# Diocese of Altoona-Johnstown Elementary Curriculum

## Mathematics PK-8th Grade

| PRE-K | KINDERGARTEN |
|---|---|
| **Counting and Cardinality**<br>• Know number names and the counting sequence<br>• Count to tell the number of objects<br>• Compare numbers (more than, less than)<br><br>**Operations and Algebraic Thinking**<br>• Understand addition as putting together<br>• Understanding subtraction as taking apart and taking from<br><br>**Geometry**<br>• Identify and describe shapes<br>• Analyze, compare, create, and compose shapes<br><br>**Measurement and Data**<br>• Describe and compare measurable attributes of length and weight of everyday objects<br>• Classify objects and count the number of objects in each category | **Counting and Cardinality**<br>• Count, recognize and compare numbers 0-100<br>• Recognize ordinal position of first through fifth<br>• Write numbers 0-20<br>• Match set of objects to appropriate numerals<br>• Compare numbers to determine more, fewer, equal<br>• Identify, create and extend three part patterns<br><br>**Operations and Algebraic Thinking**<br>• Sequence ordinal numbers 1 - 30<br>• Skip count by 2,5,10 to 100<br>• Represent addition and subtraction with manipulative and creative expression<br>• Use graphs to solve problems<br>• Add and subtract within five with automaticity<br>• Solve simple story problems using addition and subtraction<br><br>**Number and Operations in Base 10**<br>• Group and regroup numbers 11-20 into tens, ones and further ones<br>• Solve problems using concrete objects/pictures<br><br>**Measurement and Data**<br>• Sort and classify multiple attributes (color, shape, texture, etc)<br>• Distinguish between taller, longer and shorter, explore concepts of weight, measure in non-standard units using concrete objects (i.e. height in building blocks)<br>• Tell time to the hour and half hour<br><br>**Geometry**<br>• Identify 6 basic shapes: circle, square, rectangle, diamond, oval and triangle<br>• Construct and replicate simple shapes to form larger shapes |

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## Mathematics PK-8th Grade

| FIRST GRADE | SECOND GRADE |
|---|---|
| **Numbers and Operations in Base Ten**<br>• Extend the counting sequence to read and write numerals to represent objects<br>• Use place-value concept to represent amounts of tens and ones and to compare two digit numbers<br>• Write ones, tens, hundreds<br>• Use place-value concepts and properties of operations to add and subtract within 100<br>**Operations and Algebraic Thinking**<br>• Expand on addition and subtraction with doubles, doubles plus one related facts, guess and check, mental math, double digits without regrouping, three addends<br>• Produce fact families and recognize their commutative and associative relationship<br>• Use addition and subtraction facts to find the missing number in a number sentence<br>• Select the appropriate operation to solve a word problem<br>**Geometry**<br>• Draw lines of symmetry to divide a shape into two equal parts<br>• Draw, identity, describe and classify two- and three-dimensional geometric shapes and figures<br>• Divide parts of whole into halves, thirds, and fourths<br>• Manipulate and describe shapes in terms of flip, turn and slide<br>**Measurement and Data**<br>• Write/tell time to the half hour & time to the hour on an analog and digital clock<br>• Compare graphs to interpret data and make predictions<br>• Determine best unit of measurement for specific tasks | **Numbers and Operations in Base Ten**<br>• Use place-value concepts to represent amounts of tens and ones and to compare three digit numbers<br>• Use place-value concept to read, write and skip count to 1000<br>**Operations and Algebraic Thinking**<br>• Recall and memorize basic addition and subtraction facts to 20<br>• Read, interpret, and solve 1 and 2 step word problems involving two-digit addition and subtraction<br>• Use addition to check subtraction<br>• Use subtraction strategies to discover and determine the missing number<br>• Work with equal groups of objects to gain foundations for multiplication<br>**Geometry**<br>• Analyze and draw two- and three- dimensional shapes having specified attributes<br>• Use the understanding of fractions to partition shapes into halves, quarters, and thirds<br>• Determine area of a rectangle by dividing into equal squares<br>**Measurement and Data**<br>• Measure with the appropriate tool to find inches, centimeters, feet, meters, kilometers. and yards<br>• Represent and interpret data using line plots, picture graphs, and bar graphs<br>• Identify time to five, fifteen, thirty, and forty-five minute intervals<br>• Counting of coins to 99 cents<br>• Making change in amounts through 5 cents |

## 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

## 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

## 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

## 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

## 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

## 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

All standards are derived from the following public resources:

- Pennsylvania State Board of Education--Academics Standards for Mathematics Pre-K thru High School