

CORRELATION OF GEMS[®] TEACHER'S GUIDES TO THE NORTH CAROLINA 2004-2005 MATHEMATICS STANDARD COURSE OF STUDY AND GRADE LEVEL COMPETENCIES



Frog Math: Predict, Ponder, Play
Grades K-3

In an artful interweaving of math and literature, this unit begins with free exploration of buttons and leads to age-appropriate sorting, classifying, and graphing activities; introduces the concepts of probability.

Note that those teacher's guides marked with an asterisk* provide especially strong support for the concepts and competency goals listed.

Kindergarten

Major Concepts /Skills	
Number sense 0 - 30	
Calendar time	
Recognize basic shapes	
Create and extend patterns	
Sort and classify	
Strands: Number and Operations, Measurement, Geometry, Data Analysis and Probability, Algebra	

COMPETENCY GOAL 1: The learner will recognize, model, and write whole numbers through 30.	
Objectives	Appropriate GEMS Unit(s)
1.01 Develop number sense for whole numbers through 30.	
a. Connect model, number word	<i>Frog Math*</i> ; <i>Ant Homes Under the</i>

(orally), and number, using a variety of representations.	<i>Ground*</i> ; <i>Mother Opossum and Her Babies*</i> ; <i>Elephants and Their Young*</i>
b. Count objects in a set.	<i>Treasure Boxes*</i> ; <i>Ant Homes Under the Ground</i> ; <i>Mother Opossum and Her Babies</i> ; <i>Eggs, Eggs Everywhere*</i>
c. Read and write numerals.	<i>Frog Math</i> ; <i>Treasure Boxes</i> ; <i>Ant Homes Under the Ground*</i> ; <i>Mother Opossum and Her Babies</i>
d. Compare and order sets and numbers.	<i>Frog Math*</i> ; <i>Treasure Boxes*</i> ; <i>Eggs, Eggs Everywhere*</i> ; <i>Sifting through Science*</i>
e. Use ordinals (1st-10th).	<i>Group Solutions*</i>
f. Estimate quantities fewer than or equal to 10.	<i>Frog Math*</i> ; <i>Treasure Boxes</i>
g. Recognize equivalence in sets and numbers 1-10.	<i>Frog Math</i> ; <i>Treasure Boxes</i> ; <i>Eggs, Eggs Everywhere</i>
1.02 Share equally (divide) between two people; explain.	<i>Treasure Boxes*</i>
1.03 Solve problems and share solutions to problems in small groups.	<i>Group Solutions*</i> ; <i>Group Solutions, Too!*</i> ; <i>Frog Math*</i> ; <i>Treasure Boxes*</i>

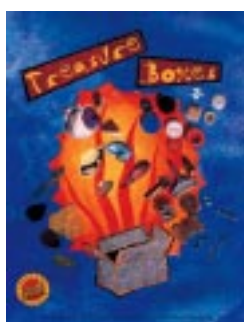
COMPETENCY GOAL 2: The learner will explore concepts of measurement.	
Objectives	Appropriate GEMS Unit(s)
2.01 Compare attributes of two objects using appropriate vocabulary (color, weight, height, width, length, texture).	<i>Group Solutions*</i> ; <i>Group Solutions, Too!*</i> ; <i>Frog Math*</i> ; <i>Treasure Boxes*</i> ; <i>Build It! Festival</i> ; <i>Mother Opossum and Her Babies</i> ; <i>Elephants and Their Young</i>
2.02 Recognize concepts of calendar time using appropriate vocabulary (days of the week, months of the year, seasons).	<i>Tree Homes</i>

COMPETENCY GOAL 3: The learner will explore concepts of geometry.	
Objectives	Appropriate GEMS Unit(s)
3.01 Identify, build, draw, and name triangles, rectangles, and circles; identify, build, and name spheres and	<i>Build It! Festival</i> ; <i>Frog Math</i> ; <i>Penguins and Their Young</i>

cubes.	
3.02 Compare geometric shapes (identify likenesses and differences).	<i>Build It! Festival; Group Solutions, Too!</i>
3.03 Model and use directional and positional vocabulary.	<i>Build It! Festival; Group Solutions; Group Solutions, Too!</i>
3.04 Complete simple spatial visualization tasks and puzzles.	<i>Build It! Festival; Group Solutions, Too!</i>

COMPETENCY GOAL 4: The learner will collect, organize and display data.	
Objectives	Appropriate GEMS Unit(s)
4.01 Collect and organize data as a group activity.	<i>Frog Math*; Treasure Boxes*; Eggs, Eggs Everywhere*; Sifting through Science*</i>
4.02 Display and describe data with concrete and pictorial graphs as a group activity.	<i>Frog Math*; Treasure Boxes*; Eggs, Eggs Everywhere*; Sifting Through Science*; Group Solutions, Too!*</i>

COMPETENCY GOAL 5: The learner will model simple patterns and sort objects.	
Objectives	Appropriate GEMS Unit(s)
5.01 Sort and classify objects by one attribute.	<i>Frog Math*; Treasure Boxes*; Eggs, Eggs Everywhere*; Sifting Through Science*; Build It! Festival</i>
5.02 Create and extend patterns with actions, words, and objects.	<i>Treasure Boxes; Build It! Festival</i>



Treasure Boxes

Grades K–3

This guide builds on children’s fascination with collections of small, everyday objects to introduce discrete mathematics, statistics, numbers, logic and language, with exciting graphing and sorting activities.

Grade 1

Major Concepts/Skills to Maintain	
Number sense 0-99	
Single digit addition and subtraction	
Time	
Non-standard measurement	
Collect and display data	
Create and extend patterns	
Basic geometric shapes	
Sort and classify	
Strands: Number and Operations, Measurement, Geometry, Data Analysis and Probability, Algebra	

COMPETENCY GOAL 1: The learner will read, write, and model whole numbers through 99 and compute with whole numbers.	
Objectives	Appropriate GEMS Unit(s)
1.01 Develop number sense for whole numbers through 99.	
a. Connect the model, number word, and number using a variety of representations.	
b. Use efficient strategies to count the number of objects in a set.	<i>Treasure Boxes*</i> ; <i>Frog Math*</i>
c. Read and write numbers.	<i>Ant Homes Under the Ground*</i> ; <i>Frog Math*</i> ; <i>Treasure Boxes*</i> ; <i>Early Adventures in Algebra*</i> ; <i>Elephants and Their Young*</i> ; <i>Mother Opossum and Her Babies</i>
d. Compare and order sets and numbers.	<i>Frog Math*</i> ; <i>Treasure Boxes*</i> ; <i>Early Adventures in Algebra*</i>
e. Build understanding of place value (ones, tens).	<i>Frog Math*</i> ; <i>Early Adventures in Algebra*</i>
f. Estimate quantities fewer than or equal to 100.	<i>Early Adventures in Algebra*</i>
g. Recognize equivalence in sets and numbers 1-99.	
1.02 Use groupings of 2's, 5's, and 10's with models and pictures to	

count collections of objects.	
1.03 Develop fluency with single-digit addition and corresponding differences using strategies such as modeling, composing and decomposing quantities, using doubles, and making tens.	<i>Early Adventures in Algebra*</i>
1.04 Create, model, and solve problems that use addition, subtraction, and fair shares (between two or three).	<i>Early Adventures in Algebra*; Treasure Boxes</i>

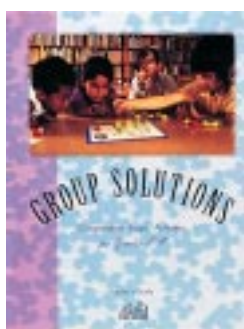
COMPETENCY GOAL 2: The learner will use non-standard units of measure and tell time.	
Objectives	Appropriate GEMS Unit(s)
2.01 For given objects:	
a. Select an attribute (length, capacity, mass) to measure (use non-standard units).	<i>Mother Opossum and Her Babies**; Elephants and Their Young*</i>
b. Develop strategies to estimate size.	<i>Mother Opossum and Her Babies*; Elephants and Their Young*</i>
c. Compare, using appropriate language, with respect to the attribute selected.	<i>Mother Opossum and Her Babies*; Elephants and Their Young*</i>
2.02 Develop an understanding of the concept of time.	
a. Tell time at the hour and half-hour.	
b. Solve problems involving applications of time (clock and calendar).	

COMPETENCY GOAL 3: The learner will identify, describe, draw, and build basic geometric figures.	
Objectives	Appropriate GEMS Unit(s)
3.01 Identify, build, draw and name parallelograms, squares, trapezoids, and hexagons.	<i>Build It! Festival*; Group Solutions, Too!*</i>
3.02 Identify, build, and name	<i>Build It! Festival; Penguins and Their</i>

cylinders, cones, and rectangular prisms.	<i>Young</i>
3.03 Compare and contrast geometric figures.	<i>Build It! Festival*; Group Solutions, Too!*</i>
3.04 Solve problems involving spatial visualization.	<i>Build It! Festival*; Group Solutions, Too!*</i>

COMPETENCY GOAL 4: The learner will understand and use data and simple probability concepts.	
Objectives	Appropriate GEMS Unit(s)
4.01 Collect, organize, describe and display data using line plots and tallies.	
4.02 Describe events as certain, impossible, more likely or less likely to occur.	<i>Frog Math*</i>

COMPETENCY GOAL 5: The learner will demonstrate an understanding of classification and patterning.	
Objectives	Appropriate GEMS Unit(s)
5.01 Sort and classify objects by two attributes.	<i>Frog Math*; Treasure Boxes*</i>
5.02 Use Venn diagrams to illustrate similarities and differences in two sets.	<i>Treasure Boxes*</i>
5.03 Create and extend patterns, identify the pattern unit, and translate into other forms.	<i>Treasure Boxes; Build It! Festival*</i>



Group Solutions: Cooperative Logic Activities

Grades K-4

The activities in this popular guide are designed for groups of four, who share clues with their group, and then have to work cooperatively to find solutions. The guide provides help with cooperative learning and bilingual presentation.

Grade 2

Major Concepts/Skills to Maintain	
Number sense 0-999	
Patterns	
Line plots, tallies	
Sort and classify	
Place value	
Addition and subtraction of multi-digit numbers	
Length, time	
Symmetry and congruence	
Pictographs	
Number sentences	
Probability experiments	
Students will solve relevant and authentic problems using appropriate technology and apply these concepts as well as those developed in earlier years	
Strands: Number and Operations, Measurement, Geometry, Data Analysis and Probability, Algebra	

COMPETENCY GOAL 1: The learner will read, write, model, and compute with whole numbers through 999.	
Objectives	Appropriate GEMS Unit(s)
1.01 Develop number sense for whole numbers through 999.	
a. Connect model, number word, and number using a variety of representations.	
b. Read and write numbers.	<i>Early Adventures in Algebra*</i> ; <i>Frog Math*</i> ; <i>Treasure Boxes*</i>
c. Compare and order.	<i>Early Adventures in Algebra*</i>
d. Rename.	<i>Early Adventures in Algebra*</i>
e. Estimate.	<i>Frog Math*</i> ; <i>Treasure Boxes</i>
f. Use a variety of models to build understanding of place value (ones, tens, hundreds).	<i>Frog Math</i> ; <i>Early Adventures in Algebra</i>
1.02 Use area or region models and set models of fractions to explore part-whole relationships in contexts.	

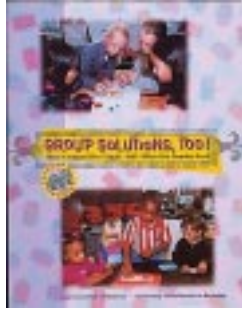
a. Represent fractions (halves, thirds, fourths) concretely and symbolically.	
b. Compare fractions (halves, thirds, fourths) using models.	
c. Make different representations of the same fraction.	
d. Combine fractions to describe parts of a whole.	
1.03 Create, model, and solve problems that involve addition, subtraction, equal grouping, and division into halves, thirds, and fourths (record in fraction form).	
1.04 Develop fluency with multi-digit addition and subtraction through 999 using multiple strategies.	
a. Strategies for adding and subtracting numbers.	<i>Early Adventures in Algebra</i>
b. Estimation of sums and differences in appropriate situations.	<i>Early Adventures in Algebra</i>
c. Relationships between operations.	<i>Early Adventures in Algebra*</i>
1.05 Create and solve problems using strategies such as modeling, composing and decomposing quantities, using doubles, and making tens and hundreds.	<i>Early Adventures in Algebra</i>
1.06 Define and recognize odd and even numbers.	<i>Early Adventures in Algebra*</i>

COMPETENCY GOAL 2: The learner will recognize and use standard units of metric and customary measurement.	
Objectives	Appropriate GEMS Unit(s)
2.01 Estimate and measure using appropriate units.	
a. Length (meters, centimeters, feet, inches, yards).	
b. Temperature (Fahrenheit).	
2.02 Tell time at the five-minute intervals.	

COMPETENCY GOAL 3: The learner will perform simple transformations.	
Objectives	Appropriate GEMS Unit(s)
3.01 Combine simple figures to create a given shape.	<i>Build It! Festival*</i> ; <i>Group Solutions, Too!</i>
3.02 Describe the change in attributes as two- and three-dimensional figures are cut and rearranged.	<i>Build It! Festival*</i>
3.03 Identify and make:	
a. Symmetric figures.	<i>Build It! Festival*</i>
b. Congruent figures.	<i>Build It! Festival</i>

COMPETENCY GOAL 4: The learner will understand and use data and simple probability concepts.	
Objectives	Appropriate GEMS Unit(s)
4.01 Collect, organize, describe and display data using Venn diagrams (three sets) and pictographs where symbols represent multiple units (2's, 5's, 10's).	<i>Treasure Boxes</i>
4.02 Conduct simple probability experiments; describe the results and make predictions.	<i>Frog Math*</i>

COMPETENCY GOAL 5: The learner will recognize and represent patterns and simple mathematical relationships.	
Objectives	Appropriate GEMS Unit(s)
5.01 Identify, describe, translate, and extend repeating and growing patterns.	<i>Treasure Boxes</i> ; <i>Build It! Festival*</i>
5.02 Write addition and subtraction number sentences to represent a problem; use symbols to represent unknown quantities.	<i>Early Adventures in Algebra*</i>



Group Solutions, Too!

Grades K-4

More activities like those of its predecessor, *Group Solutions*, designed for groups of four, who share clues with their group, and then have to work cooperatively to find solutions. The text provides help with cooperative learning and bilingual presentation.

Grade 3

Major Concepts/Skills to Maintain	
Number sense 0 - 9,999	
Addition and subtraction of multi-digit numbers	
Multiplication and division	
Non-negative rational numbers	
Length and time	
Symmetry and congruence	
Line plots, tallies, pictographs	
Venn diagrams	
Capacity and mass	
Coordinate grids	
Circle graphs	
Permutations and combinations	
Growing patterns	
Variables	
Students will solve relevant and authentic problems using appropriate technology and apply these concepts as well as those developed in earlier years	
Strands: Number and Operations, Measurement, Geometry, Data Analysis and Probability, Algebra	

COMPETENCY GOAL 1: The learner will model, identify, and compute with whole numbers through 9,999.	
Objectives	Appropriate GEMS Unit(s)
1.01 Develop number sense for whole numbers through 9,999.	
a. Connect model, number word, and number using a variety of	

representations.	
b. Build understanding of place value (ones through thousands).	
c. Compare and order.	
1.02 Develop fluency with multi-digit addition and subtraction through 9,999 using:	
a. Strategies for adding and subtracting numbers.	
b. Estimation of sums and differences in appropriate situations.	
c. Relationships between operations.	<i>Algebraic Reasoning*; Group Solutions, Too!</i>
1.03 Develop fluency with multiplication from 1x1 to 12x12 and division up to two-digit by one-digit numbers using:	
a. Strategies for multiplying and dividing numbers.	
b. Estimation of products and quotients in appropriate situations.	<i>Algebraic Reasoning*</i>
c. Relationships between operations.	<i>Algebraic Reasoning*</i>
1.04 Use basic properties (identity, commutative, associative, order of operations) for addition, subtraction, multiplication, and division.	
1.05 Use area or region models and set models of fractions to explore part-whole relationships.	
a. Represent fractions concretely and symbolically (halves, fourths, thirds, sixths, eighths).	
b. Compare and order fractions (halves, fourths, thirds, sixths, eighths) using models and benchmark numbers (zero, one-half, one); describe comparisons.	
c. Model and describe common equivalents, especially relationships among halves, fourths, and eighths, and thirds and sixths.	
d. Understand that the fractional	

relationships that occur between zero and one also occur between every two consecutive whole numbers.	
e. Understand and use mixed numbers and their equivalent fraction forms.	
1.06 Develop flexibility in solving problems by selecting strategies and using mental computation, estimation, calculators or computers, and paper and pencil.	<i>Group Solutions; Group Solutions, Too!; In All Probability; Algebraic Reasoning</i>

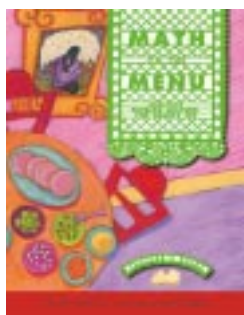
COMPETENCY GOAL 2: The learner will recognize and use standard units of metric and customary measurement.	
Objectives	Appropriate GEMS Unit(s)
2.01 Solve problems using measurement concepts and procedures involving:	
a. Elapsed time.	
b. Equivalent measures within the same measurement system.	
2.02 Estimate and measure using appropriate units.	
a. Capacity (cups, pints, quarts, gallons, liters). Length (miles, kilometers)	
b. Mass (ounces, pounds, grams, kilograms).	
c. Temperature (Fahrenheit, Celsius).	

COMPETENCY GOAL 3: The learner will recognize and use basic geometric properties of two- and three-dimensional figures.	
Objectives	Appropriate GEMS Unit(s)
3.01 Use appropriate vocabulary to compare, describe, and classify two- and three-dimensional figures.	<i>Build It! Festival*; Group Solutions, Too!</i>
3.02 Use a rectangular coordinate system to solve problems.	
a. Graph and identify points with whole number and/or letter coordinates.	<i>Treasure Boxes*</i>

b. Describe the path between given points on the plane.	
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COMPETENCY GOAL 4: The learner will understand and use data and simple probability concepts.	
Objectives	Appropriate GEMS Unit(s)
4.01 Collect, organize, analyze, and display data (including circle graphs and tables) to solve problems.	<i>Treasure Boxes; Algebraic Reasoning; In All Probability*; Math on the Menu*</i>
4.02 Determine the number of permutations and combinations of up to three items.	<i>Math on the Menu*; In All Probability</i>
4.03 Solve probability problems using permutations and combinations.	<i>In All Probability</i>

COMPETENCY GOAL 5: The learner will recognize, determine, and represent patterns and simple mathematical relationships.	
Objectives	Appropriate GEMS Unit(s)
5.01 Describe and extend numeric and geometric patterns.	<i>Algebraic Reasoning*</i>
5.02 Extend and find missing terms of repeating and growing patterns.	<i>Algebraic Reasoning; Build It! Festival</i>
5.03 Use symbols to represent unknown quantities in number sentences.	<i>Algebraic Reasoning*</i>
5.04 Find the value of the unknown in a number sentence.	<i>Algebraic Reasoning*</i>



Math on the Menu

Grades 3–5

This unit provides strong math learning experiences in a real-world context, as students plan and expand menus, determine ingredients, analyze costs, set prices and design a restaurant floor plan. Students work with data organization and analysis, explore aspects of statistics, and strengthen their sense of numbers, math and money.

Grade 4

Major Concepts/Skills to Maintain	
Number sense 0.01-99,999	
Whole number computation	
Non-negative rational numbers	
Symmetry and congruence	
Length, time, capacity, and mass	
Multiplication and division of multi-digit numbers	
Coordinate grids	
Circle graphs	
Permutations and combinations	
Perimeter and area	
Transformations	
Line graphs	
Median, mode, and range	
Variables in number sentences	
Proportional reasoning	
Students will solve relevant and authentic problems using appropriate technology and apply these concepts as well as those developed in earlier years.	
Strands: Number and Operations, Measurement, Geometry, Data Analysis and Probability, Algebra	

COMPETENCY GOAL 1: The learner will read, write, model, and compute with non-negative rational numbers.	
Objectives	Appropriate GEMS Unit(s)
1.01 Develop number sense for rational numbers 0.01 through 99,999.	
a. Connect model, number word, and number using a variety of representations.	
b. Build understanding of place value (hundredths through ten thousands).	
c. Compare and order rational numbers.	

d. Make estimates of rational numbers in appropriate situations.	
1.02 Develop fluency with multiplication and division:	
a. Two-digit by two-digit multiplication (larger numbers with calculator).	
b. Up to three-digit by two-digit division (larger numbers with calculator).	
c. Strategies for multiplying and dividing numbers.	<i>Algebraic Reasoning; Math on the Menu</i>
d. Estimation of products and quotients in appropriate situations.	<i>Algebraic Reasoning; Math on the Menu</i>
e. Relationships between operations.	<i>Algebraic Reasoning; Group Solutions, Too!</i>
1.03 Solve problems using models, diagrams, and reasoning about fractions and relationships among fractions involving halves, fourths, eighths, thirds, sixths, twelfths, fifths, tenths, hundredths, and mixed numbers.	
1.04 Develop fluency with addition and subtraction of non-negative rational numbers with like denominators, including decimal fractions through hundredths.	
a. Develop and analyze strategies for adding and subtracting numbers.	
b. Estimate sums and differences.	
c. Judge the reasonableness of solutions.	
1.05 Develop flexibility in solving problems by selecting strategies and using mental computation, estimation, calculators or computers, and paper and pencil.	<i>Algebraic Reasoning; Quadice; Math on the Menu; In All Probability; Group Solutions; Group Solutions, Too!</i>

COMPETENCY GOAL 2: The learner will understand and use perimeter and area.

Objectives	Appropriate GEMS Unit(s)
2.01 Develop strategies to determine the area of rectangles and the perimeter of plane figures.	<i>Math on the Menu; Algebraic Reasoning*</i>
2.02 Solve problems involving perimeter of plane figures and areas of rectangles.	<i>Math on the Menu; Algebraic Reasoning*</i>

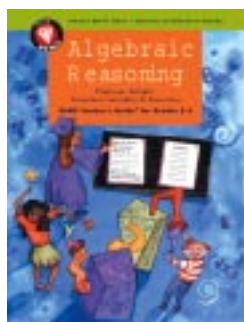
COMPETENCY GOAL 3: The learner will recognize and use geometric properties and relationships.

Objectives	Appropriate GEMS Unit(s)
3.01 Use the coordinate system to describe the location and relative position of points and draw figures in the first quadrant.	
3.02 Describe the relative position of lines using concepts of parallelism and perpendicularity.	<i>Build It! Festival; Group Solutions, Too!</i>
3.03 Identify, predict, and describe the results of transformations of plane figures.	
a. Reflections.	<i>Build It! Festival</i>
b. Translations.	
c. Rotations.	

COMPETENCY GOAL 4: The learner will understand and use graphs, probability, and data analysis.

Objectives	Appropriate GEMS Unit(s)
4.01 Collect, organize, analyze, and display data (including line graphs and bar graphs to solve problems.	<i>In All Probability*</i>
4.02 Describe the distribution of data using median, range and mode.	<i>In All Probability; Math on the Menu</i>
4.03 Solve problems by comparing two sets of related data.	<i>In All Probability</i>
4.04 Design experiments and list all possible outcomes and probabilities for an event.	<i>In All Probability</i>

COMPETENCY GOAL 5: The learner will demonstrate an understanding of mathematical relationships.	
Objectives	Appropriate GEMS Unit(s)
5.01 Identify, describe, and generalize relationships in which:	
a. Quantities change proportionally.	<i>Algebraic Reasoning*</i>
b. Change in one quantity relates to change in a second quantity.	<i>Bubble-ology; Algebraic Reasoning</i>
5.02 Translate among symbolic, numeric, verbal, and pictorial representations of number relationships.	<i>Algebraic Reasoning*; Math on the Menu; Group Solutions; Group Solutions, Too!</i>
5.03 Verify mathematical relationships using:	
a. Models, words, and numbers.	<i>Algebraic Reasoning*</i>
b. Order of operations and the identity, commutative, associative, and distributive properties	<i>Algebraic Reasoning*</i>



Algebraic Reasoning: Professor Arbegla Introduces Variables and Functions

Grades 3–5

Professor Arbegla’s “Fabulous Function Machine” helps build a foundation in algebraic reasoning. Students gain essential algebraic understandings, learn about equations, and apply what they’ve learned.

Grade 5

Major Concepts/Skills to Maintain	
Number sense 0.001-999,999	
Addition and subtraction of non-negative rational numbers	
Properties of plane figures	
Bar graphs and stem-and-leaf plots	
Rates of change	
Whole number computation	
Transformations	
Perimeter and area	

Coordinate grids	
Line graphs	
Median, mode, and range	
Simple equations and inequalities	
Students will solve relevant and authentic problems using appropriate technology and apply these concepts as well as those developed in earlier years	
Strands: Number and Operations, Measurement, Geometry, Data Analysis and Probability, Algebra	

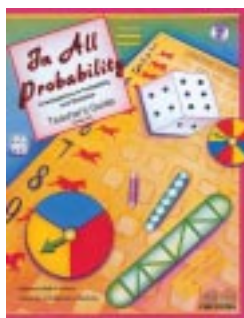
COMPETENCY GOAL 1: The learner will understand and compute with non-negative rational numbers.	
Objectives	Appropriate GEMS Unit(s)
1.01 Develop number sense for rational numbers 0.001 through 999,999.	
a. Connect model, number word, and number using a variety of representations.	
b. Build understanding of place value (thousandths through hundred thousands).	<i>Living with a Star; Quadice; The Real Reasons for Seasons; Math Around the World</i>
c. Compare and order rational numbers.	<i>In All Probability</i>
d. Make estimates of rational numbers in appropriate situations.	
1.02 Develop fluency in adding and subtracting non-negative rational numbers (halves, fourths, eighths; thirds, sixths, twelfths; fifths, tenths, hundredths, thousandths; mixed numbers).	
a. Develop and analyze strategies for adding and subtracting numbers.	
b. Estimate sums and differences.	
c. Judge the reasonableness of solutions.	
1.03 Develop flexibility in solving problems by selecting strategies and using mental computation, estimation, calculators or computers, and paper and pencil.	<i>Quadice; Group Solutions; Group Solutions, Too!; Math on the Menu; In All Probability; Algebraic Reasoning</i>

COMPETENCY GOAL 2: The learner will recognize and use standard units of metric and customary measurement.	
Objectives	Appropriate GEMS Unit(s)
2.01 Estimate the measure of an object in one system given the measure of that object in another system.	<i>Living with a Star; The Real Reasons for Seasons</i>
2.02 Identify, estimate, and measure the angles of plane figures using appropriate tools.	

COMPETENCY GOAL 3: The learner will understand and use properties and relationships of plane figures.	
Objectives	Appropriate GEMS Unit(s)
3.01 Identify, define, describe, and accurately represent triangles, quadrilaterals, and other polygons.	<i>Build It! Festival; Group Solutions, Too!*</i>
3.02 Make and test conjectures about polygons involving:	
a. Sum of the measures of interior angles.	
b. Lengths of sides and diagonals.	
c. Parallelism and perpendicularity of sides and diagonals.	<i>Build It! Festival*; Group Solutions, Too!*</i>
3.03 Classify plane figures according to types of symmetry (line, rotational).	<i>Build It! Festival*; Group Solutions, Too!*</i>
3.04 Solve problems involving the properties of triangles, quadrilaterals, and other polygons.	
a. Sum of the measures of interior angles.	
b. Lengths of sides and diagonals.	
c. Parallelism and perpendicularity of sides and diagonals.	

COMPETENCY GOAL 4: The learner will understand and use graphs and data analysis.	
Objectives	Appropriate GEMS Unit(s)
4.01 Collect, organize, analyze, and display data (including stem-and-leaf plots) to solve problems.	<i>Math on the Menu; In All Probability; Math Around the World; Only One Ocean; Bubble-ology</i>
4.02 Compare and contrast different representations of the same data; discuss the effectiveness of each representation.	
4.03 Solve problems with data from a single set or multiple sets of data using median, range, and mode.	<i>Math on the Menu</i>

COMPETENCY GOAL 5: The learner will demonstrate an understanding of patterns, relationships, and elementary algebraic representation.	
Objectives	Appropriate GEMS Unit(s)
5.01 Describe, extend, and generalize numeric and geometric patterns using tables, graphs, words, and symbols.	<i>Build It! Festival; Math Around the World; Algebraic Reasoning*</i>
5.02 Use algebraic expressions, patterns, and one-step equations and inequalities to solve problems.	<i>Algebraic Reasoning*</i>
5.03 Identify, describe, and analyze situations with constant or varying rates of change.	<i>Bubble-ology</i>



In All Probability: Investigations in Probability and Statistics

Grades 3–6

Students gain confidence as they investigate chance, gather and analyze data, make predictions, and draw conclusions. Provides a solid basis for the development of much-needed real-life understandings and skills.

Grade 6

Major Concepts/Skills to Maintain	
Negative rational numbers	
Percent	
Transformations in the coordinate plane	
Probability	
Addition and subtraction of non-negative rational numbers	
Number properties	
Perimeter and area	
Median, mode, and range	
Bar graphs and leaf plots	
Equations and inequalities	
Multiplication and division of non-negative rational numbers	
Students will solve relevant and authentic problems using appropriate technology and apply these concepts as well as those developed in earlier years	
Strands: Number and Operations, Measurement, Geometry, Data Analysis and Probability, Algebra	

COMPETENCY GOAL 1: The learner will understand and compute with rational numbers.	
Objectives	Appropriate GEMS Unit(s)
1.01 Develop number sense for negative rational numbers.	
a. Connect the model, number word, and number using a variety of representations, including the number line.	
b. Compare and order.	
c. Make estimates in appropriate situations.	
1.02 Develop meaning for percents.	
a. Connect the model, number word, and number using a variety of	<i>In All Probability; Only One Ocean*</i>

representations.	
b. Make estimates in appropriate situations.	
1.03 Compare and order rational numbers.	<i>Quadice; Only One Ocean; In All Probability</i>
1.04 Develop fluency in addition, subtraction, multiplication, and division of non-negative rational numbers.	
a. Analyze computational strategies.	<i>Quadice</i>
b. Describe the effect of operations on size.	<i>Quadice</i>
c. Estimate the results of computations.	<i>Quadice</i>
d. Judge the reasonableness of solutions.	<i>Quadice</i>
1.05 Develop fluency in the use of factors, multiples, exponential notation, and prime factorization.	
1.06 Use exponential, scientific, and calculator notation to write very large and very small numbers.	<i>Living with a Star; The Real Reasons for Seasons</i>
1.07 Develop flexibility in solving problems by selecting strategies and using mental computation, estimation, calculators or computers, and paper and pencil.	<i>Quadice; Only One Ocean; Math Around the World; In All Probability</i>

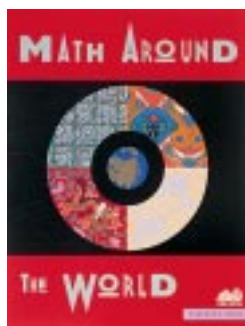
COMPETENCY GOAL 2: The learner will select and use appropriate tools to measure two- and three-dimensional figures.	
Objectives	Appropriate GEMS Unit(s)
2.01 Estimate and measure length, perimeter, area, angles, weight, and mass of two- and three-dimensional figures, using appropriate tools.	
2.02 Solve problems involving perimeter/circumference and area of plane figures.	

COMPETENCY GOAL 3: The learner will understand and use properties and relationships of geometric figures in the coordinate plane.	
Objectives	Appropriate GEMS Unit(s)
3.01 Identify and describe the intersection of figures in a plane.	
3.02 Identify the radius, diameter, chord, center, and circumference of a circle; determine the relationships among them.	
3.03 Transform figures in the coordinate plane and describe the transformation.	
3.04 Solve problems involving geometric figures in the coordinate plane.	

COMPETENCY GOAL 4: The learner will understand and determine probabilities.	
Objectives	Appropriate GEMS Unit(s)
4.01 Develop fluency with counting strategies to determine the sample space for an event. Include lists, tree diagrams, frequency distribution tables, permutations, combinations, and the Fundamental Counting Principle.	<i>In All Probability*; Math Around the World; Math on the Menu</i>
4.02 Use a sample space to determine the probability of an event.	<i>In All Probability*; Math Around the World</i>
4.03 Conduct experiments involving simple and compound events.	<i>In All Probability*; Math Around the World</i>
4.04 Determine and compare experimental and theoretical probabilities for simple and compound events.	<i>In All Probability*; Math Around the World</i>
4.05 Determine and compare experimental and theoretical probabilities for independent and	<i>In All Probability</i>

dependent events.	
4.06 Design and conduct experiments or surveys to solve problems; report and analyze results.	<i>In All Probability</i>

COMPETENCY GOAL 5: The learner will demonstrate an understanding of simple algebraic expressions.	
Objectives	Appropriate GEMS Unit(s)
5.01 Simplify algebraic expressions and verify the results using the basic properties of rational numbers.	
a. Identity.	<i>Algebraic Reasoning</i>
b. Commutative.	<i>Algebraic Reasoning</i>
c. Associative.	<i>Algebraic Reasoning</i>
d. Distributive.	<i>Algebraic Reasoning</i>
e. Order of operations.	
5.02 Use and evaluate algebraic expressions.	
5.03 Solve simple (one- and two-step) equations or inequalities.	<i>Algebraic Reasoning</i>
5.04 Use graphs, tables, and symbols to model and solve problems involving rates of change and ratios.	



Math Around the World

Grades 5–8

This stimulating unit uses games from around the world to explore mathematics in a multicultural, international context. Each game can be presented as a two- or three-session activity or as a stand-alone learning station.

Grade 7

Major Concepts/Skills to Maintain	
Computation with rational numbers	
Ratio and proportion	
Factors and multiples	
Volume and surface area	
Measures of central tendency	
Box plots and histograms	
Number properties	
Percent	
Transformations in the coordinate plane	
Probability	
Equations and inequalities	
Students will solve relevant and authentic problems using appropriate technology and apply these concepts as well as those developed in earlier years	
Strands: Number and Operations, Measurement, Geometry, Data Analysis and Probability, Algebra	

COMPETENCY GOAL 1: The learner will understand and compute with rational numbers.	
Objectives	Appropriate GEMS Unit(s)
1.01 Develop and use ratios, proportions, and percents to solve problems.	<i>Only One Ocean</i>
1.02 Develop fluency in addition, subtraction, multiplication, and division of rational numbers.	
a. Analyze computational strategies.	
b. Describe the effect of operations on size.	
c. Estimate the results of computations.	
d. Judge the reasonableness of solutions.	
1.03 Develop flexibility in solving problems by selecting strategies and	<i>Math Around the World; Quadice</i>

using mental computation, estimation, calculators or computers, and paper and pencil.	
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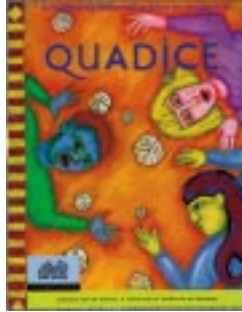
COMPETENCY GOAL 2: The learner will understand and use measurement involving two- and three-dimensional figures.	
Objectives	Appropriate GEMS Unit(s)
2.01 Draw objects to scale and use scale drawings to solve problems.	
2.02 Solve problems involving volume and surface area of cylinders, prisms, and composite shapes.	

COMPETENCY GOAL 3: The learner will understand and use properties and relationships in geometry.	
Objectives	Appropriate GEMS Unit(s)
3.01 Using three-dimensional figures:	
a. Identify, describe, and draw from various views (top, side, front, corner).	<i>Build It! Festival</i>
b. Build from various views.	<i>Build It! Festival</i>
c. Describe cross-sectional views.	
3.02 Identify, define, and describe similar and congruent polygons with respect to angle measures, length of sides, and proportionality of sides.	<i>Build It! Festival</i>
3.03 Use scaling and proportional reasoning to solve problems related to similar and congruent polygons.	

COMPETENCY GOAL 4: The learner will understand and use graphs and data analysis.	
Objectives	Appropriate GEMS Unit(s)
4.01 Collect, organize, analyze, and display data (including box plots and histograms) to solve problems.	<i>Math Around the World</i>
4.02 Calculate, use, and interpret the	

mean, median, mode, range, frequency distribution, and inter-quartile range for a set of data.	
4.03 Describe how the mean, median, mode, range, frequency distribution, and inter-quartile range of a set of data affect its graph.	
4.04 Identify outliers and determine their effect on the mean, median, mode, and range of a set of data.	
4.05 Solve problems involving two or more sets of data using appropriate statistical measures.	

COMPETENCY GOAL 5: The learner will demonstrate an understanding of linear relations and fundamental algebraic concepts.	
Objectives	Appropriate GEMS Unit(s)
5.01 Identify, analyze, and create linear relations, sequences, and functions using symbols, graphs, tables, diagrams, and written descriptions.	<i>Math Around the World</i>
5.02 Translate among different representations of algebraic expressions, equations and inequalities.	
5.03 Use and evaluate algebraic expressions, linear equations or inequalities to solve problems.	
5.04 Develop fluency in the use of formulas to solve problems.	<i>Math Around the World</i>



Quadice

Grades 4–8

A challenging math game that encourages students to perform mental calculations, handle fractions with confidence, and explore probability. Provides an exciting context for skills practice and strategic thinking.

Grade 8

Major Concepts/Skills to Maintain	
Real numbers	
Ratio, proportion, and percent	
Factors and multiples	
Box plots and histograms	
Linear functions	
Pythagorean theorem, indirect measurement	
Volume and surface area	
Scatterplots	
Slope	
Equations and inequalities	
Students will solve relevant and authentic problems using appropriate technology and apply these concepts as well as those developed in earlier years	
Strands: Number and Operations, Measurement, Geometry, Data Analysis and Probability, Algebra	

COMPETENCY GOAL 1: The learner will understand and compute with real numbers.	
Objectives	Appropriate GEMS Unit(s)
1.01 Develop number sense for the real numbers.	
a. Define and use irrational numbers.	
b. Compare and order.	
c. Use estimates of irrational numbers in appropriate situations.	
1.02 Develop flexibility in solving	<i>Math Around the World; Quadice</i>

problems by selecting strategies and using mental computation, estimation, calculators or computers, and paper and pencil.	
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COMPETENCY GOAL 2: The learner will understand and use measurement concepts.

Objectives	Appropriate GEMS Unit(s)
2.01 Determine the effect on perimeter, area or volume when one or more dimensions of two- and three-dimensional figures are changed.	
2.02 Apply and use concepts of indirect measurement.	

COMPETENCY GOAL 3: The learner will understand and use properties and relationships in geometry.

Objectives	Appropriate GEMS Unit(s)
3.01 Represent problem situations with geometric models.	
3.02 Apply geometric properties and relationships, including the Pythagorean theorem, to solve problems.	
3.03 Identify, predict, and describe dilations in the coordinate plane.	

COMPETENCY GOAL 4: The learner will understand and use graphs and data analysis.

Objectives	Appropriate GEMS Unit(s)
4.01 Collect, organize, analyze, and display data (including scatterplots) to solve problems.	
4.02 Approximate a line of best fit for a given scatterplot; explain the meaning of the line as it relates to the problem and make predictions.	

4.03 Identify misuses of statistical and numerical data.	
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COMPETENCY GOAL 5: The learner will understand and use linear relations and functions.	
Objectives	Appropriate GEMS Unit(s)
5.01 Develop an understanding of function.	
a. Translate among verbal, tabular, graphic, and algebraic representations of functions.	
b. Identify relations and functions as linear or nonlinear.	
c. Find, identify, and interpret the slope (rate of change) and intercepts of a linear relation.	
d. Interpret and compare properties of linear functions from tables, graphs, or equations.	
5.02 Write an equation of a linear relationship given: two points, the slope and one point on the line, or the slope and y-intercept.	
5.03 Solve problems using linear equations and inequalities; justify symbolically and graphically.	
5.04 Solve equations using the inverse relationships of addition and subtraction, multiplication and division, squares and square roots, and cubes and cube roots.	

Great Explorations in Math and Science (GEMS) is a program of the Lawrence Hall of Science at the University of California, Berkeley.

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