Transfer Goals ***Students will INDEPENDENTLY be able to...***	**Understandings** ***Students will UNDERSTAND that...***	**Essential Questions** ***Students will regularly consider...***
Based on an examination of the **problem/situation**, initiate a plan, execute it, evaluate and explain the reasonableness of the solution.	● Effective problem solvers work to identify the relevant information before trying to solve a problem ● Effective problem solvers identify and apply an appropriate model, tool, or strategy. ● Effective problem solvers are able to use multiple strategies to obtain and verify a reasonable solution.	● What do I picture/visualize when I look at this problem? ● What is important in this problem/situation? What is not important? ● What strategy is the most useful to solve this problem? ● Does my solution make sense? If my solution is not reasonable, what is my error and how can I learn from it?
Demonstrate **automaticity** in basic computation and **critical vocabulary**	● Committing anything to long-term memory requires constant practice, evaluation of what's not memorized yet, and changing strategies/settings. ● Memorizing facts correctly will make more complex problems less of a struggle.	● How do I get and keep math **facts** in my brain? ● Which facts have I mastered? Which facts need more practice? ● How can I get faster and still get it right? ● What will I do if I do not know the fact?
Investigate and explain how mathematical concepts can relate to one another in the context of a **problem/situation*** or abstract relationships.	● Most concepts can be traced back to the relationships and connections among the basic operations. ● Mathematical concepts can be represented in words, graphically, numerically, algebraically, and/or **concretely**.	● How do you picture/visualize a mathematical idea? ● How are values/ideas/ operations related to each other? ● What rule/pattern/or relationship do I see?
Demonstrate **perseverance*** through making an attempt, evaluating	● By making connections from prior knowledge, problem solvers persevere through	● Have I seen this problem (or something like it) before? How does that help me make

strategy/solution, and being flexible when working on problems, situations, or concepts	difficulties encountered in the problem/situation. ● Making and growing through mistakes is fundamental to progressing as a problem solver and deepening math knowledge.	sense of the problem/situation? ● What do I do when I get stuck? ● Is there another way to think about/approach the problem/situation? ● How does how I feel about the problem affect my thinking and computation?
Communicate effectively in a **variety of ways*** based on purpose, task, and audience using appropriate vocabulary.	● The language of mathematics allows us to communicate in a precise, efficient, and logical manner. ● Discussions or written explanations provide clarity about a problem and/or related concepts.	● How can I represent the same idea in different ways? ● How can I communicate my thoughts so that others can understand it? ● When I hear someone else's explanation, how does that help me? ● How is my explanation similar/different from others?

Teacher Notes on Language

- **problem/situation** means practical applications that can be integrated into other subject area
- **automaticity** means instant and correct response to basic math facts
- **facts** means basic computation and critical vocabulary
- **concrete** means using manipulatives or physical models
- **perseverance** means to work through a problem using a variety of methods (tools/strategies) to reach a solution regardless of right/wrong
- **variety of ways** means concretely , algebraically, pictorially, graphically, abstractly , orally, or in written form.

Number and Number Sense

Understandings	Essential Questions
● There are many ways to represent and maintain equivalency as numbers are classified by their attributes (even/odd, prime/composite, classification of numbers), ● The problem in front of me is a member of a larger class of problems (which allows number sense to develop through experience). ● Precision in how we express numbers because numbers can represent quantity, position, location, and/or relationships. ● A quantity can be represented numerically in various ways: It depends on the context of the problem..	● How do I determine the best numerical representation (pictorial, symbolic, objects) for a given situation? How does this help me become an efficient problem solver? ● How does finding the common characteristics among similar problems help me to be a more efficient problem solver? ● What does this number/relationship mean? How does it compare to another number/relationship? ● How do we use numbers to make sense of the world around us?

Computation

Understandings	Essential Questions
● When objects are combined, mathematical rules guarantee the resulting quantity (k+). ● The relationships among the operations and their properties promote computational automaticity (k+). ● In certain situations, an estimate is as useful (if not more useful) than an exact answer (2+).	● How do mathematical operations relate to each other? ● How do I know which mathematical operation (+, -, x, ÷, exponents, etc.) to use (and in which order to use them) ? How do I know if I'm right? ● How do I make a reasonable estimation and how does it help me? ● When does the pattern or rule no longer hold true? Is this a new set of rules or an exception to an already existing rule?

Measurement

Understandings	Essential Questions

● Every coin/ bill has a value that can be combined/ compared to make calculation/ consumer choices. ● Precision of when something is happening/ has happened/ is going to happen helps organize my day/ week/ month/ year. ● Every measurement has an appropriate unit in which it is expressed, but the precision is dependent on the situation. ● Measurements with the same unit can be compared, combined, converted and categorized to recognize patterns that describe the world.	● When I pay for something will I have money left over? Will I get change back? ● What time is it? How does that help me? ● What properties of the object am I trying to measure? How do I measure them? ● How precise do I need to be in my measurement? ● How do I compare/combine measurements of objects? (coins, time, temperature, shapes, solids and liquids)

Geometry

Understandings	Essential Questions
● Objects in the real world can be described by their shape(s). ● Every shape has properties that define it. ● The properties of a shape do not change when it is reflected, rotated, or translated. ● The construction of an accurate shape honors the attributes of geometry. ● Any shape can be subdivided and combined to make new shapes. ● 3-D shapes can be categorized by the number and nature of their surfaces. ● Circles encompass all the relationships of geometry: points make lines, lines make triangles, triangles make polygons, and polygons make circles.	● What shapes do you see when you look around? ● What is this shape and how do I know? ● What shape can I create? ● How can I tell if these shapes are congruent, similar, or neither? ● When we combine shapes, what new shapes can be made? ● What patterns do you see in this shape? ● What attributes or characteristics would I use to describe this object? ● How can a polygon make a circle? ● What geometric relationship can be observed within a circle?

Probability and Statistics

Understandings	Essential Questions
● The organization and the display of data makes it possible to recognize patterns, trends, and relationships (K+). ● Analyze and interpret data and its properties to predict future outcomes (3+) ● The probability of an event's occurrences and	● What is the purpose of collecting and analyzing this data? How does that impact the way I collect and analyze this data? ● How do people use data to influence others?

outcomes can be predicted, found, analyzed, and interpreted with varying degrees of confidence (3+).	● What patterns/predictions can be made based on data? ● How can I use probability to make wise/informed decisions in my life?

Patterns, Functions, and Algebra

Understandings	Essential Questions
Patterns: 1. Objects may be sorted or classified by one or more attributes 2. Numbers, objects, or attributes may repeat in predictable ways (patterns). 3. Patterns/Sequences can be expressed and extended by identifying the given rule and relationship among other patterns 4. Investigating and applying the properties of arithmetic and geometric sequences and series can be used to solve real-world problems.**(Algebra II+)** 5. Operations can be performed on complex numbers, and express the results in simplest form using patterns of the powers of *i*. (**Algebra II+)** **Functions/Algebra:** 1. A limited set of symbols can be used to represent numerical descriptions and relationships. 2. Applications of specific properties/operations can simplify expressions and solve equations. 3. The use of appropriate properties/axioms for the set of real/imaginary numbers and subsets can simplify expressions, justify steps, and solve equations and inequalities **(Algebra I+)** 4. A problem can be created using a variable(s) to establish a mathematical relationship. 5. Substituting a correct value(s) for an unknown makes the mathematical statement/relationship true. 6. Equations and Inequalities can be solved and graphed. (This includes linear and inequality systems).	**Patterns:** How can patterns be used to make predictions? How are patterns important in the world today? What rule or pattern can help me simplify the expression or solve this problem? What strategies can be used to continue a sequence? **Functions/Algebra:** How can I represent this information in symbols/equations/models? What is the value of this number/ relationship and how can I represent it in different ways? What function best models the data? How does its characteristics help me make predictions? Why are variables used? How do the properties contribute to algebraic understanding? How is an equation like a balance scale? What strategies can be used to solve for unknowns? How are tables, graphs, and equations useful for representing relationships? What are the similarities and differences in the procedures for

7. Connections can be made between and among multiple representations of functions including concrete, verbal, numeric, graphic, and algebraic 8. Linear and quadratic functions can be investigated and analyzed using their characteristics both algebraically and graphically. 9. Polynomials can be simplified using mathematical operations. **(Algebra I+)** 10. Square roots and cube roots of whole numbers and the square root of a monomial algebraic expressions can be expressed in simplest radical form **(Algebra I+)**	solving and expressing the solutions of equations and inequalities? How are the properties of real numbers related to polynomials? What rule or pattern can help me simplify the expression or solve this problem?

ORIGINAL IDEAS ABOUT THE MATH STUDENTS WE WANT:

- find math fun, magical
- think for themselves
- making something out of "math facts to approach/solve a problem
- take risks
- learn from mistakes/failures
- try strategies when stuck
- get started by doing something
- make connections outside of math class (other subject areas, outside of school