8.NS The Number System

- Know that numbers that are not rational are called irrational. (8.NS.A.1)
- Understand informally that every number has a decimal expansion. (8.NS.A.1)
- Convert a decimal expansion which repeats eventually into a rational number. (8.NS.A.1)
- Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram. (8.NS.A.2)
- Estimate the value of expressions. (8.NS.A.2)

Essential Questions	**Enduring Understandings**
Where do we use different categories of real numbers in real life? (natural, whole, integers) How can algebraic expressions be transformed?	A number line represents the various categories of real numbers; Integers have magnitude and direction; Absolute value gives the magnitude of a number.
Suggested Activities and Resources (in addition to guided reading and leveled materials) Literature Connection: *If you Hopped Like a Frog* (Schwartz, 1999) – contains 12 situations that use proportional reasoning to determine what it would be like if people had the powers or dimensions of various familiar animals;	**Suggested Assessments** Students take turns, take a picture, & name the use(s) of number that are depicted. Then ask the other students to signal if they agree or disagree, or see another use depicted; Create a set of pictures showing the different uses of number (or you can use pictures already created or cut out of magazines by students).

8.EE Expressions and Equations

- Know and apply the properties of integer exponents to generate equivalent numerical expressions. (8.EE.A.1)
- Use square root and cube root symbols to represent solutions to equations of the form x2 = p and x3 = p, where p is a positive rational number. (8.EE.A.2)
- Evaluate square roots of small perfect squares and cube roots of small perfect cubes. (8.EE.A.2)
- Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities. (8.EE.A.3)
- Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. (8.EE.A.4)
- Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities. (8.EE.A.4)
- Interpret scientific notation that has been generated by technology. (8.EE.A.4)
- Graph proportional relationships, interpreting the unit rate as the slope of the graph. (8.EE.B.5)
- Compare two different proportional relationships represented in different ways. (8.EE.B.5)
- Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane. (8.EE.B.6)
- Solve linear equations in one variable. (8.EE.C.7)
- Analyze and solve pairs of simultaneous linear equations. (8.EE.C.8)

Essential Questions	**Enduring Understandings**
What different information is obtained from equivalent forms of algebraic expressions? What is the purpose of exponents? How can a function be identified? How are graphs, tables and symbols used to represent relationships? Are you able to solve a linear inequality by graphing? What is the best method to solve a system of equations and inequalities in problem solving?	Equivalent forms of algebraic expressions provide different information for solving problems; Exponential and scientific notation are efficient ways of expressing numbers; Functional relationships can be represented graphically and symbolically; Systems are used to model and solve real-life problems that involve more than one variable.
Suggested Activities and Resources (in addition to guided reading and leveled materials) Fraction Notation -- instead of focusing on having students memorize the terms, focus them on investigating the functions of the numerator & denominator - What does the top number in a fraction tell us? What does the bottom	**Suggested Assessments** Students match the correct picture to an oral description. Example - Which picture show a half of a candy bar? Which show a whole candy bar?

8.F Functions

- Understand that a function is a rule that assigns to each input exactly one output. (8.F.A.1)
- Compare properties of two functions each represented in a different way. (8.F.A.2)
- Interpret the equation y = mx + b as defining a linear function, whose graph is a straight line. (8.F.A.3)
- Give examples of functions that are not linear. (8.F.A.3)
- Construct a function to model a linear relationship between two quantities. (8.F.B.4)
- Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values. (8.F.B.4)
- Describe qualitatively the functional relationship between two quantities by analyzing a graph. (8.F.B.5)

Essential Questions	**Enduring Understandings**
Can the given geometric concept be modeled algebraically? How do linear and non-linear functions compare?	Functions express a special kind of relationship between two quantities; Non-linear functions have non-constant rates of change.
Suggested Activities and Resources (in addition to guided reading and leveled materials) Fraction Notation -- instead of focusing on having students memorize the terms, focus them on investigating the functions of the numerator & denominator - What does the top number in a fraction tell us? What does the bottom number in a fraction tell us? *(it tells what's being counted)*	**Suggested Assessments** Students match the correct picture to an oral description. Example - Which picture show a half of a candy bar? Which show a whole candy bar?

8.G Geometry

- Verify experimentally the properties of rotations, reflections, and translations. (8.G.A.1)
- Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations. (8.G.A.2)
- Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates. (8.G.A.3)
- Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations. (8.G.A.4)
- Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. *(8.G.A.5)*
- Explain a proof of the Pythagorean Theorem and its converse. (8.G.B.6)
- Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions. (8.G.B.7)
- Apply the Pythagorean Theorem to find the distance between two points in a coordinate system. (8.G.B.8)
- Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems. (8.G.C.9)

Essential Questions	**Enduring Understandings**
Why do we study geometry? How do patterns help us interpret the world around us? Where do we see patterns? How does geometry relate to everyday life?	Points, lines, and planes are the foundations of geometry; All geometric figures have properties that make them unique; Understanding these properties can help us solve problems in the real world.
Suggested Activities and Resources (in addition to guided reading and leveled materials) Challenge students with “if-then” or “true-false” reasoning; Pass around models of 3-D shapes. Ask students questions relative to (a) characteristics of particular types of shapes & (b) similarities & differences among shapes. Also have them find real-life examples of the various shapes; Instructional activities relative to points, lines, line segments, rays, & angles should focus on helping students develop a growing under-standing of them & of geometric applications relative to them. ; Teacher Resource: *Creative Constructions* by S. Schadler	**Suggested Assessments** Ongoing observation, questioning, & review of student work in order to determine pupil progress relative to –identifying & describing relation-ships for 2 or more objects in space, which characteristics students can use without prompting, use of appropriate language when describing/ discussing geometric shapes/relationships

8.SP Statistics and Probability

- Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. (8.SP.A1)
- Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association. (8.SP.A1)
- Know that straight lines are widely used to model relationships between two quantitative variables. (8.SP.A.2)
- Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. (8.SP.A.3)
- Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. (8.SP.A.4)
- Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. (8.SP.A.4)
- Use relative frequencies calculated for rows or columns to describe possible association between the two variables. (8.SP.A.4)

Essential Questions	**Enduring Understandings**
What are some ways to organize data? Are there advantages and disadvantages in ways that data is presented? How is the probability of an event determined and described? Why make predictions? Does changing the scale affect how data is communicated?	The expected outcome of an event might actually happen in the future; The probability is the mathematics of chance; Data representation is not always accurate; Statistical measures provide a numeric picture of the shape of the data.
Suggested Activities and Resources **(in addition to guided reading and leveled materials)** Use a leveling perspective to help students gain a better understanding of one interpretation of the “mean” – have students make cube towers of different heights to record data, then have students manipulate & level the cubes to ascertain the mean. This can then be connected to the standard averaging paper-and-pencil procedure.	**Suggested Assessments** Ongoing observation & questioning in order to ascertain group & individual pupil progress in - understanding the data collection & analysis process, constructing meaning for terms & concepts related to data collection & analysis, constructing meaning for & applying measures