Number and Operations

Connecting Math Ideas: The real numbers are ones that can be located on a number line. They include natural (counting), whole, integers, rational and irrational numbers. We need them for computation. All the sets of real numbers are infinite.

Teaching Tip: Use three steps when teaching a set of numbers: *identification*, *comparison* and *computation*. Use a number line that extends in both the positive and negative direction to show the position of a number on the number line and how the number might be used in real life. Compare: which numbers are larger, smaller, equal. Compute: What happens when numbers added subtracted, multiplied and divided.

Counting Numbers and Whole Numbers	**Integers**	**Rational and Irrational Numbers**
This is what your students should be able to articulate • 1,2,3…are natural or counting numbers and are needed for addition and multiplication • natural or counting numbers are needed for addition and multiplication • number theory is concerned with natural numbers • 0, 1, 2…are whole numbers and are needed for subtraction (5 – 5) • numbers are ideas; numerals are symbols we use to express the ideas • numerals are invented by cultures the numeration system we use is Hindu-Arabic	This is what your students should be able to articulate • …-3, -2, -1, 01,2,3…are integers and are needed for subtraction (5 – 6)	This is what your students should be able to articulate • rational numbers are expressed as fractions or decimals • rational numbers are needed for division 5 divided by 10) • the root of rational numbers is ratio which means the number can be written as a fraction • the fraction bar is the division symbol in mathematics • irrational numbers cannot be expressed as ratios • the expression of an irrational number is always approximate • irrational numbers are needed for measurement (pi)
Identification	**Identification**	**Identification**
Common Multiples Instructional	Coordinate plane	Creating Ratios
Common Multiples: Challenging	**Comparison**	Golden Ratio Illustrated
Common Multiples: Difficult	Graphing Equalities and Inequalities	Trigonometry Ratios Identification of Fractions
Multi-Digit Multiplication Practice Inspired by *The Number Devil: A Mathematical Adventure* by Hans Magnus Enzensberger, Rotraut Susanne Berner and Michael Henry Heim (May 1, 2000)	Graphing Inequalities **Computation** Adding Integers Integer Computation Subtraction with Integers Illustrated	**Comparison** Comparing Fractions with the Same Denominator Comparing Fractions with the Same Numerator Creating Fractions with the same Numerator
Counting to 15 in Roman, Mayan, Egyptian and Babylonian	Integer Computation- Rules (Algorithms)	Equivalent Fraction Patterns Simplification of Prime and Relatively Prime Fractions

Roman and Hindu-Arabic Numerals Inspired by *The Number Devil: A Mathematical Adventure* by Hans Magnus Enzensberger, Rotraut Susanne Berner and Michael Henry Heim (May 1, 2000)		**Computation** Adding and Subtractiing Fractions Using One Denominator
Comparison		Adding & Subtracting Fractions
Word Problems and Comparisons		Adding & Subtracting Fractions - Using a new denominator
Computation: Addition/Subtraction		Multiplying and Dividing Fractions Dividing Fractions Illustrated
A Trick for Adding Consecutive Counting Numbers		Multiplying Fractions: An Application
Consecutive Number Patterns		**Using Ratios**
Patterns: Pascal's Triangle		Decimals
Patterns: Triangular Numbers Inspired by *The Number Devil: A Mathematical Adventure* by Hans Magnus Enzensberger, Rotraut Susanne Berner and Michael Henry Heim (May 1, 2000)		Comparison of Decimals Using Scientific Notation Percents
Patterns: The 12 Days of Christmas Addition		Find the % (Percent) Successive Discounts
Computer Pattern: the Binay Numbers		Fractions, Decimals, and Percents
The Sum of Consecutive Odd Numbers = Square Numbers		Changing Fractions to Decimals
Patterns: Fibonacci Sequence		Equivalence of Fractions, Decimals and Percents
Palindrome Trick		Visuals of Equivalent Fractions, Decimal & Percent
A Trick for Adding Consecutive Counting Numbers		Ordering Fractions, Decimals and Percents: Intructional
Multiplication and Division		Ordering Fractions, Decimals and Percents: practice
Multiplication Patterns		Ordering Fractions, Decimals and Percents: Assessment
Multiplication Table		Addition and Subtraction of Fractions, Decimals & Percents
Multiplication: lattice method		**Ratios**
Patterns: Base two Log		Proportions
Multiples and Factors		Intro to Proportions
Identifying Common Multiples		Proportions: Similar Figures
Divisibility Rules for 10, 5 and 2		Proportions: Scale
Common Multiples Instructional		Percent Designs
Common Multiples: Challenging		Proportion: Indirect measurement

Common Multiples: Difficult		A jelly bean counting contest
Venn diagram - Common Multiples: Instructional		Proportions: Sampling Proportions: Scale of Miles
Venn diagram - Common Multiples: Challenging		Measuring Angles
Venn diagram - Common Multiples: Difficult		Estimate the distance traveled on the Underground Railroad. Inspired by *Aunt Harriet's Underground Railroad in the Sky* by Faith Ringgold
Fundamental Counting Principle		**Irrational Numbers**
Fundamental Counting Principle		Comparing Division vs Square Root
Fundamental Counting Principle Illustrated: Instructional		Square Roots: Rational or Irrational Numbers
Fundamental Counting Principle Illustrated: Practice		All About Pi Discovering Pi
Fundamental Counting Principle Illustrated: Assessment		
Factorials and Permutations		
Number & Operations: Factorials!		
Factorials & Permutations		
Using Factorials		
Exponents: Squares and Cubes		
Exponential Growth Illustrated		
Multiplication by Powers of 10		
Using Exponential Notation		
Tricks for Finding Multiples of 3 and 4		
Finding Factors of 126		
Division Puzzle		
Long Division: Guided Examples		
Changing Fractions to Decimals		
Order and Operations		
Prime & Composite Numbers: Sieve of Eratosthenes		
Prime Numbers Illustrated 1		
Prime Numbers Illustrated 2		
Table of Factors: 1 to 15		
Prime Factorization		

Three Prime Number Tricks Inspired by *The Number Devil: A Mathematical Adventure* by Hans Magnus Enzensberger, Rotraut Susanne Berner and Michael Henry Heim (May 1, 2000)		
Prime Numbers and Goldbach's Conjectures		
Perfect, Deficient and Abundant Numbers		
Multiplication Practice: Happy Numbers		
Order of Operations		
Order of Operations Puzzle 1		
Order of Operations Puzzle 2		
Digital Roots		