciprocal) functions.
e. Graph absolute value functions.

Standard A.13: The student will manipulate RATIONAL EXPRESSIONS AND EQUATIONS.

a. Simplify rational expressions.
b. Multiply and divide rational expressions.
c. Add and subtract rational expressions with like denominators using variables.
d. Add and subtract rational expressions with unlike denominators using variables.
e. Simplify mixed expressions and complex fractions.
f. Solve rational equations.
g. Simplify expressions using negative exponents.

Standard A.14: The student will manipulate RADICAL EXPRESSIONS AND EQUATIONS.

a. Simplify radical expressions.
b. Add, subtract, multiply and divide radical expressions.
c. Apply the Pythagorean Theorem and its converse to solve geometric problems.
d. Apply the Pythagorean Theorem to find the distance between two points.
e. Solve radical equations.
f. Solve quadratic equations involving perfect squares.
g. Apply the quadratic formula to solve problems.
h. Use the discriminant to find the nature of the roots and the number of x- intercepts of the graph of quadratic equations.

Standard A.15: The student will apply ALGEBRAIC LOGIC.

a. Use properties of the number system to judge the validity of results, justify steps in a procedure and prove/disprove statements.
b. Use simple aspects of logical argumentation.
c. Solve problems using patterns.

Standard A.16: The student will apply principles of STATISTICS.

a. Interpret variation and central measures of tendency in real-world contexts.
b. Calculate and interpret mean absolute deviation, standard deviation, and z-scores.
c. Use box-and-whisker plots to compare and contrast multiple univariate data sets.
d. Determine the equation of best fit in order to make predictions.
e. Solve real-world problems using mathematical models. Models will include linear and quadratic functions.

High School - Geometry

Standard G.1: The student will apply the LANGUAGE OF GEOMETRY.

a. Use and draw representations of the undefined terms: point, line, and plane.
b. Use postulates and theorems relating points, lines, and planes.
c. Use the terms collinear, coplanar, equidistant and intersection.
d. Use symbols for lines, segments, rays, and distances.
e. Find the length of a segment on a number line.
f. Use the Ruler Postulate and the Segment Addition Postulate.
g. Apply the definition and theorems about perpendicular lines.
h. Use postulates and theorems relating points, lines, and planes.

Standard G.2: The student will apply concepts related to ANGLES.

a. Name angles and find their measures.
b. State and use the Angle Addition Postulate.
c. Apply the definitions of complementary and supplementary angles.
d. State and apply the theorems about angles supplementary to, or complementary to, congruent lines.
e. State and use the vertical angles theorem.
f. Apply the formula to find the sum of the angles of a polygon.
g. Apply the formula to find the angle measurement in regular polygons.
h. Apply the formula to find the sum of the exterior angles of a polygon.

Standard G.3: The student will apply concepts of LOGICAL REASONING.

a. Recognize the hypothesis and the conclusion of an if-then statement.
b. State the converse of an if-then statement and develop proof by counterexample.
c. Understand the meaning of a biconditional statement (if and only if).
d. State the contrapositive and inverse of an if-then statement.
e. Understand the relationship between logically equivalent statements.
f. Draw correct conclusions from given statements.
g. Understand and create truth tables.
h. Plan proofs and write them in two-column form.
i. Use properties from algebra and properties of congruence in proofs.
j. Write indirect proofs in paragraph form.

Standard G.4: The student will apply concepts of PARALLEL LINES AND PLANES.

a. Distinguish between intersecting lines, parallel lines, and skew lines.
b. State and apply the theorem about the intersection of two parallel lines by a third plane.
c. Identify the angles formed when two lines are cut by a transversal.
d. Apply the postulates and theorems about parallel lines.
e. Apply the theorems about a parallel and a perpendicular to a given line through a point outside the line.

Standard G.5: **The student will apply concepts of TRIANGLES.**

a. Use the Triangle Sum Theorem.
b. Understand properties and their proofs for triangles to include scalene, isosceles, and equilateral.
c. Apply the theorems and corollaries about isosceles triangles.
d. Understand the conjectures for the exterior angles of triangles.
e. Apply the properties and theorems associated with the median, the altitude, the perpendicular bisector, and the angle bisector.

Standard G.6: **The student will apply concepts of CONGRUENT TRIANGLES.**

a. Identify corresponding parts of congruent figures.
b. Prove two triangles congruent by using the SSS, SAS and ASA Postulates.
c. Use the AAS theorem to prove two triangles congruent.
d. Use the HL, LL, HA, and LA theorems to prove two right triangles congruent.
e. Prove that two overlapping triangles are congruent.
f. Prove two triangles congruent by first proving two other triangles congruent.

Standard G.7: **The student will apply concepts of QUADRILATERALS.**

a. Apply the definition of a parallelogram and the theorems about properties of a parallelogram.
b. Prove that certain quadrilaterals are parallelograms.
c. 3 Apply the definitions and identify the special properties of a rectangle, a rhombus, and a square.
d. Determine when a parallelogram is a rectangle, rhombus or square.
e. 5 Apply the definitions and identify the properties of a trapezoid, isosceles trapezoid, and kite.

Standard G.8: **The student will apply concepts of INEQUALITIES.**

a. Apply properties of inequality to positive numbers, lengths of segments and measures of angles.
b. State and use the Exterior Angle Inequality Theorem.
c. State and apply the Triangle Inequality Theorem.
d. State and apply the theorem relating unequal sides and unequal angles of a triangle.

Standard G.9: **The student will apply concepts of SIMILARITY.**

a. State and apply the properties of similar polygons.
b. Use the AA Similarity Postulate to prove triangles similar.
c. Use the SAS and SSS Similarity Theorems to prove triangles similar.
d. Use scale drawings as an application of similarity.
e. Solve application problems using similarity properties.
f. Apply the Mid-Segment Theorem .
g. Apply the Triangle Proportionality Theorem and its corollary.
h. Apply the Triangle Angle-Bisector Theorem.

Standard G.10: The student will apply concepts of RIGHT TRIANGLES.

a. Simplify radical expressions.
b. Determine the geometric mean between two numbers.
c. State and apply the relationships that exist when the altitude is drawn to the hypotenuse of a right triangle.
d. State and apply the Pythagorean Theorem to find the lengths of segments, the midpoints of segments, the distance between a point and a line.
e. State and apply the converse of the Pythagorean Theorem and related theorems about obtuse and acute angles.
f. Determine the lengths of two sides of a 45°-45°-90°or a 30°- 60°-90° triangle when the length of the third side is known.
g. Solve right triangle problems by using the sine, cosine, and tangent ratios.

Standard G.11: The student will apply concepts of CIRCLES.

a. Understand basic conjectures and proofs of properties of a circle to include investigations of π.
b. Develop the concept of diameter-chord relationships in circles.
c. Apply the formulas for the circumferences and areas of circles.
d. Develop relationships between the area and central angles in circles.
e. Use the formulas for arc length and the areas of sectors of a circle.
f. Understand angle and arc length relationships in circles.
g. Apply the proofs for theorems of angles, chords, secants, and tangent segments.
h. Apply the general equation of the circle using its locus of points.

Standard G.12: The student will show PROOF OF GEOMETRIC THEOREMS using construction tools *(straight edge and compass)*

Standard G.13: The student will apply concepts related to AREAS OF PLANE FIGURES.

a. Use the formulas for the areas of rectangles, parallelograms, triangles, rhombuses, trapezoids, and regular polygons.
b. Apply the relationships between scale factors, perimeters, and areas of similar figures.
c. Use areas to solve problems involving geometric probability.

Standard G.14: The student will apply concepts related to AREA AND VOLUME OF SOLIDS.

a. Apply the formulas for the surface area of prisms, cylinders, pyramids, cones, and spheres.
b. Apply the formulas for the volume of prisms, cylinders, pyramids, cones, and spheres.
c. Recognize the properties of similar solids.

Standard G.15: The student will apply concepts related to COORDINATE GEOMETRY.

a. Apply the distance and midpoint formulas.
b. Understand the basic properties of vectors.
c. Given a polygon, choose a convenient placement of coordinate axes and assign appropriate coordinates.
d. Prove statements by using coordinate geometry methods.

Standard G.16: The student will manipulate figures using TRANSFORMATIONS.

a. Recognize and use terms: image, preimage, mapping, one-to-one mapping, transformation, isometry, and congruence mapping.
b. Recognize and use the terms' identity and inverse in relation to mappings.
c. Locate images of figures by reflection, translation and glide reflection, rotation, dilation/reduction, composites of mapping.
d. Describe the symmetry of figures and solids.
e. Recognize tessellations.

High School - Algebra 2

Standard A2.1: The student will review BASIC ALGEBRAIC CONCEPTS

a. Identify, distinguish among, compare, order, and use various subsets of the real number system: natural, whole, integer, rational, irrational, and real numbers.

b. Understand basic algebraic properties and use them efficiently to simplify algebraic expressions:

i. reflexive, symmetric, and transitive properties
ii. associative properties
iii. commutative properties
iv. closure properties
v. identity properties
vi. property of reciprocals
vii. property of opposites
viii. property of opposites of a sum
ix. multiplicative and additive properties of equalities and inequalities"

c. Apply the order of operations to simplify and evaluate expressions with and without variables and grouping symbols involving:

i. fractions
ii. decimals
iii. negatives
iv. absolute value
v. exponent"

Standard A2.2: The student will solve EQUATIONS AND PROBLEMS.

a. Use appropriate algebraic vocabulary: equation, solve, like (similar) terms, combine like terms, replacement set, solution set.
b. Translate verbal statements into algebraic expressions/equation and vice-versa.
c. Solve equations in one variable by applying real number properties.
d. Solve multiple variable equations for a specific variable (literal equations).
e. Solve equations and problems with variables on both sides.
f. Solve real-life applications including the following types:

i. multi-step problems
ii. age problems (including those involving age now, age in the past, age in the future)
iii. percent problems
iv. consecutive integers/multiples
v. rate-time-distance problems: motion in the same direction, motion in opposite directions, round trip problems
vi. area/ perimeter / angle measures
vii. problems that do not have a solution.

Standard A2.3: The student will apply concepts of POLYNOMIALS.

a. Use appropriate algebraic vocabulary.
    i. monomial, binomial, trinomial, polynomial
    ii. degree of a monomial
    iii. degree of a constant term
    iv. degree of a polynomial
b. Write a polynomial in ascending / descending order of a specified variable.
c. Add and subtract polynomials.
d. Multiply monomials using the rules of exponents to include:
    i. Raising a power to a given power
    ii. Raising a product to a given power
e. Find products in the following ways:
    i. multiply a polynomial by a monomial.
    ii. multiply two binomials (using FOIL or a similar method)
    iii. multiply a polynomial by a binomial.
f. Solve problems using direct and indirect variation.
g. Divide polynomials using long division and synthetic division.
h. Use the remainder and factor theorems to find factors of polynomials.
i. Find rational roots of polynomials.

Standard A2.4: The student will FACTOR POLYNOMIALS.

a. Find quotients and factors as follows:
    i. find the GCF of several integers.
    ii. simplify quotients of monomials
    iii. divide polynomials by monomials.
    iv. Find the monomial factor (GCF) of a polynomial.
b. Factor the following types of polynomials:
    i. difference of two perfect squares
    ii. perfect square trinomials
    iii. factoring by grouping terms
    iv. apply factoring patterns for x^2 + bx + c, where c is positive / negative.
    v. apply factoring patterns for ax^2 + bx + c, where c is positive / negative.
c. Use factoring in solving polynomial equations.
d. Solve application problems by writing and factoring quadratic equations.
e. Solve polynomial equations and polynomial functions; identify roots, zeros, and multiples of each.
f. Solve real-life applications involving polynomials.
g. Solve polynomial inequalities.

Standard A2.5: The student will solve RATIONAL EXPRESSIONS AND EQUATIONS.

a. Simplify rational expressions.
b. Multiply rational expressions
c. Divide rational expressions.
d. Add and subtract rational expressions with like denominators.
e. Add and subtract rational expressions with unlike denominators.
f. Graph rational functions.
g. Simplify complex fractions.
h. Evaluate exponential expressions containing negative and zero exponents.
i. Find the domain and range of rational functions.
j. Solve equations and inequalities having fractional coefficients.
k. Solve fractional equations.
l. Solve real-life equations and identify those which have no solution.

Standard A2.6: The student will be introduced to FUNCTIONS.

a. Use appropriate algebraic vocabulary: relation, function, domain, range.
b. Understand what a function is and define a function by using tables and graphs.
c. Identify the domain and range of a function.
d. Use the vertical line test to determine if a graph is a function.
e. Find the value of the function given the domain.
    a. Graph a linear function on a coordinate plane.

Standard A2.7: The student will apply concepts related to LINEAR EQUATIONS.

a. Use appropriate algebraic vocabulary: linear equation, slope, x- and y-intercepts, slope-intercept form, standard/general form.
b. Identify a linear equation.
c. Differentiate between linear equations written in standard/general form and those written in slope-intercept form.
d. Transform linear equations from one form to another.
e. Understand and use the slope-intercept method of graphing a linear equation.
f. Understand and use the x- and y-intercept method of graphing a linear equation.
g. Determine the slope of a line when given the graph of a line.
h. Determine the slope of a line algebraically using the slope formula when given two points.
i. Determine the equation of a line when given:
    i. the slope and the y-intercept
    ii. the slope and one point on the line
    iii. two points on a line
j. Determine the midpoint of a line segment.
k. Determine the distance between two points.

Standard A2.8: The student will apply concepts related to SYSTEMS OF LINEAR EQUATIONS

a. Solve systems of linear equations in two variables by using:
    i. graphs
    ii. linear combinations
    iii. substitution method
b. Understand the solution sets of linear equations can result in:
    i. a single ordered pair (intersecting lines)
    ii. the empty set (parallel lines)
    iii. infinitely many ordered pairs (coincident lines)
c. Graph linear equations in two variables on a coordinate plane using:
    i. x- and y-intercepts
    ii. slope and y-intercept
    iii. coordinate points
d. Solve for the slope a line and the equation of a line using:
    i. slope formula
    ii. slope-intercept form
e. Solve real-life application problems using systems of linear equations:
    i. wind and water current problems
    ii. other types of applicable problems

Standard A2.9: The student will apply concepts related to INEQUALITIES.

a. Solve and graph inequalities in one variable on a number line.
b. Solve and graph combined inequalities involving both "and" / "or" situations.
c. Solve and graph absolute value equations.
d. Solve and graph absolute value inequalities involving both "and" / "or" situations.
e. Solve and graph linear inequalities in two variables.
f. Solve and graph systems of linear and quadratic inequalities by graphing.

Standard A2.10: The student will apply concepts related to RATIONAL AND IRRATIONAL NUMBERS.

a. Express rational numbers as decimals or fractions.
b. Find square roots of numbers that have rational square roots.
c. Simplify radicals.
d. Work with problems containing radical expressions in the following way:
    i. simplify products and quotients of radicals.
    ii. simplify sums and differences of radicals.
    iii. multiply binomials containing square root radicals.
    iv. rationalize binomial denominators.
    v. solve radical equations.

Standard A2.11: The student will apply concepts related to COMPLEX NUMBERS.

a. Identify the real and imaginary components of complex numbers.
b. Simplify square roots of negative numbers.
c. Add, subtract, multiply, and divide complex numbers.

Standard A2.12: The student will apply concepts related to QUADRATIC FUNCTIONS.

a. Solve quadratic equations by completing the square.
b. Solve quadratic equations by using the quadratic formula.
c. Find the determinant to determine the nature of its roots.
d. Graph quadratic equations and their transformations.
e. Solve systems of quadratic equations.

Standard A2.13: The student will apply concepts related to CONIC SECTIONS.

a. Find the distance between any two points.
b. Find the midpoint of a line segment joining any two points.
c. Write the standard form of the equation of a circle, graph a circle, and find the center and radius of a circle.
d. Write the standard form of the equation of a parabola, graph a parabola, and find the vertex, directrix, focus, axis of symmetry, and latus rectum.
e. Write the standard form of the equation of a hyperbola, graph a hyperbola, and find the center, vertices, equations of the asymptotes, and foci.
f. Write the standard form of the equation of an ellipse, graph an ellipse, and find the center, vertices, co-vertices, and foci.

Standard A2.14: The student will apply concepts related to LINEAR ALGEBRA (MATRICES).

a. Identify & describe matrices.
b. Add, subtract, multiply, transpose matrices.
c. Use Row-Reduction to solve a system via the graphing calculator.
d. Evaluate inverses and determinants.
e. Apply Cramer's method.

Standard A2.15: The student will apply concepts related to LOGARITHMIC AND EXPONENTIAL FUNCTIONS

a. Change exponential expressions to logarithmic expressions.
b. Change logarithmic expressions to exponential expressions.
c. Evaluate, determine the domain, and graph logarithmic functions.
d. Solve problems using direct, indirect, and joint variation.
e. Solve logarithmic equations using properties of logarithms.
f. 6. Solve logarithmic and exponential equations using a graphing utility.

Standard A2.16: The student will apply concepts related to SEQUENCES AND SERIES.

a. Define, construct, and explain recursive formulas.
b. Arithmetic sequences and series.
c. Geometric sequences and series.
d. Geometric and arithmetic means.
e. Sigma notation: application and expansion.
f. Address a variety of sequence and series applications.

Standard A2.17: The student will apply concepts related to PROBABILITY.

a. Counting principle.
b. Permutation and combinations.
c. Factorial notation and application.
d. Discrete probability.
e. Draw and interpret Venn Diagrams.

Standard A2.18: The student will apply concepts related to TRIGONOMETRIC FUNCTIONS.

a. Find degree and radian measures of an angle.
b. Find sine, cosine, tangent, and reciprocal functions of an acute triangle.
c. Find the trigonometric functions of general angles.

High School – Trigonometry

Standard T.1: The student will apply concepts related to ALGEBRA CONCEPTS.

a. Recognize monomials and polynomials, and add, subtract, and divide polynomials.
b. Review methods for factoring polynomials
c. Review how to reduce, multiply, divide, add, and subtract rational expressions.
d. Simplify complex fractions.
e. Solve rational equations and inequalities.
f. Review evaluating square roots and rational exponents.

Standard T.2: The student will apply concepts related to POLYNOMIALS.

a. Solve quadratic equations by factoring, completing the square and the quadratic formula.
b. Solve problems involving quadratic equations.
c. Solve systems of polynomial functions: conics and lines.
d. Find all zeros of a polynomial function.
e. Know the factoring of a sum and/or difference of cubes.
f. Factor a polynomial using the rational roots theorem and long division or synthetic division.

Standard T.3: The student will apply concepts related to GRAPHING.

a. Locate x- and y-intercepts.
b. Locate discontinuities: point, infinite, and jump.
c. Locate all vertical and horizontal asymptotes.
d. Write the equation of a line in slope-intercept formula, point slope form or general form.
e. Write the standard form of the equation of a circle, graph a circle, and find the center and radius of a circle.
f. Write the standard form of the equation of a parabola, graph a parabola, and find the vertex, directrix, focus, axis of symmetry, and latus rectum.
g. Write the standard form of the equation of a hyperbola, graph a hyperbola, and find the center, vertices, equations of the asymptotes and foci.
h. Write the standard form of the equation of an ellipse, graph an ellipse, and find the center, vertices, co-vertices, and foci.
i. Draw and interpret scatter diagrams.
j. Distinguish between linear and nonlinear relations.
k. Use a calculator to find the line of best fit.
l. Identify the graph of a function.
m. Graph the following functions: rational, polynomial, root, exponential, logarithmic.

Standard T.4: The student will apply concepts related to FUNCTIONS.

a. Study linear, rational, root, polynomial, exponential, and logarithmic functions.
b. Identify the domain and range of a relation.
c. Model relations using diagrams, graphs, and set notation.
d. Identify the range, domain, and intercepts given the graph of a function.
e. Find the value of a function given the domain.
f. Graph linear functions on a coordinate plane.
g. Graph the following types of functions: piecewise, constant, identity, quadratic, cube root and square root, reciprocal, absolute value.

Standard T.5: The student will apply concepts related to COMPLEX NUMBERS.

a. Identify the real and imaginary components of complex numbers.
b. Simplify square roots and negative numbers.
c. Add, subtract, multiply, and divide complex numbers.

Standard T.6: The student will apply concepts related to LOGARITHMIC FUNCTIONS.

a. Change exponential expressions to logarithmic expressions.
b. Change logarithmic expressions to exponential expressions.
c. Evaluate, determine the domain, and graph logarithmic functions.
d. Solve problems using direct, indirect, and joint variation.
e. Solve logarithmic equations using properties of logarithms.
f. Solve logarithmic and exponential equations using a graphing utility.

Standard T.7: The student will apply concepts related to CONICS.

a. Identify conic sections.
b. Discuss and Graph conics.
c. Recognize and analyze conic sections equations given in general form.
d. Graph and interpret systems of conic sections (include inequalities).

Standard T.8: The student will apply concepts related to LINEAR ALGEBRA (MATRICES).

a. Identify & describe matrices.
b. Add, subtract, multiply, transpose matrices.
c. Use Row-Reduction to solve a system via the graphing calculator.
d. Evaluate inverses and determinants.
e. Apply Cramer's method.

Standard T.9: The student will apply concepts related to SEQUENCES AND SERIES.

a. Define, construct, and explain recursive formulas.
b. Arithmetic sequences and series.
c. Geometric sequences and series.
d. Geometric and arithmetic means.
e. Sigma notation: application and expansion.
f. Address a variety of sequence and series applications.

Standard T.10: The student will apply concepts related to PROBABILITY.

a. Counting principle.
b. Permutation and combinations.
c. Factorial notation and application.
d. Discrete probability.
e. Draw and interpret Venn Diagrams.

Standard T.11: The student will apply concepts related to TRIGONOMETRY.

a. Identify the following: period, amplitude, phase shift, vertical shift.
b. Master sine, cosine, and tangent values corresponding to the unit circle at angles of 0, pi/6, pi/4, pi/3, pi/2, pi (or 0, 30, 45, 60, 90, 180 degrees) and multiples of the same.
c. Define and use circular trigonometric functions.
d. Define and use trigonometric function of right triangle.
e. Compute the values of trigonometric functions of angles.
f. Graph trigonometric functions and their transformations.
g. Graph sinusoidal functions and find an equation for a sinusoidal graph.
h. Find an angle using a calculator and an inverse trigonometric function.
i. Prove trigonometric identities.
j. Use Law of Sines and Law of Cosines to solve triangle and applied problems.

High School – Precalculus

Standard PC.1: The student will apply concepts related to ALGEBRA CONCEPTS.

a. Review process for factoring polynomials.
b. Review how to find domain and range.
c. Review how to solve linear equations.
d. Write solutions in set and interval notation.
e. Check solutions in set and interval notation.
f. Check solutions through equations.
g. Use patterns for exponents.
h. Emphasize the importance of using the correct unit of measurement.
i. Evaluate / use area and volume.
j. Solve rate problems.
k. Create deductive proofs.
l. Use inductive reasoning.
m. Analyze general / standard form for equations.

Standard PC.2: The student will apply concepts related to FUNCTIONS AND THEIR GRAPHS.

a. Graph polynomial functions, trig functions, exponential functions, logarithmic functions, conic sections, rational functions, and special functions.
b. Graph polynomials after algebraically analyzing all aspects (x- and y-intercepts, turns, symmetry, end behavior, etc.).
c. Develop connections between factors, zeroes, x-intercepts, and solutions to f(x) = 0.
d. Review transformations and combinations of functions.
e. Apply horizontal line test to determine if a function is invertible .
f. Find inverse functions.
g. Determine equations from graphs.
h. Develop rules for graphing functions.

Standard PC.3: The student will apply concepts related to POLYNOMIAL FUNCTIONS.

a. Analyze polynomial functions of a higher degree using the rational roots theorem, synthetic division, and Descartes' rule of signs to find the zeros of the functions.
b. Graph composite and inverse functions.
c. Use synthetic and long division.
d. Review complex numbers and how to find complex zeroes of a polynomial function.
e. Apply Pascal's Triangle to find binomial coefficients.
f. Analyze polynomial functions and root functions.
g. Perform arithmetic operations, composition, and find the inverse of functions.

Standard PC.4: The student will apply concepts related to RATIONAL FUNCTIONS.

a. Solve inequalities (linear, absolute value, polynomials, and rational).
b. Graph inequalities (linear, absolute value, polynomials, and rational).
c. Graph rational functions.
d. Identify vertical, horizontal, and slant asymptotes.
e. Identify the range, domain, and intercepts.
f. Analyze rational functions.
g. Introduce limits.
h. Perform partial fraction decomposition.
i. Identify end behavior.

Standard PC.5: The student will apply concepts related to EXPONENTIAL AND LOGARITHMIC FUNCTIONS.

a. Graph exponential and logarithmic functions.
b. Analyze exponential and logarithmic functions.
c. Evaluate logarithms, exponentials, and radicals.
d. Evaluate, determine the domain, and graph logarithmic functions.
e. Use laws of exponents / logarithms.
f. Use patterns for exponents and logarithms.
g. Use zeros of equations applying exponents, radicals, and logarithms to estimate.
h. Perform composition and inversion of functions.
i. Solve exponential growth and decay problems.
j. Create and use normal distribution graphs.

Standard PC.6: The student will apply concepts related to TRIGONOMETRY.

a. Define degree and radian measure.
b. Convert between degree and radian measure.
c. Define trig functions using the unit circle, right triangles, and trig functions of any angle.
d. Calculate arc length and sector area of circles.
e. Evaluate angular / linear velocity .
f. Know trigonometric function values of all integral multiples of pi/6 and pi/4.
g. Use 30 - 60 - 90 and 45 - 45 - 90 triangles to derive those values.
h. Prove trig identities.
i. Graph sine, cosine, tangent, secant, cosecant, and cotangent functions.
j. Define and graph inverse trig functions.
k. Perform composition of functions.
l. Solve trig equations.
m. Manipulate fundamental identities, sum, and difference formulas, multiple angle formulas, and product and sum formulas.
n. Use approximate decimals for trigonometric values.
o. Use law of sines and law of cosines.
p. Solve problems involving bearings and/or directions.
q. Apply Heron's Formula.
r. Solve simple harmonic motion problems.

Standard PC.7: The student will apply concepts related to VECTORS.

a. Calculate vector magnitude.
b. Use vectors and rotations.
c. Add, subtract, and find a scalar product and the magnitude of a vector.
d. Find a vector from its direction and magnitude.
e. Evaluate Dot Product and Cross Product.
f. Apply Dot Product and Cross Product to various real-world applications.

Standard PC.8: The student will apply concepts related to POLAR COORDINATES AND COMPLEX NUMBERS.

a. Define properties of complex numbers.
b. Describe the relationship between polar and complex numbers; convert complex numbers to polar form and vice-versa.
c. Compute powers and roots of complex numbers.
d. Compute products and quotients of complex numbers in polar form .
e. Convert rectangular coordinates to polar coordinates and vice-versa.
f. Graph polar curves.
g. Solve equations in polar coordinates .

Standard PC.9: The student will apply concepts related to STATISTIC AND PROBABILITY.

a. Introduce and evaluate factorials.
b. Use theories of combination and permutation.
c. Use normal distribution graphs.

Standard PC.10: The student will apply concepts related to ANALYTICAL GEOMETRY.

a. Graph conic sections.
b. Analyze conic sections.
c. Solve conic section problems.
d. Write the standard form of the equation of a circle, graph a circle, and find the center and radius of a circle.
e. Analyze properties and graphs of functions defined parametrically.
f. Convert functions defined parametrically to rectangular coordinate by eliminating the parameter.
g. Use parametrically defined functions to model motion.

Standard PC.11: The student will apply concepts related to LINEAR ALGEBRA.

a. Perform matrix arithmetic (sums, differences, scalar multiplication, matrix multiplication).
b. Calculate determinants using minors and co-factors and the Rule of Sums.
c. Solve systems of equations using both matrix algebra (inverse matrices) and Cramer's Rule.

Standard PC.12: The student will apply concepts related to MATHEMATICAL INDUCTION.

a. Define recursive and explicit formulas.
b. Review sequences and series.
c. Construct mathematical induction proofs.

Standard PC.13: The student will apply concepts related to LIMITS OF FUNCTIONS (INCLUDING ONE-SIDED LIMITS).

a. Develop an intuitive understanding of the limiting process.
b. Calculate limits using algebra.
c. Estimate limits from graphs and tables of data.
d. Develop an understanding of asymptotes in terms of graphical behavior.
e. Develop asymptotic behavior in terms of limits involving behavior.
f. Develop an intuitive understanding of continuity (The function values can be made as close as desired by taking sufficiently close values of the domain).
g. Develop an understanding of continuity in terms of limits.

Standard PC.14: The student will apply concepts related to DERIVATIVES.

a. Define average rate of change of a function on an interval.
b. Interpret an instantaneous rate of change as the limiting case of an average rate of change.
c. Interpret a derivative as an instantaneous rate of change.
d. Present a derivative graphically, numerically and analytically .
e. Interpret a derivative as the limit of the difference quotient.

High School – Calculus

FUNCTIONS, Graphs, and Limits

Standard C.1: **The student will apply concepts related to ANALYSIS OF GRAPHS**

a. Use technology to produce graphs of functions .
b. Understand the interplay between the geometric and analytic information.
c. Use calculus both to predict and to explain the observed local and global behavior of a function.

Standard C.2: **The student will apply concepts related to LIMITS OF FUNCTIONS (including one-sided limits)**

a. Develop an intuitive understanding of the limiting process.
b. Calculate limits using algebra.
c. Estimate limits from graphs or tables of data .

Standard C.3: **The student will apply concepts related to ASYMPTOTIC AND UNBOUNDED BEHAVIOR**

a. Develop an understanding of asymptotes in terms of graphical behavior.
b. Describe asymptotic behavior in terms of limits involving infinity.
c. Compare relative magnitudes of functions and their rates of change to include contrasting exponential growth, polynomial growth, and logarithmic growth.

Standard C.4: **The student will apply concepts related to CONTINUITY AS A PROPERTY OF FUNCTIONS**

a. Develop an intuitive understanding of continuity (The function values can be made as close as desired by taking sufficiently close values of the domain).
b. Develop an understanding of continuity in terms of limits.
c. Develop a geometric understanding of graphs of continuous functions including the Intermediate Value Theorem and Extreme Value Theorem.

DERIVATIVES.

Standard C.5: **The student will apply concepts related to CONCEPT OF THE DERIVATIVE.**

a. Present a derivative graphically, numerically, and analytically.
b. Interpret a derivative as an instantaneous rate of change.
c. Define a derivative as the limit of the difference quotient.
d. Determine the relationship between differentiability and continuity.

Standard C.6: **The student will apply concepts related to DERIVATIVE AT A POINT.**

a. Provide examples of the slope of a curve at a point, including points at which there are vertical tangents and points at which there are no tangents.
b. Provide examples of a tangent line to a curve at a point and local linear approximation.
c. Describe instantaneous rate of change as the limit of average rate of change.
d. Approximate rate of change from graphs and tables of values.

Standard C.7: **The student will apply concepts related to DERIVATIVE AS A FUNCTION**

a. Understand the corresponding characteristics of graphs of f and f '.
b. Understand the relationship between the increasing and decreasing behavior of f and the sign of f '.
c. Understand the Mean Value Theorem and its geometric consequences.
d. Solve equations involving derivatives.
e. Translate verbal descriptions into equations involving derivatives and vice versa.

Standard C.8: The student will apply concepts related to SECOND DERIVATIVES.

a. Understand the corresponding characteristics of the graphs of f, f ', and f ".
b. Understand the relationship between the concavity of f and the sign of f ".
c. Describe points of inflection as places where concavity changes.

Standard C.9: The student will apply concepts related to APPLICATIONS OF DERIVATIVES.

a. Analyze curves, including the notions of monotonicity and concavity.
b. Understand optimization, both absolute (global) and relative (local) extrema.
c. Model rates of change, including related rates problems.
d. Use implicit differentiation to find the derivative of an inverse function.
e. Interpret the derivative as a rate of change in varied applied contexts, including velocity, speed, and acceleration.
f. Understand the geometric interpretation of differential equations via slope fields and the relationship between slope fields and solution curves for differential.

Standard C.10: The student will apply concepts related to COMPUTATION OF DERIVATIVES.

a. Demonstrate knowledge of the derivatives of basic functions: power, exponential, logarithmic, trigonometric, inverse trigonometric functions.
b. Understand and use the basic rules for the derivative of sums, products, and quotients of functions.
c. Understand chain rule and implicit differentiation.

INTEGRALS

Standard C.11: The student will apply concepts related to INTERPRETATIONS AND PROPERTIES OF DEFINITE INTEGRALS

a. Interpret a definite integral as a limit of Riemann sums.
b. Interpret a definite integral of the rate of change of a quantity over an interval interpreted as the change of the quantity over the interval.
c. Understand and use the basic properties of definite integrals, including additivity and linearity.

Standard C.12: The student will apply concepts related to APPLICATIONS OF INTEGRALS

a. Use appropriate integrals in a variety of applications to model physical, biological, or economic situations.
b. Use the integral of a rate of change to give accumulated change.
c. Use the method of setting up an approximating Riemann sum and representing its limit as a definite integral.
d. Specific applications should include finding the area of a region, finding a volume of a solid with known cross sections, finding the average value of a function, finding the distance traveled by a particle along a line.

Standard C.14: The student will apply concepts related to FUNDAMENTAL THEOREM OF CALCULUS

a. Use the Fundamental Theorem to evaluate definite integrals.
b. Use the Fundamental Theorem to represent a particular antiderivative and the analytical and graphical analysis of functions so defined.

Standard C.15: The student will apply concepts related to TECHNIQUES OF ANTIDIFFERENTIATION

a. Use antiderivatives following directly from derivatives of basic functions.
b. Use antiderivatives by substituting variables (including change of limits for definite integrals).

Standard C.16: The student will apply concepts related to APPLICATIONS OF ANTIDIFFERENTIATION.

a. Find specific antiderivatives using initial conditions, including applications to motion along a line.
b. Solve separable differential equations and use them in modeling. In particular, study the equation y' = ky and exponential growth .

Standard C.17: The student will apply concepts related to NUMERICAL APPROXIMATIONS TO DEFINITE INTEGRALS

a. Use Riemann sums (using left, right, and midpoint evaluation points) and trapezoidal sums to approximate definite integrals of functions represented algebraically, graphically, and by tables of values.

High School – Statistics

Standard S.1: The student will apply concepts related to SUMMARIZING DATA WITH FREQUENCY TABLES.

a. Organize or normalize data into a frequency table or relative distribution table .
b. Construct a joint frequency contingency table from two categorical variables.
c. Construct a frequency polygon and a frequency curve from a frequency (or relative frequency) distribution.
d. Construct an objective given a relative cumulative frequency distribution .

Standard S.2: The student will apply concepts related to PICTURES OF DATA

a. Develop methods of displaying numerical data in an organized form.
b. Construct a histogram from a frequency distribution.
c. Distinguish between a histogram and a stem-and-leaf diagram.
d. Construct a bar graph from given data.
e. Construct a circle graph from given data.
f. Identify distortions (illustrations) in graphs or picture charts.
g. Plot points on a scattergram when given a bivariate distribution.
h. Construct a normal curve for data and standardized data.
i. Construct a box and whisker plot.

Standard S.3: The student will apply concepts related to MEASURES OF CENTER.

a. Compute the mean, median, and mode for a set of numbers.
b. Describe common characteristics of the mean, median, and mode.
c. Compute harmonic and geometric means for a set of data.
d. Locate the relative positions of the mean, median, and mode on a skewed frequency distribution.
e. Describe how measures of dispersion differ from measures of central tendency.
f. Determine an appropriate measure of central tendency for data scaled on nominal, ordinal, interval, and ratio levels.
g. Explain why the mean is influenced by extreme values in a distribution while the median is relatively unaffected by extreme values.

Standard S.6: The student will apply concepts related to MEASURE OF VARIATION

a. Calculate the standard deviation.
b. Interpret the variance.
c. Interpret the mean deviation.
d. Distinguish among definitions of the range of a set of data .
e. Interpret the standard deviation from a given value of the variance for a variable.
f. Understand and use the 5-number summary including: min, Q1, median, Q3, max.
g. Compute the sum of the squares of the deviation scores.
h. Distinguish between “real” and “apparent” class intervals.
i. Interpret the meaning of an individual standard score relative to the distribution of concern.
j. Describe characteristics of the normal curve.
k. Interpret the meaning of r and R^2.

Standard S.5: The student will apply concepts related to MEASURES OF POSITION

a. Describe Z-score and T-score numerical distributions in terms of the mean and standard deviation.
b. Transfer raw scores into corresponding standard Z-scores .
c. Convert a set of Z-scores into a distribution of standard scores with any given mean and standard deviation.
d. Given a set of Z-scores, use characteristics of the normal curve to convert the Z-scores into percentile equivalents.
e. Given a percentile score, use the characteristics of the normal curve to transform the percentile to a standard Z-score.
f. Convert a set of Z-scores into a distribution of T-scores.

Standard S.6: The student will apply concepts related to HYPOTHESIS TESTING.

a. Define Hypothesis testing: null versus alternative.
b. Hypothesis testing for one proportion.
c. Hypothesis testing for two proportions.
d. Hypothesis testing for the mean $n \geq 30$ and $n < 30$.
e. Hypothesis testing for the difference between two means.
f. Hypothesis testing for the slope of a regression line.
g. Hypothesis testing for the association between two categorical variables.
h. Discuss and research Ethical research practices.
i. Discuss and explain Type I and Type II Error.

Standard S.7: The student will apply concepts related to CONFIDENCE INTERVALS.

a. Define confidence intervals.
b. Confidence intervals for one proportion.
c. Confidence intervals for two proportions.
d. Confidence intervals for the mean $n \geq 30$ and $n < 30$.
e. Confidence intervals for the difference between two means.
f. Confidence intervals for the slope of a regression line.

Standard S.8: The student will apply concepts related to CORRELATION AND REGRESSION.

a. Define correlation.
b. Define linear regression.
c. Compare & contrast a regression line vs. a least-square regression line.
d. Measures of regression and prediction intervals.
e. Explain r and R^2 .
f. Calculate the slope of a regression line using statistical formulas.

Standard S.9: The student will apply concepts related to CHI-SQUARE TEST & F-DISTRIBUTION

a. Define "Goodness-of-Fit."
b. Define and assess independence .
c. Compare two variances.
d. Define when to use an ANOVA.
e. Properly run and interpret an ANOVA.

Standard S.10: The student will apply concepts related to GENERAL CONCEPTS/DISTRIBUTIONS NAMES.

a. Be able to author a research-based paper within the context of the study.
b. Use a process such as S.P.D.C.: State, Plan, Do, Conclude to report findings.
c. Use calculator/computer to manipulate various statistical data.
d. Normal Distribution.
e. F-Distribution.
f. ANOVA analysis.
g. Binomial distribution.
h. t Distribution.

Standard S.11: The student will apply concepts related to NON-PARAMETRIC TEST (*Time permitting)

a. Sign test.
b. Wilcoxon tests.
c. Kruskal-Wallis test.
d. Rank correlation.

Appendices

Number Sense Routine Resources

Steve Wyborney - https://stevewyborney.com/

- Esti-Mysteries
- Splat
- Estimation Clipboard
- Cube Conversations

You Cubed - https://www.youcubed.org/

- Data Talks - https://www.youcubed.org/resource/data-talks/

John SanGiovanni

- https://www.youcubed.org/resource/data-talks/
- https://www.youtube.com/watch?v=id2I6f8K5WY

Estimation 180- http://www.meaningfulmathmoments.com/estimation-180.html
Which one doesn't belong- https://wodb.ca/

Same but different- https://www.samebutdifferentmath.com/multiplication-division Sherry Parrish- Number Talks Book

Fraction Talks-http://fractiontalks.com/

Graphing Stories- http://www.graphingstories.com/

Visual Patterns- https://www.visualpatterns.org/21-40.html

Fluency Resources

Greg Tang Math - https://gregtangmath.com/
Mathigon- https://mathigon.org/activities

Problem Solving

3 Act Tasks-

- G. Fletchy- https://gfletchy.com/3-act-lessons/
- Yummy Math- https://www.yummymath.com/category/3-act-tasks/
- Dan Meyer (middle and high school) https://docs.google.com/spreadsheets/d/1jXSt_CoDzyDFeJimZxnhgwOVsWkTQEsfqouLWNNC6Z4/edi t#gid=0

Robert Kaplinksky's Problem Based Problems https://docs.google.com/spreadsheets/u/0/d/181LP2l8fQaYxnumsYn-xcddyFjuv6zZb3JZSkBiNfk4/htmlview?us p=gmail_thread

Mash Up Math- https://www.mashupmath.com/

Open Middle Math- https://www.openmiddle.com/

Numberless Word Problems- https://bstockus.wordpress.com/numberless-word-problems/ Desmos Classroom Activities- https://teacher.desmos.com/

Catholic Curricular Standards and Dispositions in Mathematics

MATHEMATICS K-6[11]

The school considers human knowledge as a truth to be discovered. In the measure in which subjects are taught by someone who knowingly and without restraint seeks the truth, they are to that extent Christian. Discovery and awareness of truth leads man to the discovery of Truth itself. A teacher who is full of Christian wisdom, well prepared in his own subject, does more than convey the sense of what he is teaching to his pupils. Over and above what he says, he guides his pupils beyond his mere words to the heart of total Truth.
The Catholic School, 1977, #41

			General Standards
CS	M.K6	GS1	Demonstrate the mental habits of precise, determined, careful, and accurate questioning, inquiry, and reasoning.
CS	M.K6	GS2	Develop lines of inquiry (as developmentally appropriate) to understand why things are true and why they are false.
CS	M.K6	GS3	
CS	M.K6	GS4	Survey the truths about mathematical objects that are interesting in their own right and independent of human opinions.
			Dispositional Standards
CS	M.K6	DS1	Display a sense of wonder about mathematical relationships as well as confidence in mathematical certitude.
CS	M.K6	DS2	Respond to the beauty, harmony, proportion, radiance, and wholeness present in mathematics.
CS	M.K6	DS3	Show interest in the pursuit of understanding for its own sake.
CS	M.K6	DS4	Exhibit joy at solving difficult mathematical problems and operations.
CS	M.K6	DS5	Show interest in how the mental processes evident within the discipline of mathematics (such as order, perseverance, and logical reasoning) help us with the development of the natural virtues (such as self-discipline and fortitude).

[11] See Appendix F for mathematics resources.

Mathematics Resources

Best Practice Suggestions for Mathematics in Catholic Schools, Grades K-6

- Ensure developmentally appropriate mathematics instruction in younger grades. Beware of mathematical programs that push abstract operations too quickly into younger minds.
- Ensure a positive approach to mathematical inquiry by maximizing student success and confidence in early mathematical experiences and incorporating opportunities for joy, wonder, and excitement in the study of mathematics.

Best Practice Suggestions for Mathematics in Catholic Schools, Grades 7-12

- Consider an interdisciplinary, liberal arts approach to mathematics, especially in high school.
- Professional development in philosophy, especially philosophers who have greatly impacted the Catholic western tradition.

Abstractions of the Human Mind

What one abstracts from reality is basic but fundamental, though what is constructed out of the abstraction is much more important in the study of mathematics. For example, one can take in at a glance a small number of apples, say 5 or 6, but not as many as 100 or 1,000. Mathematics teaches us how to construct these numbers in our mind from the simpler concepts immediately abstracted from reality.

Mathematics Resources

Ashley, B. *The arts of learning and communication: A handbook of the liberal arts*. http://www.amazon.com/Arts-Learning-Communication-Handbook-Liberal/dp/1606089315/ref=la_B001HD41Q8_1_7?s=books&ie=UTF8&qid=1452700470&sr=1-7

Ashley, B. *The way toward wisdom: An interdisciplinary and intercultural introduction to metaphysics*. http://www.amazon.com/Way-toward-Wisdom-Interdisciplinary-Intercultural/dp/0268020353/ref=la_B001HD41Q8_1_3?s=books&ie=UTF8&qid=1452700831

K-2 Math Curriculum Changes
Kindergarten

Number Sense
Taken Away:

- Read, order, and write numbers to 30
- Skip counting by 5s
- One to one correspondence to 31
- Ordinal numbers
- Identify 1 more and 1 less
- Place value with manipulatives (tens and ones)
- Represent commonly used fractions ¼ and ½

Added:

- Read, order, and write numbers to 20
- Recognize number words to 10
- One to one correspondence to 20
- Identify the number after without counting up to 100; identify the number before without counting less than 10
- Share a whole equally with 2 sharers (fair shares)

Addition and Subtraction
Taken Away:

- None

Added:

- Show fluency with part-whole numbers up to 5
- Describe part-whole relationships with numbers up to 10
- Solve story problems with or without using + or - symbols (introduced at the end)

Fractions, Decimals and Percents (added to Number Sense)
Taken Away:

- Represent commonly used fractions such as ¼ and ½

Added:

- The student will share a whole equally between two sharers when given a practical situation. (using a set of objects and using a single object)
- The student will represent fair shares concretely or pictorially.

Measurement and Geometry
Taken Away:

- Non-standard measurement
- Time to the hour and half-hour
- 2D shapes (oval, diamond, heart)
- 3D shapes (all) Added:

Probability and Statistics

Taken Away:

- Collect data about themselves and their surroundings (e.g., hair color, eye color, shoe color, birthdays)
- Construct and interpret graphs, real graphs (using physical objects), pictographs from previously collected data

Added:

- The students will collect, organize, and represent data
- The students will read and interpret data in object graphs, picture graphs and tables

Patterns, Functions and Algebra

Taken Away:

- Sort and classify objects according to their attributes (e.g., shape, size, color)

Added:

- Sort and classify objects according to one attribute

First Grade

Number Sense:

Taken Away:

- Read and write numbers 0 - 100
- Being able to read numbers 0- 120.

Added:

- Write numbers 0 - 120
- Students will now be able to skip count by 1's, 2's, 5's, and 10's to 120.
    - 120 is a change from 100.
- Identifying the ordinal position of objects first-tenth.
- Count backwards by ones within 30.

Computation and Estimation:

Taken Away:

- Requirement for use of a number line.
- Addition and subtraction fluency to 12
- Add and subtract 2-digit numbers without regrouping.
- Vocabulary commutative and associative properties of addition

Added:

- Addition and subtraction fluency to 10
- Explain strategies used to solve addition and subtraction problems within 20 using spoken words, objects, pictorial models, and number sentences.
- Create and solve single-step oral or written story and picture problems, using addition and subtraction within 20.

Measurement and Geometry:

Taken Away:

- Measure weight and length using standard measurements.
- Compare and order weight using standard measurements.
- 3D shapes

Added:

- Measure and compare volume using non-standard units.

Patterns, Functions and Algebra:

Taken Away:

- "Use concrete objects and pictures to create patterns and describe them in a variety of ways."

Added:

- Sort and classify objects using up to 2 attributes.
- Identify, describe, extend, create, and transfer growing and repeating patterns.

2nd Grade

Number Sense:

Taken Away:

- Place value including 1000s.
- Round to the nearest 100

Added:

- Skip count by 1s, 2s, 5s, 10s, given any multiple as a starting point.
- Count backwards from 120.
- Ordinal numbers 1st through 20th
- 10 more/10 less; 100 more/100 less
- Fractions - The student will name and write fractions represented by a set, region, or length model for halves, fourths, eighths, thirds, and sixths.

Computation and Estimation:

Taken Away:

- Add and subtract whole numbers of at least 4 digits with and without renaming/regrouping.

Added:

- Related facts (fact families)
- Use relationship between addition and subtraction to solve 1-step word problems.
- Adding and subtracting 2-digit numbers with and without regrouping
- Adding and subtraction 3-digit numbers without regrouping
- Single and 2-step word problems involving addition, subtraction, or both.

Measurement and Geometry:

Taken Away:

- Time to the quarter hour
- Time to the minute
- Length w/ metric measurements (centimeters, meters, grams)
- Celsius on thermometers

- Perimeter and area

Added:

- Time to the 5 minutes
- Interpreting a calendar (identify specific days and dates; determine past and future days on a given calendar)

Patterns, Functions and Algebra:

Taken Away:

- None

Added:

- Pictographs (key 1s, 2s, 5s, 10s) and bar graphs
- The student will identify, describe, create, extend, and transfer patterns found in objects, pictures, and numbers (repeating and growing)

3-5 Math Curriculum Changes

Third Grade

Third grade math should place a large emphasis on number sense and working flexibly with numbers. This should include an understanding of multiplication and division strategies up to

100. Students should deepen their understanding of fractions, beginning to create equivalent fractions and representing fractions larger than 0.

Taken Away:

- Round to the nearest 1,000 is now round to the nearest 9,999.
- Add and subtract 6 digits is changed to add and subtract up to 4-digit numbers
- Compare fractions with uncommon denominators (it will be only like denominators)
- Multiplication facts 0-12 is now 0-10 (0-12 is in 4th now)
- Line plots is moved to 5th grade.

Added:

- Mass/weight and temperature standards were added.
- Represent equivalent math relationships.

Fourth Grade

Fourth grade math continues to focus on building number sense. Students should be comfortable working flexibly with numbers including fractions and decimals. They should be able to decompose and compose numbers and apply these concepts to the other strands in the curriculum. By the end of 4th grade, multiplication facts up to 12 should be mastered.

Taken Away:

- Prime Factorization (this is in 5th grade)
- Decimal place value to the millionths
- Ordering and comparing mixed numbers (this is in 5th; in 4th it is just proper fractions with like and unlike denominators)

- Compare and order whole numbers, fractions, decimals, and percents (percents are not introduced in 4th grade)
- Write decimals as equivalent fractions to the thousandths place (only to the hundredths place)
- Measuring surface area
- Stem and Leaf Plots

Added:

- Add and subtract 6-digit numbers
- Add and subtract fractions with like and unlike denominators (not mixed numbers)
- Mass/weight and temperature standards were added.
- Specific graphing standards were added.

Fifth Grade

Fifth grade math focuses on developing fluency with adding and subtracting fractions and decimals. Students will be extending their understanding of division to 2-digit divisors and multiplying and dividing fractions and decimals. They will begin applying their knowledge of fractions and decimals to the other strands of the curriculum.

Taken Away:

- Divide decimals with a decimal in the divisor (only divide by whole numbers)
- Divide by multi- digit divisors is changed to 2-digit divisors
- Surface area
- Scatterplots

Added:

- Prime and Composite Numbers up to 100 and Prime Factorization
- A probability standard
- Line plots

Middle School Math Curriculum Changes

In updating the middle school math curriculum, the following were the goals:

- Update the standards to reflect the needs of our students, including those who come from other schools.
- Ensure that there are less gaps in the curriculum.
- Prepare students for high school level classes.
- Remove some of the repetition in order to be able to work deeper.

We have updated (for some) the sequencing of classes. We have written curriculums for the following classes:

- Math 6
- Math 7
- Math 6/7
- Pre-Algebra

Old Non- Algebra Sequence Changes

6th Grade

This curriculum focuses on developing number sense, proportional reasoning, and problem solving. A large emphasis is placed on understanding integers, fractions, and decimals and performing operations using rational numbers. Students will begin to solve equations and develop algebraic thinking skills. They will analyze, make inferences, and apply their previous probability, statistics, and geometry knowledge.

Taken Away:

- Scientific notation (only positive powers of 10- scientific notation is done in Prealgebra)
- Find the LCM and GCF (applied when adding and subtracting fractions and simplifying)
- Round decimals (incorporated into operations with decimals)
- Convert into percents (in 7th grade)
- Angles (in Prealgebra)
- Transformations (in Prealgebra)
- Properties of Quadrilaterals (in 7th grade)
- Probability of dependent events (it is just simple independent events)

Added:

- Begin using the properties of equality when solving.
- Square roots/perfect squares
- Convert and compare fractions and decimals.
- Perimeter and area of composite figures (using a grid)
- More emphasis on unit rate, ratios, and proportions
- Mean, Median, Mode, Range

7th Grade

7th grade math builds on 6th grade skills. Students deepen their proportional understanding, apply operations with rational numbers, percents are introduced, and they begin solving two- step equations. They go from 2-D figures to 3-D figures and begin dependent probability. Students will have a strong foundation upon entering Prealgebra.

Taken Away:

- Operations with scientific notation
- Identify basic elements of geometric figures using geometric tools (use compass protractor, straight edge where appropriate) – midpoints, perpendicular bisectors, central angles, and chords.
- Estimate and calculate the perimeter and area of composite figures (moved to Prealgebra)
- Volume and surface area of cylinders (moved to Prealgebra)
- Pythagorean Theorem (in Prealgebra)
- Tessellations (in Prealgebra)
- Mean, Median, Mode, Range (in 6th grade now)
- Slope Intercept Form
- Irrational Numbers (Prealgebra)
- Create and extend patterns/ write the function rule (in Prealgebra and incorporated into proportional reasoning/ratios in 6th and 7th)

Added:

- Negative Powers of 10
- Cube Roots
- Practical Problems with rational numbers
- Convert and compare fractions, decimals, and percents.

Prealgebra (old 8th grade math)

Pre-Algebra continues to build on the 7th grade curriculum, preparing students for Algebra. Students solve multi step equations and begin to develop the concepts of slope and functions. They solve practical problems using proportions and percents and analyze data using scatter plots and box plots. Students will dive into geometric concepts such as Pythagorean Theorem and angle relationships as well as continue to expand their knowledge in volume and surface area. Focus on problem solving, reasoning, and application will set students up with the necessary foundation for Algebra.

Taken Away:

- Laws of exponents
- Operations with scientific notation (it is just converting now)
- Factor algebraic expressions with the distributive property
- Identify basic elements of geometric figures using geometric tools (use compass protractor, straight edge where appropriate) – altitudes, midpoints, diagonals, perpendicular bisectors, central angles, radii, diameters, and chords.
- Compute the volumes and surface areas of regular pyramids, cones and sphere using a variety of methods (only going to cylinders)
- Calculate the interior and exterior angles of various regular polygons (incorporated with angle relationships and in grade 7)
- Slope intercept form graphing (only graphing from equation to table to graph and calculating slope)
- Solving 2 variable inequalities by graphing
- Solve literal equations.

Added:

- Cube Roots as part of order of operations
- Box plots
- The development of the concept of slope (not slope formula)

Old Algebra Sequence Changes

6th Grade Math Accelerated (new 6/7 Grade Math Curriculum)

This course is designed for 6th graders who will take Algebra in 8th grade. It will build number sense as students work intensely with integers, fractions, decimals, and percents. It will also build a strong foundation in proportional relationships and algebraic reasoning. Students will analyze, make inferences, and apply their previous probability, statistics, and geometry knowledge. 6/7 grade math will set a strong foundation to be successful in Prealgebra the next year.

Taken Away

- Scientific Notation (in Prealgebra)
- Real Number System (in Prealgebra)
- Round decimals and fractions (incorporated in solving practical problems with rational numbers when estimating)
- Adjacent, Vertical, Supplementary and Complementary Angles (Prealgebra)
- Properties of Triangles (in 7th grade)
- Volume of Triangular Prisms
- Write a Function Rule (incorporated into proportional reasoning and ratios in 6th and 7th)

Added

- Square and cube roots
- More emphasis on ratios and proportions

Prealgebra

Pre-Algebra continues to build on the 6/7th grade curriculum, preparing students for Algebra. Students solve multi step equations and begin to develop the concepts of slope and functions. They solve practical problems using proportions and percents and analyze data using scatter plots and box plots. Students will dive into geometric concepts such as Pythagorean Theorem and angle relationships as well as continue to expand their knowledge in volume and surface area. Focus on problem solving, reasoning, and application will set students up with the necessary foundation for Algebra.

Taken Away

- Laws of exponents
- Multiplying and dividing scientific notation (they are only converting)
- Identify basic elements of geometric figures using geometric tools (use compass protractor, straight edge where appropriate) – midpoints, perpendicular bisectors, central angles, and chords.
- Volume and surface area of pyramids (only doing cylinders and prisms)
- Interior and exterior angles of regular polygons (applied to angle relationships and in grade 7)

Added

- Boxplots
- Using cube roots in order of operations
- Introduction to the concept of slope (not slope formula)