



Diocese of Altoona-Johnstown Elementary Curriculum

Mathematics PK-8th Grade

PRE-K	KINDERGARTEN
<p>Counting and Cardinality</p> <ul style="list-style-type: none"> Know number names and the counting sequence Count to tell the number of objects Compare numbers (more than, less than) <p>Operations and Algebraic Thinking</p> <ul style="list-style-type: none"> Understand addition as putting together Understanding subtraction as taking apart and taking from <p>Geometry</p> <ul style="list-style-type: none"> Identify and describe shapes Analyze, compare, create, and compose shapes <p>Measurement and Data</p> <ul style="list-style-type: none"> Describe and compare measurable attributes of length and weight of everyday objects Classify objects and count the number of objects in each category 	<p>Counting and Cardinality</p> <ul style="list-style-type: none"> Count, recognize and compare numbers 0-100 Recognize ordinal position of first through fifth Write numbers 0-20 Match set of objects to appropriate numerals Compare numbers to determine more, fewer, equal Identify, create and extend three part patterns <p>Operations and Algebraic Thinking</p> <ul style="list-style-type: none"> Sequence ordinal numbers 1 - 30 Skip count by 2,5,10 to 100 Represent addition and subtraction with manipulative and creative expression Use graphs to solve problems Add and subtract within five with automaticity Solve simple story problems using addition and subtraction <p>Number and Operations in Base 10</p> <ul style="list-style-type: none"> Group and regroup numbers 11-20 into tens, ones and further ones Solve problems using concrete objects/pictures <p>Measurement and Data</p> <ul style="list-style-type: none"> Sort and classify multiple attributes (color, shape, texture, etc) Distinguish between taller, longer and shorter, explore concepts of weight, measure in non-standard units using concrete objects (i.e. height in building blocks) Tell time to the hour and half hour <p>Geometry</p> <ul style="list-style-type: none"> Identify 6 basic shapes: circle, square, rectangle, diamond, oval and triangle Construct and replicate simple shapes to form larger shapes



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FIRST GRADE	SECOND GRADE
<p>Numbers and Operations in Base Ten</p> <ul style="list-style-type: none">Extend the counting sequence to read and write numerals to represent objectsUse place-value concept to represent amounts of tens and ones and to compare two digit numbersWrite ones, tens, hundredsUse place-value concepts and properties of operations to add and subtract within 100 <p>Operations and Algebraic Thinking</p> <ul style="list-style-type: none">Expand on addition and subtraction with doubles, doubles plus one related facts, guess and check, mental math, double digits without regrouping, three addends.Produce fact families and recognize their commutative and associative relationshipUse addition and subtraction facts to find the missing number in a number sentenceSelect the appropriate operation to solve a word problem <p>Geometry</p> <ul style="list-style-type: none">Draw lines of symmetry to divide a shape into two equal partsDraw, identify, describe and classify two- and three-dimensional geometric shapes and figuresDivide parts of whole into halves, thirds, and fourthsManipulate and describe shapes in terms of flip, turn and slide <p>Measurement and Data</p> <ul style="list-style-type: none">Write/tell time to the half hour & time to the hour on an analog and digital clockCompare graphs to interpret data and make predictionsDetermine best unit of measurement for specific tasks	<p>Numbers and Operations in Base Ten</p> <ul style="list-style-type: none">Use place-value concepts to represent amounts of tens and ones and to compare three digit numbersUse place-value concept to read, write and skip count to 1000 <p>Operations and Algebraic Thinking</p> <ul style="list-style-type: none">Recall and memorize basic addition and subtraction facts to 20Read, interpret, and solve 1 and 2 step word problems involving two-digit addition and subtractionUse addition to check subtractionUse subtraction strategies to discover and determine the missing numberWork with equal groups of objects to gain foundations for multiplication <p>Geometry</p> <ul style="list-style-type: none">Analyze and draw two- and three- dimensional shapes having specified attributesUse the understanding of fractions to partition shapes into halves, quarters, and thirdsDetermine area of a rectangle by dividing into equal squares <p>Measurement and Data</p> <ul style="list-style-type: none">Measure with the appropriate tool to find inches, centimeters, feet, meters, kilometers. and yardsRepresent and interpret data using line plots, picture graphs, and bar graphsIdentify time to five, fifteen, thirty, and forty-five minute intervalsCounting of coins to 99 centsMaking change in amounts through 5 cents.



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THIRD GRADE

Numbers and Operations in Base Ten

- Round to nearest 10,100, 1,000, 10,000, and 100,000
- Memorize basic multiplication facts 0 – 12
- Apply place-value understanding and properties of operations to perform multi-digit mathematical functions

Numbers and Operations—Fractions

- Develop an understanding of fractions as numbers
- Record fractions in numerical notation and written form
- Recognize relationship between fractions and decimals
- Identify equal parts and equivalent fractions

Operations and Algebraic Thinking

- Multiply two and three digits by one digit
- Solve word problems using multiplication and division
- Recognize repeated subtraction when dividing
- Understand addition, subtraction, multiplication, and division concepts, properties, and terminology

Geometry

- Identify, compare, and classify shapes and their attributes
- Name flat shapes and tell number of sides and corners
- Understand that shapes in different categories may share attributes and that the shared attributes can define a larger category

Measurement and Data

- Recognize, determine and utilize the correct unit and instrument for measurement
- Estimate and compare length, weight, mass and capacity in customary and metric units
- Create line graphs by plotting data



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FOURTH GRADE

Numbers and Operations in Base 10

- Recognize a digit in one place represents 10x what it represents in the place to its right
- Compare and order whole numbers to millions place
- Recognize and define the following terms: place value, standard form, expanded for equality, inequality, compare, and ordering
- Choose appropriate sign of “greater than”, “less than” and “equal to” in order to represent the comparison of two whole numbers
- Properly align numbers when setting up a multiplication problem
- Compute multiplication of 2, 3, and 4 digits by 1 digit multipliers
- Multiply 2 two-digit numbers
- Recognize the relationship between multiplication and division

Numbers and Operations—Fractions

- Extend the understanding of fractions to show equivalence and ordering
- Construct and use number lines, pictures and models, including rulers, to determine and identify equivalent fractions
- Reduce fractions to lowest terms using greatest common factor
- Recognize like denominators and add/subtract numerators

Operations and Algebraic Thinking

- Apply problem solving strategies to word problems
- Use drawings and equations with a variable to represent the problems
- Solve multi-step equations using all four operations
- Substitute for variables
- Develop and/or apply number theory concepts to find factors and multiples

Geometry

- Identify intercepting, parallel, and perpendicular lines, rays, and line segments
- Classify angles as right, acute, or obtuse
- Classify triangles (right, scalene, isosceles)
- Build and draw two dimensional shapes
- Identify and name two dimensional and three dimensional figures
- Recognize symmetry in a two dimensional figure
- Draw or fold lines of symmetry
- Explore congruent figures

Measurement and Data

- Measure weights and capacity in standard and metric units
- Measure length in standard and metric units
- Express measurement equivalent for weights, capacity, length and time
- Solve word problems using diagrams and number lines
- Express measurement equivalents
- Estimate, compare, and convert length, weight, mass, and capacity in customary and metric units
- Determine time to the minute using both analog and digital
- Calculate elapsed time
- Apply area and perimeter formula to real world applications



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FIFTH GRADE

Numbers and Operations in Base Ten

- Read and write whole numbers (through the hundreds, thousands, millions and billions) in expanded and word format
- Differentiate between various place values through hundreds, thousands, millions and billions
- Compute using multiplication of whole numbers and decimals
- Solve division problems involving decimal divisors and dividends

Numbers and Operations—Fractions

- Express numbers as equivalent fractions
- Distinguish between like and unlike denominators
- Apply least common multiple techniques to calculate equivalent fractions
- Find factors of numbers to obtain a greatest common factor
- Find common denominators to solve addition and subtraction problems
- Use division to convert improper fractions to mixed numbers
- Select greatest common factor to simplify fractions into lowest terms

Operations and Algebraic Thinking

- Demonstrate the application of the commutative, associative, identity, zero, and distributive properties of multiplication
- Recognize a variable and substitute with a value to solve an equation
- Read a word problem and apply problem solving strategies (understand, plan, solve and look back)
- Select various problem solving strategies to solve multi-step problems: use objects; draw a picture; look for a pattern; guess and check logical reasoning; make an organized list; make a table; solve a simpler problem; work backwards

Geometry

- Name angles (acute, right and obtuse)
- Distinguish various types of polygons, solids, plane figures and lines
- Create a coordinate system by using two perpendicular lines to create four quadrants with the intersection of these lines serving as the origin point (0,0)
- Graph points in the first quadrant on the coordinate plane and interpret these points when solving real world and mathematical problems
- Recognize and plot ordered pairs and apply them to coordinate geometry

Measurement and Data

- Use addition properties to find perimeter by adding the length of all sides of a given shape
- Use multiplication principles to find the area of well-known shapes
- Explain the difference between perimeter and area
- Understand the concept of volume and its relationship to multiplication & addition
- Apply concepts of volume to solve problems and relate volume to multiplication and to addition



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Mathematics PK-8th Grade

SIXTH GRADE

Ratios and Proportional Relationships

- Model and find percent
- Estimate percent of a number
- Solve proportions using cross products
- Define and calculate unit rates (ex. miles per hour)
- Define and solve problems involving ratios, rates, and percent
- Convert units of measure in Metric and Customary Units
- Examine patterns converting measures within the Metric System

The Number System

- Define and find LCM (Lowest Common Multiple)
- Identify equivalent fractions
- Convert between fraction and decimal form
- Illustrate bar notation to express repeating decimals
- Estimate by rounding fractions and mixed numbers to the nearest half or whole
- Multiply and divide mixed numbers and fractions
- Apply integer vocabulary terms including absolute value, additive identity and multiplicative identity

Expressions and Equations

- Use powers and exponents in expressions
- Solve and evaluate simple algebraic expressions and equations
- Distinguish among the properties of addition and multiplication to solve algebraic equations
- Write exponential numbers as products of factors and vice versa
- Explain the term "order of operations" and accurately demonstrate the sequence of operations

Geometry

- Classify and measure angles using a protractor
- Identify, classify, and draw polygons
- Examine relationship between perimeter and area
- Apply geometric principles in the context of solving real world problems
- Find the area and perimeter of triangles, parallelograms, trapezoids and circles
- Demonstrate accurate usage of protractor and compass
- Identify and measure any angle given
- Find volume and surface areas of 2 and 3 dimensional figures using formulas

Statistics and Probability

- Find and interpret the probability of an event using different methods
- Solve probability problems utilizing diagrams and tables
- Use probability to make predictions
- Identify, compute, and explain the concept of mean, median, mode, range and outliers
- Select the appropriate type of graphs, scales and intervals for representing data.
- Construct and interpret frequency charts, line graphs, bar graphs, circle graphs, pictograph and stem-and-leaf.



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SEVENTH GRADE

Ratios and Proportional Relationships

- Compute unit rate as ratios of length, area, time and other measurements
- Find equivalent ratios and use equivalency to solve proportions
- Construct and interpret graphs and charts
- Recognize whether two quantities are in proportional relationships
- Solve word problems with word proportions involving rates and scale factors
- Convert between fraction, decimal and percent forms
- Identify, apply and use percent to make comparisons and solve problems

The Number System

- Find the opposite and absolute value of integers
- Understand that absolute value is a distance, and magnitude and it is always positive.
- Estimate and describe operations with rational numbers
- Identify and use the properties of all integers in every operation
- Use the order of operations to evaluate and simplify expressions

Expressions and Equations

- Utilize problem solving strategies
- Understand that expressions can be combined using like terms or expanded using the distributive property
- Solve algebraic equations and formulas for a given variable
- Write and solve algebraic equations from real-life word problems
- Translate word problems into algebraic expressions

Geometry

- Solve problems involving geometric figures
- Apply and solve problems involving a scale drawing of geometric figures
- Compute actual lengths and areas from a scale drawing
- Use a scale to draw different geometric figures
- Measure and construct angles
- Construct parallel and perpendicular lines as well as line and angle bisectors
- Solve real world problems with right triangles and application of the Pythagorean Theorem
- Know the formulas for the area and circumference of a circle and use them to solve problems
- Formulate the surface area and volume of three dimensional figures
- Measure and construct supplementary and complementary angles
- Use the facts about angles to solve equations for an unknown angle

Statistics and Probability

- Collect data using appropriate methodology
- Explain the effects of sample size and sampling techniques
- Understand how generalizations about a sample population are valid only for that type of sample
- Make inferences after examining a representative sample of a population
- Find mean, median, mode and range of a set of data
- Use data from samples to make inferences about an event and populations
- Use standard deviation when making predictions



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EIGHTH GRADE

The Number System

- Perform all operations with decimals including rounding
- Identify rational and irrational numbers
- Convert between fraction, percentage and decimal - including repeating decimals
- Demonstrate the relationship between percentage, fraction and decimal
- Interpret rational and irrational numbers on a number line
- Graph decimals on the number line

Expressions and Equations

- Simplify and evaluate expressions with variables
- Analyze and solve linear equations and pairs of simultaneous linear equations
- Perform operations with integer exponents
- Evaluate square roots of small perfect squares and cube roots of small perfect cubes
- Perform operations including estimation using Scientific Notation
- Graph and interpret a linear equation using slopes and intercepts applied to real world situations
- Compute slope and y-intercept using similar triangles
- Explain the relationship of slope and the coordinate plane
- Evaluate and solve linear equations and inequalities

Functions

- Perform operations and evaluate problems using patterns and functions
- Identify a relation and a function
- Use a table to find the solution of an equation in two variables
- Compare functions using multiple strategies
- Interpret graphs and give examples of linear and non-linear functions
- Construct a function

Geometry

- Apply and explain properties of angles and triangles to determine measurement of triangles and parallel lines
- Use the Pythagorean theorem to find the sides of a right triangle in a coordinate system
- Transform parallel and perpendicular lines and angles.
- Transform geometric figures on a coordinate plane and draw the result
- Use formulas to find the volume of solid figures in word problems
- Apply the concepts of volume of cones, cylinders, and spheres to solve real-world and mathematical problems

Statistics and Probability

- Calculate mean, median, mode, range, and identify outliers
- Interpret graphs and describe the correlations found in the data
- Describe patterns of association between two quantities
- Analyze and predict outcomes using varied data
- Collect and evaluate data using appropriate methodologies
- Analyze and predict outcome using varied data
- Identify misleading data in charts and graphs
- Determine between dependent and independent results
- Perform experimental probabilities



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All standards are derived from the following public resources:

- ❖ [Pennsylvania State Board of Education--Academics Standards for Mathematics Pre-K thru High School](#)