

CONTENT THREADS	TRANSFER	UNDERSTANDINGS	ESSENTIAL QUESTIONS
<p><i>Counting and Cardinality (K)</i></p> <p><i>Number and Operations in Base 10 (Gr. K-5); and Fractions (Gr. 3-5)</i></p> <p><i>Number Systems (Gr. 6-8)</i></p> <p><i>Ratio and Proportional Relationships (Gr. 6-7)</i></p> <p><i>Number and Quantity (9-12)</i></p>	<ul style="list-style-type: none"> • Describe, classify and compare objects/ numbers and sets of objects/ numbers • Use descriptions to clarify and/or solve problems • Compose and decompose numbers to establish relationships and perform operations. • Move from one representation to another without changing the quantity. • Perform operations within the real and complex number system 	<ul style="list-style-type: none"> • Objects and sets of objects can be given numerical descriptions. • When objects/numbers are combined, mathematical rules guarantee the resulting quantity. • The value of a number is quantified by the placement of its digits. • The same value can be represented in multiple ways. • Mathematics is a universal language that uses assumed and logical statements to describe the world. • Mathematicians develop new understandings based on established relationships/ theorems/ postulates. • A limited set of symbols can be used to represent numerical descriptions and relationships. 	<ul style="list-style-type: none"> • How do I describe this object/ number or set of objects/ numbers? • How do I classify/compare objects or sets of objects? • What rule do I know OR what pattern can I recognize to help me make a prediction/solve this problem? • What is the value of this number/ relationship and how can I represent it in different ways? • How do I use my number sense to perform operations?

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<p><i>Operations and Algebraic Thinking (Gr. K-5)</i></p> <p><i>Expressions and Equations (Gr. 6-8)</i></p> <p><i>Algebra (Gr. 9-12)</i></p> <p><i>Functions (Gr. 8-12)</i></p>	<ul style="list-style-type: none"> • Compose and decompose numbers to establish relationships, perform operations, and solve problems • Perform operations in a conventional order within the real and complex number system • Describe and/or solve problems using algebraic expressions, equations, inequalities, and functions • Use functions or equations to model relationships among quantities • Classify, interpret, and compare functions or equations 	<ul style="list-style-type: none"> • Numbers, objects, or elements may repeat in predictable ways (patterns). • The same value can be represented in multiple ways. • The application of specific properties and order of operations can simplify expressions, solve equations, and combine functions. • Certain mathematical manipulations preserve the relationship in an expression or equation, even though they change the representation. • Substituting a correct value(s) for an unknown makes the mathematical statement/relationship true. • Expressions, equations, inequalities, and functions use symbols to represent quantities, operations, and their relationships. • A function can represent how quantities in the real world relate to one another. • Recognition of predictable mathematical patterns supports the analysis of functional relationships and the prediction of data. • Mathematical symbols (e.g. period, line) represent quantities and operations in agreed upon ways (e.g. decimal place holders, line to separate numerator from denominator). • Algebraic relationships can be represented by analytical geometry. • Trigonometric functions can be composed and decomposed to model a cyclical pattern and to solve problems. 	<ul style="list-style-type: none"> • What rule or pattern can help me simplify the expression or solve this problem? • How can I represent this information in symbols/equations/models? • What value(s) can I use/substitute to make this relationship true? • What is the relationship between/among these values? • What is the value of this number/ relationship and how can I represent it in different ways? • (Gr. 6-12) How can I represent this relationship as a function or equation? • (Gr. 6-12) How do I evaluate this function or solve the equation? • (Gr. 8-12) How do I classify, interpret, and compare functions or equations? • (Gr. 8-12) What function best models the data? How do its characteristics help me make predictions?

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<p><i>Measurement and Data (K-5)</i></p> <p><i>Statistics and Probability (6-12)</i></p>	<ul style="list-style-type: none"> • Describe, classify, and compare objects. • Represent, summarize, and interpret data to clarify and solve problems or to make informed decisions. • Apply appropriate formulas to determine the unknown. 	<ul style="list-style-type: none"> • Every measurement has a unit in which it is expressed. • There are many appropriate units that can be used to measure an object(s), but the precision is dependent on the situation. • Measurements of the same physical property can be converted. • Measurements with the same unit can be compared and combined. • Measurements can be used to categorize objects and recognize patterns that describe the world. • Sets of measurements may display patterns. • (Gr. 7-12) All generalizations from data must be compared to random behavior to determine causation. • A data set is summarized by its properties (central tendency, variability, etc.). • There may be more than one statistical measure for the same data set property. • Data sets may be causally related to or independent of one another. • Collected data and properties of it can be used to predict future data. • Predictions of an event may require consideration of multiple data sets on which the target is dependent. • Measures of the likelihood of future events can be determined through the combination of independent or dependent events. 	<ul style="list-style-type: none"> • 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? • How do I effectively organize and display data? • What patterns do I see in this data set? (Gr 6-12) Could this be random behavior? • What measurements are appropriate to describe the properties of the data set? • How can I predict future values from a data set? • How are these data sets related? Based on that relationship, can I create a prediction? • Have I accurately applied the appropriate measurement formula?

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<p><i>Geometry</i> (K-12)</p>	<ul style="list-style-type: none"> Describe, classify, and compare objects by their attributes. Compose / decompose shapes or attributes to form new shapes. Infer properties of an object from its shape, location and measurements. Infer the relationship between objects based on their shape, location, and measurements. Apply appropriate theorems and formulas to determine the unknown. 	<ul style="list-style-type: none"> Objects in the world can be described by their shape. Every shape has properties that define it. Shapes in different categories may share attributes that can define a larger category. The properties of a shape do not change when it is reflected, rotated, or translated. If one object can be dilated into a second object and a uniform change of scale, then the two objects are similar. Shapes can be described synthetically or analytically. Every geometric theorem or formula is an established relationship that can be applied to a specific set of figures. Analytic geometry allows you to visualize algebraic relationships. Trigonometry is based on the relationship between sides and the angles in any triangle. <p>2-D:</p> <ul style="list-style-type: none"> When a line intersects a 2-D shape, the areas of the new shapes add up to the area of the original. Given a 2-D shape and its scale, mathematicians can compute its area and perimeter. 2-D shapes can be categorized by the number and nature of the attributes that form them. <p>3-D:</p> <ul style="list-style-type: none"> When a plane intersects with a 3-D shape, the volume of the new shapes add up to the volume of the original. Given a 3-D shape and its scale, mathematicians can compute its surface area and volume. 3-D shapes can be categorized by the number and nature of their surfaces. 	<ul style="list-style-type: none"> What kinds of attributes/ characteristics would I use to describe this object? What category do they belong to? How do these shapes (categories of shapes) compare with one another? What shape(s) can I create? How do I show its attributes? How can I tell if these shapes are congruent, similar, or neither? (Gr. 8-12) How do I justify my argument analytically? How do I use measurements about the shape to calculate additional information about it? (Gr. 5-12) What is the theorem/formula necessary to solve this problem? (Gr. 3-12) How much space does this shape take up/enclose? (2-D and 3-D) What does an object(s) location in space tell me? How do some values in a triangle determine others?