

Content Standard: ALGEBRAIC REASONING: PATTERNS AND FUNCTIONS

Patterns and functional relationships can be represented and analyzed using a variety of strategies, tools and technologies.

Guiding Question:

How do patterns and functions help us describe data and physical phenomena and solve a variety of problems?

Students in K-12 should understand and describe patterns and functional relationships

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Students in grade 3 should create and describe patterns using different objects and symbols.

- (1) Use a variety of materials to construct, reproduce, describe and extend numerical and spatial patterns.
- (2) Explore and describe patterns and sequences using tables, graphs and charts.
- (3) Sort and classify the same set of objects in more than one way and explain the reason for each sort.

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Students in grade 4 should classify patterns as repeating or growing.

- (Alg. 4.1) Recognize a variety of patterns and trends including repeating and growing patterns.
- (Alg. 4.2) Explore extending and comparing arithmetic and geometric sequences.
- (Alg. 4.3) Develop and test generalizations of patterns and relationships.

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Students in grade 5 should identify trends and make predictions based upon patterns and data displayed in different formats.

- (1) Extend and compare arithmetic and geometric sequences.
- (2) Represent geometric and numeric patterns using words, tables, graphs and equations.
- (3) Analyze patterns and data to make generalizations and predictions.

Students in K-12 should represent and analyze quantitative relationships in a variety of ways.

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<p>Students in grade 3 should identify mathematical relationships as equations.</p> <p>(1) Model situations that reflect mathematical relationships involving addition, subtraction, multiplication and division as open number sentences and match number sentences to story problems.</p>	<p>Students in grade 4 should demonstrate the equivalence of both sides of an equation.</p> <p>(Alg. 4.4) Use equations to describe the rules for number patterns and to model word problems. (Alg. 4.5) Demonstrate equivalence with the commutative, associative and distributive properties of whole numbers.</p>	<p>Students in grade 5 should recognize that a change in one variable may relate to a change in another variable.</p> <p>(1) Describe how a change in one variable relates to a change in a second variable in context.</p>

Students in K-12 should use operations, properties and algebraic symbols to determine equivalence and solve problems.

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<p>Students in grade 3 should represent quantities that have the same value with an equal sign.</p> <p>(1) Demonstrate understanding of the = sign as an equality symbol and explore inequalities and the \neq symbol. (2) Demonstrate equivalence using the commutative and associative properties of whole numbers.</p>	<p>Students in grade 4 should represent possible values using symbols.</p> <p>(Alg. 4.5) Use variables to represent quantities in expressions and number sentences.</p>	<p>Students in grade 5 should describe the general relationship between two sets of data using an equation or inequality.</p> <p>(1) Represent mathematical relationships using variables in expressions, equations and inequalities. (2) Model and solve one-step equations using materials that model equivalence.</p>

Content Standard: NUMERICAL AND PROPORTIONAL REASONING

Quantitative relationships can be expressed numerically in multiple ways in order to make connections and simplify calculations using a variety of strategies, tools and technologies.

Guiding Question:

How are quantitative relationships represented by numbers?

Students in K-12 should understand that a variety of numerical representations can be used to describe quantitative relationships.

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<p>Students in grade 3 should. represent numbers in expanded and regrouped forms in the base ten place value system.</p> <p>(1) Use models and expanded and regrouped forms to represent two- and three-digit numbers. (2) Locate, label, compare and order whole numbers to 1000, including multiples of 10 and 100, using place value models, number patterns and the number line. (3) Name and state the value of pennies, nickels, dimes, quarters and half-dollars and show different ways to make a given amount. (4) Determine and compare the values of sets of coins and write the values using decimal notation.</p>	<p>Students in grade 4 should extend whole number place value patterns, models and notations to include decimals, which are fractions that have denominators that are multiples of ten.</p> <p>(Num. 4.1) Build place value models, draw diagrams and show equivalent representations for two-, three- and four-digit numbers in expanded and regrouped forms. (Num. 4.2) Build models and describe tenths and hundredths using equivalent ratio, fraction and decimal notation.</p>	<p>Students in grade 5 should extend whole number place value patterns, models and notations to include decimals, which are fractions that have denominators that 10.</p> <p>(1) Identify, round, order and compare whole numbers to 1,000,000 using place value models, diagrams and number lines. (2) Express numbers in expanded and regrouped forms and use the numbers to support computational strategies. (3) Solve problems involving finding 10, 100 and 1000 more and less than a number. (4) Estimate products and missing factors using multiples of 10, 100 and 1000. (5) Use models to extend whole number place value concepts and patterns to decimals. (6) Explore numbers less than zero and extend the number line to introduce the concept of integers within practical applications.</p>

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<p>Students in grade 3 should recognize that a fraction with the same numerator and denominator represents the whole object or an entire set.</p> <p>(1) Use models and pictures to represent fractions and label the parts with words and fraction symbols.</p> <p>(2) Identify a whole as a fraction with the same numerator and denominator.</p> <p>(3) Use counting and grouping of objects to find equal parts of a set of objects and use models and number patterns to identify amounts such as $\frac{2}{3}$ of 12 is 8.</p>	<p>Students in grade 4 should use models and pictures to reveal patterns about equivalent fractions and ratios.</p> <p>(Num. 4.3) Estimate locations and label fractions on number lines and rulers.</p> <p>(Num. 4.4) Build and label a variety of models to represent, compare and order fractional parts of a whole and mixed numbers and to identify ratios and equivalent fractions.</p> <p>(Num. 4.5) Use counting, number patterns and grouping to identify parts of a set.</p>	<p>Students in grade 5 should express numbers as equivalent fractions, decimals or percents.</p> <p>1) Represent a rational number in its equivalent fraction, decimal, ratio and percent forms with models, number patterns and common factors.</p> <p>2) Construct and use models and pictures to add and subtract fractions, decimals and mixed numbers with like and unlike denominators.</p> <p>3) Use equivalence and substitution with common denominators when adding and subtracting.</p> <p>4) Construct and use models and pictorial representations to multiply common fractions and mixed numbers.</p>
<p>Students in grade 3 should use fractions to measure and to represent points on a ruler or number line.</p> <p>(1) Estimate fractional values and measure to the nearest half unit with the aid of number lines and rulers.</p>	<p>Students in grade 4 should use fractions to represent a ratio or a division problem.</p> <p>(Num. 4.6) Express a division problem as a fraction and describe the relationship between the divisor and the remainder written as a fraction.</p>	

	<p>Students in grade 4 should make comparisons and describe quantitative relationships using ratios.</p> <p>(Num. 4.7) Use models, pictures and number patterns to solve simple problems involving ratios and proportions.</p>	<p>Students in grade 5 should represent ratios and proportions and solve problems using models and pictures.</p> <p>(1) Build models to identify and compare ratios and describe quantitative relationships using fraction and decimal equivalents.</p> <p>(2) Write division problems in fraction form and round the fraction form to estimate an answer to a division problem.</p> <p>(3) Use ratios and proportions to solve practical problems such as interpreting maps and scale drawings or identifying probability.</p>
		<p style="text-align: center;">5</p> <p>Students in grade 5 should classify numbers by their factors.</p> <p>1) Use rectangular arrays to identify factor pairs and to classify numbers as prime, composite and perfect squares.</p> <p>(2) Explore divisibility rules and patterns with remainders.</p>

Students in K-12 should use numbers and their properties to compute flexibly and fluently and to reasonably estimate measures and quantities.

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Students in grade 3 should use strategies that involve place value patterns and algebraic properties to estimate, add and subtract.

- (1) Identify 10 and 100 more and less than a number.
- (2) Compare and round numbers to the nearest 10 and 100.
- (3) Use commutative and associative properties to solve problems.

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Students in grade 4 should use place value concepts and commutative and associative properties to estimate and compute.

- (Num. 4.8) Use place value models, diagrams, number patterns and number lines to identify, order, round, and compare two-, three-, and four-digit whole numbers up to 10,000. Explore 5-digit numbers.
- (Num. 4.9) Solve practical problems and extend patterns involving 10 and 100 more and less than a number.
- (Num. 4.10) Use place value concepts, number patterns, the number line and the commutative and associative properties to develop estimation and computation strategies.
- (Num. 4.11) Apply and explain a variety of estimation strategies in problem-solving situations to add and subtract money amounts less than \$10.00 and two- and three-digit numbers with and without regrouping.
- (Num. 4.12) Determine and discuss the reasonableness of an answer and explain why a particular estimation strategy will result in an over- or underestimate.
- (Num. 4.13) Write and solve multistep word

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Students in grade 5 should estimate and compute using models and pictures.

- (1) Choose and use benchmarks to approximate locations on number lines and coordinate grids.
- (2) Estimate and use counting, grouping of objects, number patterns, equivalent ratios and division to find fractional parts of a set of objects.
- (3) Develop strategies, using place value relationships, inverse operations and commutative, associative and distributive properties, to simplify computations with two-, three-, and four-digit numbers and money amounts.
- (4) Use estimation to predict results and to recognize when an answer is or is not reasonable.
- (5) Explain when an estimation strategy will result in an over- or underestimate.
- (6) Create and solve multistep problems and explore order of operations in the context of practical situations.

	<p>problems, including problems with extraneous information.</p>	
<p style="text-align: center;">3</p> <p>Students in grade 3 should approximate solutions to problems involving computation through the use of efficient methods.</p> <p>(1) Estimate, add and subtract with two- and three- digit numbers using a variety of strategies.</p> <p>(2) Use estimation strategies to determine and justify the reasonableness of a computational answer.</p> <p>(3) Recognize when an estimate is appropriate and determine whether an estimation strategy will result in an over-or underestimate.</p>	<p style="text-align: center;">4</p> <p>Students in grade 4 should use number patterns, basic facts, rectangular arrays, place value models and the distributive property to multiply and divide.</p> <p>(Num. 4.14) Develop fluency with multiplication and division fact families for all factors 1 through 12.</p> <p>(Num. 4.15) Relate multiplication and division to models with groups and rectangular arrays and begin to identify prime and composite numbers. <i>Explore square numbers.</i></p> <p>(Num. 4.16) Explore the property of zero in multiplication and its implication in division.</p> <p>(Num. 4.17) Identify the appropriate operation and write a word problem to match a given addition, subtraction, multiplication or division number sentence and write the matching number sentence to solve a word problem.</p> <p>(Num. 4.18) Use arrays and explore using the distributive property $10 \times (5 + 4) = (10 \times 5) + (10 \times 4)$ to estimate, multiply and divide two- and three-digit numbers by one-digit factors.</p>	

<p style="text-align: center;">3</p> <p>Students in grade 3 should solve multiplication and division problems using rectangular arrays, number patterns, skip counting and repeated addends.</p> <p>(1) State the multiplication and division facts with factors of 1, 2, 3, 4, 5 and 10. (2) Explore division problems with and without remainders. (3) Write and solve multiplication and division story problems and match to number sentences (equations). (4) Use models and pictures of sets and arrays to represent multiplication and division of two- and three-digit numbers by one-digit numbers.</p>	<p style="text-align: center;">4</p>	<p style="text-align: center;">5</p>
<p>Students in grade 3 should compare fractions, identify equivalent fractions and add and subtract fractions with like and unlike denominators using models and pictures.</p> <p>(1) Construct and use models to identify equivalent fractions and to compare and order fractions with like and unlike denominators of 2, 3, 4, 5, 6 and 8. (2) Identify patterns with equivalent ratios</p>	<p>Students in grade 4 should add and subtract fractions and mixed numbers with like and unlike denominators using models, pictures and number sentences</p> <p>(Num. 4.19) Solve problems involving the addition and subtraction of fractions with like denominators. (Num. 4.20) Use models and pictures to estimate a reasonable answer when adding or subtracting decimals, fractions and mixed numbers.</p>	

<p>such as 3 out of 6 crayons are red or 4 out of 8 crayons are red are the same as 1 out of 2 crayons is red.</p> <p>(3) Construct and use models to add and subtract fractions with like and unlike denominators and write fraction sentences to match the models.</p> <p>(4) Write and solve story problems that involve fractions.</p>	<p>(Num. 4.21) Write and solve word problems involving decimals, fractions and mixed numbers, identify reasonable answers, and match equations to the problems.</p>	
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GEOMETRY AND MEASUREMENT

Shapes and structures can be analyzed, visualized, measured and transformed using a variety of strategies, tools and technologies.

Guiding Question:

How do geometric relationships and measurements help us to solve problems and make sense of our world?

Students in K-12 should use properties and characteristics of two- and three-dimensional shapes and geometric theorems to describe relationships, communicate ideas and solve problems.

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Students in grade 3 should classify and compare polygons and solids using various attributes.

(1) Sort polygons and solids through using characteristics such as the relationship of sides (parallel, perpendicular), kinds of angles (acute, right and obtuse), symmetry and congruence.

(2) Describe similarities and differences of two- and three-dimensional shapes in the environment using physical features such as number of sides, number of angles, lengths of sides and straight and curved parts.

(3) Investigate ways to tile or tessellate a region or shape using various polygons.

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Students in grade 4 should describe geometric properties of polygons and solids.

(GeoMeas.4.1) Build, draw, describe and classify two- and three-dimensional figures.

(GeoMeas.4.2) Analyze two-dimensional shapes and determine lines of symmetry and congruence.

(GeoMeas.4.3) Identify translations, reflections and rotations in geometric designs.

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Students in grade 5 should use geometric relationships to describe polygons and solids.

(1) Use geometric relationships such as parallel, perpendicular and congruent to describe the attributes of sets and subsets of shapes and solids.

(2) Make and test conjectures about geometric relationships.

		<p>Students in grade 5 should recognize that changes in the perimeter of a polygon may affect its area, and changes in area may affect the perimeter.</p> <p>(1) Explore the relationship between area and perimeter when the dimensions of a polygon change. (2) Develop formulas to find the perimeter and area of squares, rectangles and triangles.</p>
<p>Students in K-12 should use spatial reasoning, location and geometric relationships to solve problems.</p>		
<p style="text-align: center;">3</p> <p>Students in grade 3 should represent location on simple maps.</p> <p>(1) Draw and interpret simple maps using coordinate systems and shapes or pictures.</p>	<p style="text-align: center;">4</p> <p>Students in grade 4 should find possible pathways between two points using maps that are based on the rectangular coordinate system.</p> <p>(GeoMeas.4.4) Create and read maps and use coordinate systems to specify locations.</p>	<p style="text-align: center;">5</p> <p>Students in grade 5 should determine geometric relationships through spatial visualization.</p> <p>1) Plot points on the rectangular coordinate system and estimate and determine the distance between points.</p>

		<p style="text-align: center;">5</p> <p>Students in grade 5 should identify, describe and build nets for solid figures and objects.</p> <p>(1) Represent the surface of three-dimensional objects through the use of two-dimensional nets. (2) Investigate and develop strategies to determine the volume of rectangular solids.</p>
<p>Students in K-12 should develop and apply units, systems, formulas and appropriate tools to estimate and measure.</p>		
<p style="text-align: center;">3</p> <p>Students in grade 3 should plan events and make schedules.</p> <p>(1) Tell time to the minute, using analog and digital clocks, and identify AM and PM. (2) Use calendars and clocks to plan and sequence events.</p>	<p style="text-align: center;">4</p> <p>Students in grade 4 should recognize that patterns exist between measurements of length, perimeter and area of squares and rectangles.</p> <p>(GeoMeas.4.5) Explore converting inches to feet and feet to yards. (GeoMeas.4.6) Solve practical problems that involve estimation and measurement of length, perimeter, area, volume, capacity, weight and temperature. (GeoMeas.4.7) Explore relationships between the lengths of sides of rectangles and their areas and perimeters and generalize the patterns as simple formulas.</p>	<p style="text-align: center;">5</p> <p>Students in grade 5 should solve problems in the measure of time and in the conversion of units of length in the customary and metric systems using specific ratios.</p> <p>(1) Solve length problems involving conversion of measure within the customary and metric systems. (2) Solve problems involving the conversion of measure of time and elapsed time (days, hours, minutes and seconds). (3) Estimate and choose appropriate units and tools to measure and solve a variety of problems involving length, perimeter, area, volume, capacity, mass, time, angle and temperature.</p>

<p>Students in grade 3 should determine and use different tools and units appropriate for specific measurement tasks.</p> <p>(1) Develop and explain strategies for using nonstandard and standard referents to estimate measurements of length, area, weight, temperature, volume and capacity.</p> <p>(2) Explore strategies for estimating and measuring the perimeters, areas and volumes of irregular shapes and solids.</p> <p>(3) Describe and use estimation strategies that can identify a reasonable answer to a measurement problem when an estimate is appropriate.</p>	<p>Students in grade 4 should make precise measurements and use benchmarks to estimate measures.</p> <p>(GeoMeas.4.8) Identify and use the appropriate customary and metric units and tools for measuring length, perimeter, area, weight, time, temperature, volume and capacity.</p> <p>(GeoMeas.4.9) Explore converting from one unit to another when measuring time and solve problems that involve elapsed time using clocks and calendars.</p> <p>(GeoMeas.4.10) Use estimation to predict reasonable answers to measurement problems.</p> <p>(GeoMeas.4.11) Estimate, draw and measure length to the nearest inch, half-inch, centimeter, <i>and millimeter</i>.</p>	

Content Standard: WORKING WITH DATA: PROBABILITY AND STATISTICS

Data can be analyzed to make informed decisions using a variety of strategies, tools and technologies.

Guiding Question:

How can collecting, organizing and displaying data help us analyze information and make reasonable predictions and informed decisions?

Students in K-12 should collect, organize and display data using appropriate statistical and graphical methods.

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Students in grade 3 should design surveys for the collection of data and justify conclusions drawn from the data.

- (1) Pose questions and use a variety of ways to collect, organize and analyze data from samples and surveys.
- (2) Display, read, interpret and draw conclusions from data that is represented in a variety of ways including tables, charts, lists, diagrams, line plots and bar graphs.

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Students in grade 4 should organize and analyze categorical and numerical data.

- (Data.4.1) Explore a variety of ways to collect, organize, record, analyze and interpret data and identify patterns and trends.
- (Data.4.2) Construct and interpret broken line graphs, line plots, bar graphs, picture graphs, glyphs and simple circle graphs.
- (Data.4.3) Make predictions and defend conclusions based on data.

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Students in grade 5 should differentiate between numerical and categorical data and their appropriate representations.

- (1) Construct and interpret broken line graphs, line plots, bar graphs, picture graphs, simple circle graphs, and stem and leaf plots and evaluate how well each kind of display represents the features of the data.

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tudents in K-12 should analyze data sets to form hypotheses and make predictions.

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Students in grade 3 should analyze data to identify a typical element or event.

- (1) Describe trends in data using range and mode.

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Students in grade 4 should. describe what is “average” about the characteristics in a data set.

- (Data.4.4) Use the range, mode, median and mean to describe features of a data set.

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Students in grade 5 should examine different data collection methods and their effects.

- 1) Design and conduct surveys and samplings to collect data that represent a general population.
- (2) Explore how a change in an outlier can change the measures of central tendency.

Students in K-12 should understand and apply basic concepts of probability		
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<p>Students in grade 3 should use samples and simulations to determine probability and to make and test predictions.</p> <p>(1) Make predictions and test them by conducting probability experiments and recording results. (2) Explore the fairness of games involving a variety of spinners and dice.</p>	<p>Students in grade 4 should determine fair situations and good choices based upon the likelihood of an occurrence.</p> <p>(Data.4.5) Identify possible outcomes of events using combinations (where order does not matter) and explore situations resulting in permutations (where order does matter). (Data.4.6) Conduct probability experiments and express the probability based on possible outcomes.</p>	<p>Students in grade 5 should. relate the likelihood of an event to a numerical value.</p> <p>(1) Identify possible outcomes and express the likelihood of events as a fraction. (2) Design and conduct probability experiments and games of chance. (3) Make and test predictions of probability and fairness.</p>