

LACONIA SCHOOL DISTRICT

Mathematics Curriculum

2011

Non-Negotiable Math Skills and Concepts

Version 1

Kindergarten

Big Idea in Quantitative Reasoning:

Additive Reasoning (K-2)

1. Number conceptualization:
 - a. 1 to 1 correspondence
 - b. Sequencing
 - c. Visual Clustering
2. Knowing numbers 1-10 well (mentally decompose and recompose numbers)
3. Knowing number names up to 100 and above (creating lexical entries for numbers)
4. Counting forward and backward from a given number (by 1's, 2's and 10's)
5. Place value two digits (canonical and non-canonical decomposition)
6. Number relationships:
 - a. Commutative property of addition
 - b. $N+1, 1+N$
 - c. Making 10
 - d. $N+10, 10+N$
7. Recognize $\frac{1}{2}$ and $\frac{1}{4}$

Big Idea in Spatial Reasoning (K-2):

Recognizing, identifying, naming, drawing commonly found objects in the environment

1. Recognize commonly found objects
2. Representing commonly found objects
3. Spatial sense
 - a. Identifying objects using ones own body as a reference (left, right, above, below, etc. appropriate for age 6)
 - b. Identifying objects using mirror image as a reference (appropriate for age 7)
 - c. Identifying objects from any perspective (appropriate for age 8-9)

First Grade

Big Idea in Quantitative Reasoning:

Additive Reasoning

1. Automatize 10×10 addition facts
 - a. Know facts fluently (less than 2 seconds orally, 3 seconds written)
 - b. Understanding of multiple strategies for same fact
2. Place value (at least 3 digits)
3. Counting by 1, 2, 5, 10, 100 from any number
4. Recognizing, describing and drawing all the basic figures
5. Recognize wholes, $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{10}$

Big Idea in Spatial Reasoning (K-2):

Recognizing Objects

1. Recognize commonly found objects
2. Representing commonly found objects
3. Spatial sense
 - a. Identifying objects using ones own body as a reference (left, right, above, below, etc. appropriate for age 6)
 - b. Identifying objects using mirror image as a reference (appropriate for age 7)
 - c. Identifying objects from any perspective (appropriate for age 8-9)

Suggested time spent on concepts:

70% on additive reasoning

20% on spatial reasoning

10% on other concepts such as time, money, data, and measurement.

Second Grade

Big Idea in Quantitative Reasoning:

Additive Reasoning

1. Automatize 10×10 subtraction facts
2. Addition and subtraction fact families and missing addend mastered
3. Addition and subtraction standard procedures
 - a. Partial sums and differences
 - b. Empty number line
 - c. 100 chart
 - d. Standard procedure with and without grouping
4. Multiplication table of 1, 2, 5, 10
5. Recognize fractions $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{10}$

Big Idea in Spatial Reasoning (K-2):

Recognizing Objects

1. Recognize commonly found objects
2. Representing commonly found objects
3. Spatial sense
 - a. Identifying objects using ones own body as a reference (left, right, above, below, etc. appropriate for age 6)
 - b. Identifying objects using mirror image as a reference (appropriate for age 7)
 - c. Identifying objects from any perspective (appropriate for age 8-9)
4. Apply quantitative and spatial reasoning to the concept of money, time and measurement (perimeter of common figures)

Third Grade

Big Idea in Quantitative Reasoning:

Multiplicative Reasoning

1. Concept of multiplication as
 - a. Repeated addition
 - b. Groups of
 - c. Array
 - d. Area of rectangle
2. Automaticity of multiplication facts (1-10)
3. Associative, commutative and distributive properties of addition and multiplication
4. Multiplication standard procedure
 - a. Partial products
 - b. Place value recording
 - c. Standard procedure for multi-digits
5. Recognizing, locating, and making fractions and equivalent fractions

Big Idea in Spatial Reasoning (3-4):

Describing Familiar Objects

1. Relating and describing commonly found objects in the environment
- 2 Apply quantitative and spatial reasoning to the concept of money, time and measurement (perimeter of common figures and area of rectangles)

Fourth Grade

Big Idea in Quantitative Reasoning:

Multiplicative Reasoning

1. Concept of division as
 - a. Equal sharing (counting skill needed)
 - b. Repeated subtraction (subtraction skill needed)
 - c. Groups of (multiplication skill needed)
 - d. Partitioning model (cutting apart the whole)
 - e. Array
 - f. Area of a rectangle
2. Automaticity of division facts
3. Division standard procedure
 - a. Partial quotient
 - b. Standard Procedure

Big Idea in Spatial Reasoning (3-4):

Describing Familiar Objects

1. Relating and describing commonly found objects in the environment
2. Apply quantitative and spatial reasoning to the concept of money, time and measurement (perimeter of common figures and find the areas of rectangles and other related figures)

Fifth Grade

Big Idea in Quantitative Reasoning:

Proportional Reasoning

1. Ascertaining the mastery of multiplication and division facts
2. Divisibility Tests for 2, 3, 4, 5, 6, 8, 9, and 10
3. Prime Factorization
4. Primary concepts of fractions
 - a. Whole is being divided
 - b. There are a certain number of parts
 - c. Parts are equal
 - d. All parts together make a whole
5. Operations of fractions in all forms
 - a. Fractions
 - b. Decimals
 - c. Percents
 - d. Ratios
 - e. Proportion

* Be sure to use prime factorization to find common denominators when adding or subtracting fractions

Big Idea in Spatial Reasoning (5-6):

Making Connections between objects and relationships

1. Describe, relate, and make inferences about commonly found objects in the environment. (genealogy of quadrilaterals).
2. Solve problems involving perimeter and area of triangles and all quadrilaterals having at least 1 pair of parallel lines.

Sixth Grade

Big Idea in Quantitative Reasoning:

Proportional Reasoning

1. Applications of fractions
 - a. Parts to whole (probability)
 - b. Comparison of 2 quantities (ratio, unit price, scale conversion)
 - c. Comparison of a quantity ($12\% = .007$)
 - d. Comparison of a Comparison (equivalent fractions, proportions)
3. Converting fraction into rational numbers (expressing rational numbers as fractions, decimal with terminal number of digits, decimals with non-terminating repeating decimals)
4. Operations on integers with fluency and understanding

* Must teach difference between number and numeral and contextualize integers

Big Idea in Spatial Reasoning (5-6):

Making Connections between objects and relationships

1. Describe, relate, and make inferences about commonly found objects in the environment. (genealogy of quadrilaterals).
2. Analyze the properties of two-dimensional shapes and solve problems involving perimeter and area, and analyze the properties of three- dimensional shapes and solve problems involving surface area and volume.

Seventh Grade

Big Idea in Quantitative Reasoning:

Algebraic Reasoning

1. Introduce variables in fractions, decimals, percents, ratio, proportion and variations.
2. Rules of exponents
3. Consolidate geometry- find surface areas and volume of simple and compound shapes, figures, and diagrams.
4. Solve simple linear equations, solve for unknown variables

Big idea in Spatial Reasoning (7-10):

Making inferences, proving claims, describing relationships, connecting quantitative and spatial ideas

1. Find the area and surface area of compound figures
2. Describe, connect, relate, making inferences about known figures
3. Be familiar with the relationship between similar triangles and the concept of the slope of a line.

Eighth Grade

Big Idea in Quantitative Reasoning:

Algebraic Reasoning

1. Algebraic expressions and operations on algebraic expressions
2. Understanding real numbers and operations on real numbers
3. Laws of exponents with rational exponents
4. Solving linear and quadratic equations
5. Understanding the relationships between linear, quadratic and exponential forms, equations, and relationships

Until students come with sufficient skills in Numeracy, Fractions , and Integers; this should be the focus for at least next year.

1. Numeracy
2. Fractions
3. Integers
 - a. Conjecture 1: Learn to make multiple signs into 1 sign
 - b. Conjecture 2: Similar signs you add the numerals and keep the common signs
 - c. Conjecture 3: Different signs you subtract the smaller numeral from the larger and keep the sign of the larger numeral

Big idea in Spatial Reasoning (7-10):

Making inferences, proving claims, describing relationships, connecting quantitative and spatial ideas

Ninth Grade

Big Idea in Quantitative Reasoning:

Algebraic Reasoning

1. Algebraic expressions and operations on algebraic expressions
2. Understanding real numbers and operations on real numbers
3. Laws of exponents with rational exponents
4. Solving linear and quadratic equations
5. Understanding the relationships between linear, quadratic and exponential forms, equations, and relationships

Until students come with a sufficient background in math, this should be followed for at least the first year.

1. Numeracy
2. Fractions
3. Integers
4. Linear equations
 - a. Conjecture 1: If you add a number on one side of an equation and add the same number to the other side of the equation, you get an equivalent equation
 - b. Conjecture 2: If you subtract a number from one side of an equation and subtract the same number from the other side of the equation, you get an equivalent equation
 - c. Conjecture 3: If you multiply a number on one side of an equation and multiply the same number to the other side of the equation, you get an equivalent equation
 - d. Conjecture 4: If you divide by a number from one side of an equation and divide by the same number from the other side of the equation, you get an equivalent equation
5. Exponents

Big idea in Spatial Reasoning (7-10):

Making inferences, proving claims, describing relationships, connecting quantitative and spatial ideas

High School

Ninth Grade:

Comprehensive course in Algebra that integrates arithmetic, algebraic, probabilistic, statistical, and geometric models, or a simple algebra course (Math I) for the majority of students.

Grade nine will eventually be a **comprehensive look at Geometry**- study of geometrical objects, their relationships, making inferences about them, supporting and constructing geometrical objects and defending geometrical arguments. (Math II)

Tenth Grade:

Integration of algebra and geometry, coordinate geometry, trigonometry, functions, and discrete models (Math III)

Eleventh Grade:

Comprehensive look at functions, limits, and rate of change (Math IV)

Twelfth Grade:

A comprehensive course on calculus that includes differential and integral calculus and differential equations and discrete models (Math V)