

A Correlation of



to the

Kansas
Curricular Standards for Mathematics
Grade Four



G/M-219_ Gr 4

INTRODUCTION

This document demonstrates how well **Investigations in Number, Data, and Space®** integrates with the Kansas Curricular Standards for Mathematics. The citations within this correlation provide Investigation Curriculum Unit titles, Investigation numbers and Session numbers or Focus Time/Choice Time titles correlated to the Kansas Curricular Standards for Mathematics.

Investigations in Number, Data, and Space®, a Kindergarten through Grade 5 program, offers a complete and flexible curriculum that aligns with the NCTM principles and Standards for School Mathematics. The main teaching tool is a single resource book, called the *teacher book*, for each unit in a grade level. Students explore the central topics in depth through a series of investigations, gradually encountering and using many important mathematical ideas. ***Investigations*** offers activity-based mathematics that encourages students to think creatively, develop their own strategies, and work together. Students practice skills through games, daily routines, activities, and practice pages.

The program blends concrete materials with appropriate technology. The software provided with several ***Investigations*** units harnesses the power of computers to help students explore mathematical ideas and relationships that cannot be explored in the same way with physical materials. A balanced approach to calculator use is found in the program.

Every unit in the Investigations curriculum offers a list of related children's literature that can be used to support the mathematical ideas presented in the unit. This list of books is found in the materials list located in the front of each unit.

Developed by TERC under a grant from the National Science Foundation, ***Investigations in Number, Data, and Space®*** is comprehensive in its approach to students of diverse learning styles, students from different cultures, and students of different language groups. In an effort to give mathematical lessons a broader spectrum, students are encouraged to explore working in groups, individually and as a whole class. By incorporating these methods into everyday learning, students learn to express mathematical thinking through talking, drawing, and writing.


Investigations in Number, Data and Space® was developed after three years of nationwide field-testing and includes teacher's practical suggestions, student dialogues, and teacher notes. Further information can be found on the internet at www.scottforesman.com/investigations.

**Investigations in Number, Data, and Space
to the
Kansas Curricular Standards for Mathematics
Grade Four**

Standard 1: Number and Computation – The student uses numerical and computational concepts and procedures in a variety of situations.

Benchmark 1: Number Sense – The student demonstrates number sense for whole numbers, fractions (including mixed numbers), decimals, and money including the use of concrete objects in a variety of situations.

Grade Four Knowledge Base Indicators	Investigations in Number, Data, and Space
<p>The student...</p> <ol style="list-style-type: none"> 1. knows, explains, and uses equivalent representations for (\$): <ol style="list-style-type: none"> a. whole numbers from 0 through 100,000 (2.4.K1a-b); 	<p>Students explore hundreds and thousands, including landmark numbers; they devise and practice grouping and ordering strategies; and they compare, combine, and perform operations on whole numbers through the thousands.</p> <p>Sample References: Mathematical Thinking at Grade 4 Investigation 1: Session 1 Arrays and Shares Investigation 1: Sessions 1-3 Landmarks in the Thousands Investigation 4: Sessions 1-3</p>

Grade Four Knowledge Base Indicators	Investigations in Number, Data, and Space
(continued)	Different Shapes, Equal Pieces Investigation 1: Sessions 2-4 The Shape of the Data Investigation 2: 5-7 Money, Miles, and Large Numbers Investigation 1: Sessions 1-2 Changes Over Time Investigation 1: Sessions 5-6 Packages and Groups Investigation 2: Sessions 1-3 Sunken Ships and Grid Patterns Investigation 1: Sessions 2-4 Three Out of Four Like Spaghetti Practice Pages 69-81
b. fractions greater than or equal to zero (halves, fourths, thirds, eighths, tenths, twelfths, sixteenths, hundredths) including mixed numbers (2.4.K1c);	Different Shapes, Equal Pieces Investigation 1: Sessions 1-5 Investigation 2: Sessions 1-4 Investigation 3: Sessions 1-5 Money, Miles, and Large Numbers Investigation 2: Sessions 1-3 Sunken Ships and Grid Patterns Investigation 2: Session 5 Three out of Four Like Spaghetti Investigation 1: Sessions 1-4
c. decimals greater than or equal to zero through hundredths place and when used as monetary amounts (2.4.K1c-d) (\$), e.g., 7¢ = \$.07 = 7/100 of a dollar or a hundreds grid with 7 sections colored or .1 = 1/10 =  .	Money, Miles, and Large Numbers Investigation 1: Sessions 1-2, 4-8 Investigation 2: Sessions 1-2, 4

Grade Four Knowledge Base Indicators	Investigations in Number, Data, and Space
<p>2. compares and orders:</p> <p>a. whole numbers from 0 through 100,000 (2.4.K1a-b) (\$);</p>	<p>Mathematical Thinking at Grade 4 Investigation 1: Session 4 Packages and Groups Investigation 2: Sessions 2-3</p>
<p>b. fractions greater than or equal to zero (halves, fourths, thirds, eighths, tenths, twelfths, sixteenths, hundredths) including mixed numbers with a special emphasis on concrete objects (2.4.K1c);</p>	<p>Different Shapes, Equal Pieces Investigation 1: Session 5 Investigation 2: Sessions 1-4 Investigation 3: Sessions 3-5 Three Out of Four Like Spaghetti Investigation 1: Sessions 2-3</p>
<p>c. decimals greater than or equal to zero through hundredths place and when used as monetary amounts (2.4.K1c-d) (\$).</p>	<p>Money, Miles, and Large Numbers Investigation 1: Sessions 1-2 Investigation 2: Sessions 1-2</p>

Benchmark 2: Number Systems and Their Properties – The student demonstrates an understanding of whole numbers with a special emphasis on place value; recognizes, uses, and explains the concepts of properties as they relate to whole numbers; and extends these properties to fractions (including mixed numbers), decimals, and money.

Grade Four Knowledge Base Indicators	Investigations in Number, Data, and Space
<p>The student...</p> <p>1. ▲ identifies, models, reads, and writes numbers using numerals, words, and expanded notation from hundredths place through one-hundred thousands place (2.4.K1a-b) (\$), e.g., four hundred sixty-two thousand, two hundred eighty-four and fifty hundredths = 462,284.50 or $462,284.50 = (4 \times 100,000) + (6 \times 10,000) + (2 \times 1,000) + (2 \times 100) + (8 \times 10) + (4 \times 1) + (5 \times .1) + (0 \times .01) = 400,000 + 60,000 + 2,000 + 200 + 80 + 4 + .5 + .00$.</p>	<p>Grade 4 students explore hundreds and thousands, including landmark numbers; they devise and practice grouping and ordering strategies; and they compare, combine, and perform operations on whole numbers through the thousands and decimals through the hundredths.</p> <p>Sample References: Mathematical Thinking at Grade 4 Investigation 1: Sessions 1, 4 Arrays and Shares Investigation 1: Sessions 1-3 Landmarks in the Thousands Investigation 4: Sessions 1-3 Different Shapes, Equal Pieces Investigation 1: Sessions 2-4 The Shape of the Data Investigation 2: 5-7 Money, Miles, and Large Numbers Investigation 1: Sessions 1-2 Changes Over Time Investigation 1: Sessions 5-6 Packages and Groups Investigation 2: Sessions 1-3 Sunken Ships and Grid Patterns Investigation 1: Sessions 2-4 Three Out of Four Like Spaghetti Practice Pages 69-81</p>

Grade Four Knowledge Base Indicators	Investigations in Number, Data, and Space
<p>2. classifies various subsets of numbers as whole numbers, fractions (including mixed numbers), or decimals (2.4.K1b-c, 2.4.K1i).</p>	<p>whole numbers: Mathematical Thinking at Grade 4 Investigation 1: Sessions 2-4 Landmarks in the Thousands Investigation 1: Sessions 1-3 Investigation 2: Sessions 1-5 Investigation 3: Sessions 1-5 Investigation 4, Sessions 1-3 Money, Miles, and Large Numbers Investigation 1: Sessions 1-8 Investigation 2: Sessions 1-2 Investigation 3: Sessions 1-4</p> <p>fractions: Different Shapes, Equal Pieces Investigation 1: Session 5 Investigation 2: Sessions 1-4 Investigation 3: Sessions 3-5 Three Out of Four Like Spaghetti Investigation 1: Sessions 2-3</p> <p>decimals: Money, Miles, and Large Numbers Investigation 1: Sessions 1-2 Investigation 2: Sessions 1-2</p>

Grade Four Knowledge Base Indicators	Investigations in Number, Data, and Space
<p>3. identifies the place value of various digits from hundredths place through one hundred thousands place (2.4.K1b) (\$).</p>	<p>Landmarks in the Thousands Investigation 1: Sessions 1-3 Investigation 2: Sessions 1-5 Investigation 3: Sessions 1-5 Investigation 4, Sessions 1-3 Money, Miles, and Large Numbers Investigation 1: Sessions 1-8 Investigation 2: Sessions 1-2 Investigation 3: Sessions 1-4</p>
<p>4. identifies any whole number as even or odd (2.4.K1a).</p>	<p>Grade 4 students explore even and odd numbers on a 100 chart, and they investigate the divisibility of even and odd numbers. References: Arrays and Shares Investigation 1: Sessions 1-2 Investigation 2: Sessions 2-3 Packages and Groups Investigation 3: Sessions 7-8</p>
<p>5. uses the concepts of these properties with the whole number system and demonstrates their meaning including the use of concrete objects (2.4.K1a) (\$):</p> <p>a. ▲ commutative properties of addition and multiplication, e.g., $12 + 18 = 18 + 12$ and $8 \times 9 = 9 \times 8$;</p>	<p>Arrays and Shares Investigation 2: Sessions 2-6 Packages and Groups Investigation 2: Sessions 1-3 Investigation 3: Sessions 3-8</p>

Grade Four Knowledge Base Indicators	Investigations in Number, Data, and Space
<p>b. ▲ zero property of addition (additive identity) and property of one for multiplication (multiplicative identity), e.g., $24 + 0 = 24$ and $75 \times 1 = 75$;</p>	<p>Arrays and Shares Investigation 2: Sessions 5-6 Investigation 3: Sessions 2-4: Teacher Note, page 54 Packages and Groups Investigation 2: Session 1</p>
<p>c. ▲ associative properties of addition and multiplication, e.g., $4 + (2 + 3) = (4 + 2) + 3$ and $2 \times (3 \times 4) = (2 \times 3) \times 4$;</p>	<p>Mathematical Thinking at Grade 4 Ten-Minute Math: Estimation and Number Sense Arrays and Shares Investigation 2: Sessions 2-6 Investigation 3: Sessions 1-5 Changes Over Time Investigation 1: Sessions 5-6 Packages and Groups Investigation 2: Sessions 1-3 Investigation 3: Sessions 3-8</p>
<p>d. ▲ symmetric property of equality applied to addition and multiplication, e.g., $100 = 20 + 80$ is the same as $20 + 80 = 100$ and $21 = 7 \times 3$ is the same as $3 \times 7 = 21$;</p>	<p>The symmetric property of equality is not taught explicitly, but it can be incorporated into the concept of equality and operations. For example, a student can solve the equation $3 \times 6 = \underline{\quad}$, or solve the symmetric problem of finding pairs of factors with a product of 18. Sample References: Arrays and Shares Investigation 1: Session 3 Investigation 2: Sessions 2-3</p>

Grade Four Knowledge Base Indicators	Investigations in Number, Data, and Space
<p>e. zero property of multiplication, e.g., $9 \times 0 = 0$ or $0 \times 112 = 0$;</p>	<p>Students gain experience with the zero property of multiplication as they find patterns when multiplying numbers by factors which are multiples or powers of ten.</p> <p>References: Mathematical Thinking at Grade 4 Investigation 1: Sessions 2-3 Arrays and Shares Investigation 2: Session 1 Investigation 3: Sessions 1-5 Packages and Groups Investigation 2: Session 1</p>
<p>f. distributive property, e.g., $6(7 + 3) = (6 \cdot 7) + (6 \cdot 3)$.</p>	<p>Grade 4 students apply the Distributive Property as they use multiplication clusters to break apart complex multiplication and division problems.</p> <p>References: Packages and Groups Investigation 2: Sessions 1-3 Investigation 3: Sessions 3-8</p>

Benchmark 3: Estimation – The student uses computational estimation with whole numbers, fractions (including mixed numbers) and money in a variety of situations.

Grade Four Knowledge Base Indicators	Investigations in Number, Data, and Space
<p>The student...</p> <p>1. estimates whole number quantities from 0 through 10,000; fractions (halves, fourths, thirds); and monetary amounts through \$1,000 using various computational methods including mental math, paper and pencil, concrete materials, and appropriate technology (2.4.K1a-d) (\$).</p>	<p>Mathematical Thinking at Grade 4 Investigation 1: Sessions 2-4 Investigation 2: Sessions 3-4: Choice 2, page 42 Ten-Minute Math: Estimation and Number Sense</p> <p>Landmarks in the Thousands Investigation 3: Sessions 3-5</p> <p>The Shape of the Data Ten-Minute Math: Estimation and Number Sense</p> <p>Packages and Groups Investigation 2: Sessions 2-3</p> <p>Money, Miles, and Large Numbers Investigation 1: Sessions 1-2, 7-8 Investigation 2: Sessions 1-2 Investigation 3: Session 1</p>

Grade Four Knowledge Base Indicators	Investigations in Number, Data, and Space
<p>2. uses various estimation strategies and explains how they are used when estimating whole numbers quantities from 0 through 10,000; fractions [(halves, fourths, thirds) including mixed numbers)]; and monetary amounts through \$1,000 (2.4.K1a-d) (\$).</p>	<p>Mathematical Thinking at Grade 4 Investigation 1: Sessions 2-4 Investigation 2: Sessions 3-4: Choice 2, page 42 Ten-Minute Math: Estimation and Number Sense</p> <p>Landmarks in the Thousands Investigation 3: Sessions 3-5</p> <p>The Shape of the Data Ten-Minute Math: Estimation and Number Sense</p> <p>Packages and Groups Investigation 2: Sessions 2-3</p> <p>Money, Miles, and Large Numbers Investigation 1: Sessions 1-2, 7-8 Investigation 2: Sessions 1-2 Investigation 3: Session 1</p>
<p>3. recognizes and explains the difference between an exact and an approximate answer (2.4.K1a), e.g., when asked how many desks are in the room, the student gives an estimate of about 30 and then counts the desks and indicates an exact answer is 28 desks.</p>	<p>Mathematical Thinking at Grade 4 Investigation 1: Sessions 2-4 Investigation 2: Sessions 3-4: Choice 2, page 42 Ten-Minute Math: Estimation and Number Sense</p> <p>Landmarks in the Thousands Investigation 3: Sessions 3-5</p> <p>The Shape of the Data Ten-Minute Math: Estimation and Number Sense</p> <p>Packages and Groups Investigation 2: Sessions 2-3</p> <p>Money, Miles, and Large Numbers Investigation 1: Sessions 1-2, 7-8 Investigation 2: Sessions 1-2 Investigation 3: Session 1</p>

Grade Four Knowledge Base Indicators	Investigations in Number, Data, and Space
<p>4. selects the appropriate type of estimate (overestimate, underestimate, or range of estimates) (2.4.K1a).</p>	<p>Mathematical Thinking at Grade 4 Investigation 1: Sessions 2-4 Investigation 2: Sessions 3-4: Choice 2, page 42 Ten-Minute Math: Estimation and Number Sense</p> <p>Landmarks in the Thousands Investigation 3: Sessions 3-5</p> <p>The Shape of the Data Ten-Minute Math: Estimation and Number Sense</p> <p>Packages and Groups Investigation 2: Sessions 2-3</p> <p>Money, Miles, and Large Numbers Investigation 1: Sessions 1-2, 7-8 Investigation 2: Sessions 1-2 Investigation 3: Session 1</p>

Benchmark 4: Computation – The student models, performs, and explains computation with whole numbers, fractions, and money including the use of concrete objects in a variety of situations.

Grade Four Knowledge Base Indicators	Investigations in Number, Data, and Space
<p>The student...</p> <p>1. computes with efficiency and accuracy using various computational methods including mental math, paper and pencil, concrete materials, and appropriate technology (2.4.K1a) (\$).</p>	<p>Arrays and Shares Investigation 1: Sessions 1-3 Investigation 2: Sessions 1-8 Investigation 3: Sessions 1-5 Ten-Minute Math: Counting Around the Class Ten-Minute Math: Multiple BINGO</p> <p>Landmarks in the Thousands Investigation 1: Sessions 1-2 Investigation 2: Sessions 1, 5 Investigation 3: Session 2</p> <p>Different Shapes, Equal Pieces Investigation 1: Session 5 Investigation 2: Session 3</p> <p>Money, Miles, and Large Numbers Investigation 1: Sessions 1-2, 4-8 Investigation 2: Sessions 1-2, 4</p> <p>Packages and Groups Investigation 1: Sessions 1-5 Investigation 2: Sessions 1-3 Investigation 3: Sessions 1-10 Ten-Minute Math: Guess My Number</p>

Grade Four Knowledge Base Indicators	Investigations in Number, Data, and Space
<p>2. N states and uses with efficiency and accuracy multiplication facts from 1 x 1 through 12 x 12 and corresponding division facts (2.4.K1a) (\$).</p>	<p>Mathematical Thinking at Grade 4 Investigation 1: Sessions 2-3</p> <p>Arrays and Shares Investigation 1: Sessions 1-3 Investigation 2: Sessions 1-8 Investigation 3: Sessions 1-5 Ten-Minute Math: Counting Around the Class Ten-Minute Math: Multiple BINGO</p> <p>Landmarks in the Thousands Investigation 2: Session 1 Ten-Minute Math: Counting Around the Class</p> <p>Packages and Groups Investigation 1: Sessions 1-5 Investigation 2: Sessions 1-3 Investigation 3: Sessions 1-10</p>

Grade Four Knowledge Base Indicators	Investigations in Number, Data, and Space
<p>3. N performs and explains these computational procedures (\$):</p> <p>a. adds and subtracts whole numbers from 0 through 100,000 and when used as monetary amounts (2.4.K1a-b,d);</p>	<p>Mathematical Thinking at Grade 4 Investigation 1: Sessions 2-4 Investigation 2: Sessions 1-2 Investigation 3: Sessions 3-5 Ten-Minute Math: Estimation and Number Sense</p> <p>Arrays and Shares Ten-Minute Math: Counting Around the Class</p> <p>Landmarks in the Thousands Investigation 2: Sessions 2-4 Investigation 3: Sessions 3-5</p> <p>Different Shapes, Equal Pieces Investigation 1: Session 5 Investigation 2: Session 3</p> <p>Money, Miles, and Large Numbers Investigation 1: Sessions 1-8 Investigation 2: Sessions 1-2, 4 Investigation 3: Sessions 1-4</p> <p>Sunken Ships and Grid Patterns Ten-Minute Math: Lengths and Perimeters</p>

Grade Four Knowledge Base Indicators	Investigations in Number, Data, and Space
<p>b. multiplies through a three-digit whole number by a two-digit whole number (2.4.K1a-b);</p>	<p>The multiplication strategies referenced below can be readily extended to apply to this objective.</p> <p>References:</p> <p>Arrays and Shares</p> <ul style="list-style-type: none"> Investigation 1: Sessions 1-3 Investigation 2: Sessions 1-8 Investigation 3: Sessions 1-5 Ten-Minute Math: Counting Around the Class Ten-Minute Math: Multiple BINGO <p>Landmarks in the Thousands</p> <ul style="list-style-type: none"> Investigation 2: Session 1 Ten-Minute Math: Counting Around the Class <p>Packages and Groups</p> <ul style="list-style-type: none"> Investigation 1: Sessions 1-5 Investigation 2: Sessions 1-3 Investigation 3: Sessions 1-10
<p>c. multiplies whole dollar monetary amounts (through three-digits) by a one- or two-digit whole number (2.4.K1d), e.g., \$45 x 16;</p>	<p>Grade 4 students add and subtract money values.</p> <p>References:</p> <p>Money, Miles, and Large Numbers</p> <ul style="list-style-type: none"> Investigation 1: Sessions 1-8

Grade Four Knowledge Base Indicators	Investigations in Number, Data, and Space
<p>d. multiplies monetary amounts less than \$100.00 by whole numbers less than ten (2.4.K1d), e.g., \$14.12 x 7;</p>	<p>Grade 4 students add and subtract monetary amounts. References: Money, Miles, and Large Numbers Investigation 1: Sessions 1-8</p>
<p>e. divides through a two-digit whole number by a one-digit whole number with a one-digit whole number quotient with or without a remainder (2.4.K1a-b), e.g., $47 \div 5 = 9 \text{ r } 2$;</p>	<p>Landmarks in the Thousands Investigation 2: Session 1 Packages and Groups Investigation 3: Sessions 1-2</p>
<p>f. adds and subtracts fractions greater than or equal to zero with like denominators (2.4.K1c);</p>	<p>Different Shares, Equal Pieces Investigation 1: Session 5 Investigation 2: Session 3</p>
<p>g. figures correct change through \$20.00 (2.4.K1d).</p>	<p>Mathematical Thinking at Grade 4 Investigation 2: Sessions 1-4 Investigation 3: Sessions 4-5 Money, Miles, and Large Numbers Investigation 1: Sessions 1-8</p>
<p>4. identifies multiplication and division fact families (2.4.K1a).</p>	<p>Arrays and Shares Investigation 1: Session 3 Investigation 2: Sessions 2-3 Ten-Minute Math: Counting Around the Class Ten-Minute Math: Multiple BINGO Landmarks in the Thousands Investigation 2: Session 1 Ten-Minute Math: Counting Around the Class Packages and Groups Investigation 3: Sessions 1-3</p>

Grade Four Knowledge Base Indicators	Investigations in Number, Data, and Space
<p>5. reads and writes horizontally, vertically, and with different operational symbols the same addition, subtraction, multiplication, or division expression, e.g., $6 \cdot 4$ is the same as 6×4 is the same as 4 and</p> $\begin{array}{r} 6 \\ \times 6 \\ \hline \end{array}$ <p>6(4) or 10 divided by 2 is the same as $10 \div 2$ or</p> $\frac{10}{2}$	<p>Sample References: Arrays and Shares Investigation 1: Session 3 Investigation 2: Sessions 7-8: Teacher Note, page 41 Investigation 3 Session 1, page 46 Session 5, page 58</p>
<p>6. ▲ N shows the relationship between these operations with the basic fact families (addition facts with sums from 0 through 20 and corresponding subtraction facts, multiplication facts from 1×1 through 12×12 and corresponding division facts) including the use of mathematical models (2.4.K1a) (\$):</p> <p>a. addition and subtraction,</p>	<p>Landmarks in the Thousands Investigation 2: Sessions 2-3 Changes Over Time Investigation 1: Sessions 5-6</p>
<p>b. addition and multiplication,</p>	<p>Grade 4 students relate addition and multiplication as they apply the Distributive Property to create multiplication clusters to break apart complex multiplication and division problems.</p> <p>References: Packages and Groups Investigation 2: Sessions 1-3 Investigation 3: Sessions 3-8</p>

Grade Four Knowledge Base Indicators	Investigations in Number, Data, and Space
<p>c. multiplication and division,</p>	<p>Arrays and Shares Investigation 1: Session 3 Investigation 2: Sessions 2-3 Ten-Minute Math: Counting Around the Class Ten-Minute Math: Multiple BINGO Landmarks in the Thousands Investigation 2: Session 1 Ten-Minute Math: Counting Around the Class Packages and Groups Investigation 3: Sessions 1-3</p>
<p>d. subtraction and division.</p>	<p>Students explore the concepts of division through sharing and partitioning. Sample References: Mathematical Thinking at Grade 4 Investigation 1: Sessions 2-3 Arrays and Shares Investigation 2: Sessions 7-8</p>

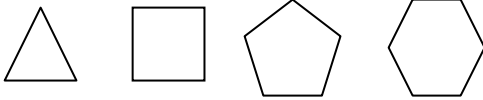
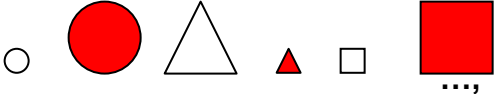
Grade Four Knowledge Base Indicators	Investigations in Number, Data, and Space
<p>7. finds factors and multiples of whole numbers from 1 through 100 (2.4.K1a).</p>	<p>Mathematical Thinking at Grade 4 Investigation 3: Sessions 1-2</p> <p>Arrays and Shares Investigation 1: Sessions 1-3 Investigation 2: Sessions 2-3, 5-6 Investigation 3: Sessions 2-4 Ten-Minute Math: Multiple BINGO</p> <p>Landmarks in the Thousands Investigation 1: Sessions 1-3 Investigation 2: Sessions 1-5 Investigation 4: Sessions 1-3</p> <p>Packages and Groups Investigation 1: Sessions 3-5 Investigation 3: Sessions 4-9</p>

Standard 2: Algebra – The student uses algebraic concepts and procedures in a variety of situations.

Benchmark 1: Patterns – The student recognizes, describes, extends, develops, and explains relationships in patterns using concrete objects in a variety of situations.

Grade Four Knowledge Base Indicators	Investigations in Number, Data, and Space
<p>The student...</p> <p>1. uses concrete objects, drawings, and other representations to work with types of patterns(2.4.K1a):</p> <p>a. repeating patterns, e.g., an AB pattern is like 1-2, 1-2, ...; an ABC pattern is like dog-horse-pig, dog-horse-pig, ...; an AAB pattern is like $\uparrow\uparrow\rightarrow, \uparrow\uparrow\rightarrow, \dots$;</p>	<p>Mathematical Thinking at Grade 4 Investigation 4: Sessions 1-6</p>
<p>b. growing patterns e.g., 2, 5, 11, 20, ...</p>	<p>Arrays and Shares Investigation 1: Sessions 1-3 Investigation 2: Sessions 1-3 Landmarks in the Thousands Investigation 1: Sessions 1-3 Investigation 3: Sessions 1-2 Investigation 4: Sessions 1-3 Packages and Groups Investigation 1: Sessions 1-3</p>

Grade Four Knowledge Base Indicators	Investigations in Number, Data, and Space
<p>2. uses these attributes to generate patterns:</p> <p>a. counting numbers related to number theory (2.4.K1a), e.g., multiples and factors through 12 or multiplying by 10, 100, or 1,000;</p>	<p>Arrays and Shares Investigation 1: Sessions 1-3 Investigation 2: Sessions 1-3</p> <p>Landmarks in the Thousands Investigation 1: Sessions 1-3 Investigation 3: Sessions 1-2 Investigation 4: Sessions 1-3 Ten-Minute Math: Counting Around the Class</p> <p>Packages and Groups Investigation 1: Sessions 1-3</p>
<p>b. whole numbers that increase or decrease (2.4.K1a) (\$), e.g., 20, 15, 10, ...;</p>	<p>Arrays and Shares Investigation 1: Sessions 1-3 Investigation 2: Sessions 1-3</p> <p>Landmarks in the Thousands Investigation 1: Session 1 Investigation 3: Sessions 1-2 Investigation 4: Sessions 1-3 Ten-Minute Math: Counting Around the Class</p> <p>Packages and Groups Investigation 1: Sessions 1-3</p>

Grade Four Knowledge Base Indicators	Investigations in Number, Data, and Space
<p>c. geometric shapes including one or two attributes changes (2.4.K1f), e.g.,</p>  <p>... when the next shape has one more side; or when both color and shape change at the same time such as</p> 	<p>Mathematical Thinking at Grade 4 Investigation 4: Sessions 1-6 Arrays and Shares Investigation 2: Sessions 1-3 Sunken Ships and Grid Patterns Investigation 2: Sessions 8-9</p>
<p>d. measurements (2.4.K1a), e.g., 3 ft., 6 ft., 9 ft., ...;</p>	<p>The Shape of the Data Investigation 2: Sessions 1-4 Money, Miles, and Large Numbers Investigation 1: Sessions 1-8 Investigation 2: Sessions 1-4 Investigation 3: Sessions 2-4 Changes Over Time Unit Preparation: Sessions 1-3 Investigation 1: Sessions 1-4 Investigation 2: Sessions 1-2 Investigation 3: Sessions 1-8 Sunken Ships and Grid Patterns Investigation 1: Sessions 1, 3-6 Ten-Minute Math: Lengths and Perimeters</p>

Grade Four Knowledge Base Indicators	Investigations in Number, Data, and Space
(continued)	<p>Arrays and Shares Investigation 2: Sessions 1-6</p> <p>Landmarks in the Thousands Investigation 1: Session 2</p> <p>Different Shapes, Equal Pieces Investigation 1: Sessions 1-5 Investigation 2: Sessions 1-4</p>
<p>e. money and time (2.4.K1a,d) (\$), e.g., \$.25, \$.50, \$.75, ... or 1:05 p.m., 1:10 p.m., 1:15 p.m., ...;</p>	<p>Changes Over Time Unit Preparation: Sessions 1-3 Investigation 1: Sessions 1-4 Investigation 2: Sessions 1-2 Investigation 3: Sessions 1-8</p>
<p>f. things related to daily life (2.4.K1a), e.g., water cycle, food cycle, or life cycle;</p>	<p>Mathematical Thinking at Grade 4 Investigation 3: Sessions 1-5 Investigation 4: Sessions 1-6</p> <p>Arrays and Shares Investigation 1: Sessions 1-3 Investigation 2: Sessions 1-6 Investigation 3: Sessions 1-5</p> <p>Ten-Minute Math</p> <p>Landmarks in the Thousands Investigation 1: Sessions 1-2 Investigation 2: Sessions 2-4 Investigation 3: Sessions 1-5 Investigation 4: Sessions 1-3</p>

Grade Four Knowledge Base Indicators	Investigations in Number, Data, and Space
(continued)	Changes Over Time Unit Preparation: Sessions 1-3 Investigation 1: Sessions 1-6 Investigation 2: Sessions 1-2 Investigation 3: Sessions 1-8 Packages and Groups Investigation 1: Sessions 1-2 Investigation 3: Sessions 4-8 Sunken Ships and Grid Patterns Investigation 1: Sessions 1-6 Investigation 2: Sessions 2-4, 8-9
g. things related to size, shape, color, texture, or movement (2.4.K1a), e.g., rough, smooth, rough, smooth, rough, smooth, ...; or clapping hands (kinesthetic patterns).	Mathematical Thinking at Grade 4 Investigation 4: Sessions 1-6 Arrays and Shares Investigation 2: Sessions 1-3 Sunken Ships and Grid Patterns Investigation 2: Sessions 8-9
3. identifies, states, and continues a pattern presented in various formats including numeric (list or table), visual (picture, table, or graph), verbal (oral description), kinesthetic (action), and written (2.4.K1a) (\$).	Mathematical Thinking at Grade 4 Investigation 3: Sessions 1-5 Investigation 4: Sessions 1-6 Arrays and Shares Investigation 1: Sessions 1-3 Investigation 2: Sessions 1-3 Packages and Groups Investigation 1: Sessions 1-3 Sunken Ships and Grid Patterns Investigation 2: Sessions 8-9

Grade Four Knowledge Base Indicators	Investigations in Number, Data, and Space
<p>4. generates:</p> <p>a. a pattern (repeating, growing) (2.4.K1a);</p>	<p>Mathematical Thinking at Grade 4 Investigation 3: Sessions 1-5 Investigation 4: Sessions 1-6</p> <p>Arrays and Shares Investigation 1: Sessions 1-3 Investigation 2: Sessions 1-3</p> <p>Landmarks in the Thousands Investigation 1: Session 3 Investigation 4: Sessions 1-3</p> <p>Packages and Groups Investigation 1: Sessions 1-3</p> <p>Sunken Ships and Grid Patterns Investigation 2: Sessions 8-9</p>
<p>b. a pattern using a function table (input/output machines, T-tables) (2.4.K1e).</p>	<p>Changes Over Time Investigation 3 Session 3, pages 49, 52 Session 5, page 58</p> <p>Packages and Groups Investigation 3: Sessions 7-8</p>

Benchmark 2: Variables, Equations, and Inequalities – The student uses variables, symbols, and whole numbers to solve equations including the use of concrete objects in a variety of situations.

Grade Four Knowledge Base Indicators	Investigations in Number, Data, and Space
<p>The student...</p> <p>1. explains and uses variables and symbols to represent unknown whole number quantities from 0 through 1,000 (2.4.K1a).</p>	<p>Arrays and Shares Investigation 2: Sessions 2-3: Teacher Note, page 23</p> <p>Landmarks in the Thousands Investigation 2: Sessions 2-4: Dialogue Box, page 32</p> <p>Changes Over Time Investigation 1: Sessions 5-6</p> <p>Packages and Groups Investigation 1: Sessions 4-5, page 15</p> <p>Investigation 3: Sessions 1-2, page 35 Sessions 7-8, page 53</p>
<p>2. ▲ solves one-step equations using whole numbers with one variable and a whole number solution that:</p> <p>a. find the unknown in a multiplication or division equation based on the multiplication facts from 1 x 1 through 12 x 12 and corresponding division facts (2.4.K1a), e.g., $60 = 10 \times n$;</p>	<p>Arrays and Shares Investigation 2: Sessions 2-3: Teacher Note, page 23</p> <p>Landmarks in the Thousands Investigation 2: Sessions 2-4: Dialogue Box, page 32</p> <p>Changes Over Time Investigation 1: Sessions 5-6</p> <p>Packages and Groups Investigation 1: Sessions 4-5, page 15</p> <p>Investigation 3: Sessions 7-8, page 53</p>

Grade Four Knowledge Base Indicators	Investigations in Number, Data, and Space
<p>b. find the unknown in a money equation using multiplication and division based upon the facts and addition and subtraction with values through \$10 (2.4.K1d) (\$), e.g., 8 quarters + 10 dimes = y dollars;</p>	<p>Grade 4 students add, subtract, and explore number relationships in the context of money. References: Money, Miles, and Large Numbers Investigation 1: Sessions 1-8</p>
<p>c. find the unknown in a time equation involving whole minutes, hours, days, and weeks with values through 200 (2.4.K1a), e.g., 180 minutes = y hours.</p>	<p>Grade 4 students solve “Ins and Outs” number problems, which involve change over time. References: Change Over Time Investigation 1: Sessions 5-6</p>
<p>3. compares two whole numbers from 0 through 10,000 using the equality and inequality symbols (=, ≠, <, >) and their corresponding meanings (is equal to, is not equal to, is less than, is greater than) (2.4.K1b) (\$).</p>	<p>Mathematical Thinking at Grade 4 Investigation 1: Session 4 Packages and Groups Investigation 2: Sessions 2-3</p>
<p>4. reads and writes whole number equations and inequalities using mathematical vocabulary and notation, e.g., $15 = 3 \times 5$ is the same as fifteen equals three times five or $4,564 > 1,000$ is the same as four thousand, five hundred sixty-four is greater than one thousand.</p>	<p>Arrays and Shares Investigation 2: Sessions 2-3 Investigation 3: Session 1 Landmarks in the Thousands Investigation 2: Sessions 2-4 Changes Over Time Investigation 1: Sessions 5-6 Packages and Groups Investigation 3: Sessions 1-2</p>

Benchmark 3: Functions – The student recognizes and describes whole number relationships including the use of concrete objects in a variety of situations.

Grade Four Knowledge Base Indicators	Investigations in Number, Data, and Space														
<p>The student...</p> <p>1. states mathematical relationships between whole numbers from 0 through 1,000 using various methods including mental math, paper and pencil, concrete materials, and appropriate technology (2.4.K1a) (\$).</p>	<p>Arrays and Shares Investigation 2: Sessions 1-6</p> <p>Changes Over Time Unit Preparation: Sessions 1-3 Investigation 1: Sessions 1-6 Investigation 2: Sessions 1-2 Investigation 3: Sessions 1-8</p> <p>Packages and Groups Investigation 3: Sessions 7-8</p> <p>Sunken Ships and Grid Patterns Investigation 1: Sessions 5-6, Dialogue Box, page 41</p>														
<p>2. ▲ finds the values, determines the rule, and states the rule using symbolic notation with one operation of whole numbers from 0 through 200 using a horizontal or vertical function table (input/output machine, T-table) (2.4.K1e), e.g., using the function table, find the rule, the rule is $N \cdot 4$.</p> <table border="1" data-bbox="510 1081 714 1346"> <tbody> <tr> <td>N</td> <td>?</td> </tr> <tr> <td>1</td> <td>4</td> </tr> <tr> <td>5</td> <td>20</td> </tr> <tr> <td>2</td> <td>8</td> </tr> <tr> <td>3</td> <td>?</td> </tr> <tr> <td>4</td> <td>?</td> </tr> <tr> <td>?</td> <td>24</td> </tr> </tbody> </table>	N	?	1	4	5	20	2	8	3	?	4	?	?	24	<p>Changes Over Time Investigation 3 Session 3, pages 49, 52 Session 5, page 58</p> <p>Packages and Groups Investigation 3: Sessions 7-8</p>
N	?														
1	4														
5	20														
2	8														
3	?														
4	?														
?	24														

Grade Four Knowledge Base Indicators	Investigations in Number, Data, and Space
<p>3. generalizes numerical patterns using whole numbers from 0 through 200 with one operation by stating the rule using words, e.g., if the pattern is 46, 68,90, 112, 134, ...; in words, the rule is add 22 to the number before.</p>	<p>Landmarks in the Thousands Investigation 1: Session 1 Investigation 3: Sessions 1-2 Investigation 4: Sessions 1-3 Ten-Minute Math: Counting Around the Class</p>
<p>4. uses a function table (input/output machine, T-table) to identify, plot, and label the ordered pairs in the first quadrant of a coordinate plane (2.4.K1a,e).</p>	<p>Sunken Ships and Grid Patterns Investigation 1: Sessions 1-6 Investigation 2: Sessions 1-9 Ten-Minute Math: Lengths and Perimeters Geo-Logo Teacher Tutorial</p>

Benchmark 4: Models – The student develops and uses mathematical models including the use of concrete objects to represent and explain mathematical relationships in a variety of situations.

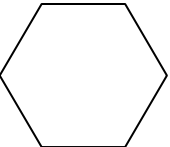

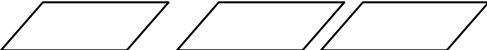

Grade Four Knowledge Base Indicators	Investigations in Number, Data, and Space
<p>The student...</p> <p>1. knows, explains, and uses mathematical models to represent mathematical concepts, procedures, and relationships. Mathematical models include:</p> <p>a. process models (concrete objects, pictures, diagrams, number lines, hundred charts, measurement tools, multiplication arrays, division sets, or coordinate planes/grids) to model computational procedures, mathematical relationships, and equations (1.1.K1a, 1.1.K2a, 1.2.K1, 1.2.K4-5, 1.3.K1-4, 1.4.K1-2, 1.4.K3a-b, 1.4.K3e, 1.4.K4, 1.4.K6-7, 2.1.K1, 2.1.K.1a-b, 2.1.K2d-g, 2.1.K3, 2.1.K4a, 2.2.K1, 2.2.K2a, 2.2.K3-4, 2.3.K1, 2.3.K4, 3.2.K1-4, 3.3.K1-2, 3.4.K1-4, 4.2.K3) (\$);</p>	<p>Grade 4 students use process models to represent mathematical concepts, procedures, and relationships throughout the course. For example, students use arrays as models for multiplication; they relate cube configurations to two-dimensional drawings, mental images, and verbal descriptions; they model numbers with a 100 Chart, a 1,000 Book, and a 10,000 Wall Chart; they model fractions with “crazy cakes;” they analyze displays of Mystery Data in tables, line plots, and graphs; and they use equations to model problem situations.</p> <p>Sample References: Mathematical Thinking at Grade 4 Investigation 2: Sessions 3-4 Arrays and Shares Investigation 2: Session 1 Seeing Solids and Silhouettes Investigation 1: Session 1 Landmarks in the Thousands Investigation 4: Sessions 1-3 Different Shapes, Equal Pieces Investigation 1: Session 1 The Shape of the Data Investigation 2: Session 4</p>

Grade Four Knowledge Base Indicators	Investigations in Number, Data, and Space
(continued)	<p>Money, Miles, and Large Numbers Investigation 3: Sessions 2-4</p> <p>Changes Over Time Investigation 3: Sessions 7-8</p> <p>Packages and Groups Investigation 3: Sessions 1-2</p> <p>Sunken Ships and Grid Patterns Investigation 1: Sessions 5-6</p> <p>Three out of Four Like Spaghetti Investigation 2: Session 3</p>
<p>b. place value models (place value mats, hundred charts, base ten blocks, or unifix cubes) to compare, order, and represent numerical quantities and to model computational procedures (1.1.K1a, 1.1.K2a, 1.2.K1-3, 1.3.K1-2, 1.4.K3a-b, 1.4.K3e, 2.2.K4) (\$);</p>	<p>Landmarks in the Thousands Investigation 1: Sessions 1-3 Investigation 2: Sessions 1-5 Investigation 3: Sessions 1-5 Investigation 4, Sessions 1-3</p> <p>Money, Miles, and Large Numbers Investigation 1, Sessions 1-8 Investigation 2, Sessions 1-2 Investigation 3, Sessions 1-4</p>
<p>c. fraction and mixed number models (fraction strips or pattern blocks) and decimal models (base ten blocks or coins) to compare, order, and represent numerical quantities (1.1.K1b-c, 1.1.K2b-c, 1.2.K2, 1.3.K1-2, 1.4.K1f) (\$);</p>	<p>Different Shapes, Equal Pieces Investigation 1: Sessions 1-5 Investigation 2: Sessions 1-4 Investigation 3: Sessions 1-5</p> <p>Money, Miles, and Large Numbers Investigation 1: Sessions 1-2, 4-8 Investigation 2: Sessions 1-4</p> <p>Sunken Ships and Grid Patterns Investigation 2: Session 5</p> <p>Three out of Four Like Spaghetti Investigation 1: Sessions 1-4</p>

<p>d. money models (base ten blocks or coins) to compare, order, and represent numerical quantities (1.1.K1c, 1.2.K1c, 1.3.K1-2, 1.4.K3a, 1.4.K3a, 1.4.K3c-d, 1.4.K3g, 2.1.K2e, 2.2.K2b) (\$);</p>	<p>Mathematical Thinking at Grade 4 Investigation 2: Sessions 1-4 Investigation 3: Sessions 4-5 Money, Miles, and Large Numbers Investigation 1: Sessions 1-8</p>
<p>e. function tables (input/output machines, T-tables) to model numerical and algebraic relationships (2.1.K4b, 2.3.K2, 2.3.K4, 3.4.K4) (\$);</p>	<p>Changes Over Time Investigation 3 Session 3, pages 49, 52 Session 5, page 58 Packages and Groups Investigation 3: Sessions 7-8</p>
<p>f. two-dimensional geometric models (geoboards, dot paper, pattern blocks, or tangrams) to model perimeter, area, and properties of geometric shapes and three-dimensional geometric models (solids) and real-world objects to compare size and to model properties of geometric shapes (2.1.K2c, 2.1.K1e, 3.1.K1-6, 3.2.K5, 3.3.K3);</p>	<p>Seeing Solids and Silhouettes Investigation 1: Sessions 1-2 Investigation 2: Sessions 1-5 Investigation 3: Sessions 1-3 Investigation 4: Sessions 1-4 Ten-Minute Math: Quick Images Different Shapes, Equal Pieces Investigation 1: Sessions 1-5 Investigation 2: Sessions 1-4 Investigation 3: Sessions 1-2 Sunken Ships and Grid Patterns Investigation 1: Sessions 1-6 Investigation 2: Sessions 1-9 Ten-Minute Math: Lengths and Perimeters Changes Over Time Ten-Minute Math: Quick Images</p>

Grade Four Knowledge Base Indicators	Investigations in Number, Data, and Space
<p>g. two-dimensional geometric models (spinners), three-dimensional models (number cubes), and process models (concrete objects) to model probability (4.1.K1-3) (\$);</p>	<p>Landmarks in the Thousands Ten-Minute Math: What Is Likely? Money, Miles, and Large Numbers Ten-Minute Math: Likely or Unlikely? Three Out of Four Like Spaghetti Ten-Minute Math: What Is Likely?</p>
<p>h. graphs using concrete objects, pictographs, frequency tables, horizontal and vertical bar graphs, line graphs, circle graphs, Venn diagrams, line plots, charts, and tables to organize and display data (4.1.K2, 4.2.K1-2) (\$);</p>	<p>Mathematical Thinking at Grade 4 Ten-Minute Math: Exploring Data The Shape of the Data Investigation 1: Sessions 1-3 Investigation 2: Sessions 1-7 Investigation 3: Sessions 1-5 Changes Over Time Unit Preparation: Sessions 1-3 Investigation 1: Sessions 1-6 Investigation 2: Sessions 1-2 Investigation 3: Sessions 1-8 Packages and Groups Ten-Minute Math: Exploring Data Sunken Ships and Grid Patterns Investigation 1: Sessions 5-6 Investigation 2: Sessions 1-9 Ten-Minute Math: Lengths and Perimeters Packages and Groups Ten-Minute Math: Exploring Data Three out of Four Like Spaghetti Investigation 1: Sessions 1-4 Investigation 2: Sessions 1-7</p>

Grade Four Knowledge Base Indicators	Investigations in Number, Data, and Space
<p>i. Venn diagrams to sort data and show relationships (1.2.K2).</p>	<p>Grade 4 students use a variety of structures to organize and display categorical data, including tally charts and line plots.</p> <p>Sample References:</p> <p>The Shape of the Data Investigation 3 Sessions 1-2 Sessions 3-5: Teacher Note, pages 63-64</p> <p>Changes Over Time Investigation 1: Sessions 1-4</p> <p>Three Out of Four Like Spaghetti Investigation 2: Sessions 1-7</p>

Grade Four Knowledge Base Indicators	Investigations in Number, Data, and Space
<p>2. creates a mathematical model to show the relationship between two or more things, e.g., using pattern blocks, a whole (1) can be represented as</p> <p>a  (1/1) or</p> <p>two  (2/2) or</p> <p>three  (3/3) or</p> <p>six  (6 (6/6)).</p>	<p>Grade 4 students create and use mathematical models to demonstrate equivalence and relationships throughout the course. For example, students use pattern blocks to create symmetrical designs.</p> <p>Sample References:</p> <p>Mathematical Thinking at Grade 4 Investigation 4: Sessions 1-6</p> <p>Arrays and Shares Investigation 2: Sessions 2-3</p> <p>Seeing Solids and Silhouettes Investigation 2: Session 5</p> <p>Landmarks in the Thousands Investigation 1: Session 1</p> <p>Different Shapes, Equal Pieces Investigation 2: Sessions 1-2</p> <p>The Shape of the Data Investigation 2: Session 4</p> <p>Money, Miles, and Large Numbers Investigation 1: Sessions 4-5</p> <p>Changes Over Time Investigation 2: Sessions 1-2</p> <p>Packages and Groups Investigation 1: Session 3</p> <p>Sunken Ships and Grid Patterns Investigation 2: Session 4</p> <p>Three out of Four Like Spaghetti Investigation 1: Session 3</p>

Standard 3: Geometry – The student uses geometric concepts and procedures in a variety of situations.

Benchmark 1: Geometric Figures and Their Properties – The student recognizes geometric shapes and investigates their properties including the use of concrete objects in a variety of situations.

Grade Four Knowledge Base Indicators	Investigations in Number, Data, and Space
<p>The student...</p> <p>1. recognizes and investigates properties of plane figures (circles, squares, rectangles, triangles, ellipses, rhombi, octagons, hexagons, pentagons) using concrete objects, drawings, and appropriate technology (2.4.K1f).</p>	<p>Mathematical Thinking at Grade 4 Investigation 4: Sessions 2-6</p> <p>Seeing Solids and Silhouettes Investigation 2: Sessions 1-2 Ten-Minute Math: Quick Images</p> <p>Different Shapes, Equal Pieces Investigation 1: Sessions 1-5 Investigation 2: Sessions 1-4</p> <p>Changes Over Time Ten-Minute Math: Quick Images</p> <p>Sunken Ships and Grid Patterns Investigation 2: Sessions 1-9</p>
<p>2. recognizes, draws, and describes plane figures (circles, squares, rectangles, triangles, ellipses, rhombi, octagons, hexagons, pentagons) (2.4.K1f).</p>	<p>Mathematical Thinking at Grade 4 Investigation 4: Sessions 2-6</p> <p>Seeing Solids and Silhouettes Investigation 2: Sessions 1-2 Ten-Minute Math: Quick Images</p> <p>Different Shapes, Equal Pieces Investigation 1: Sessions 1-5 Investigation 2: Sessions 1-4</p> <p>Changes Over Time Ten-Minute Math: Quick Images</p> <p>Sunken Ships and Grid Patterns Investigation 2: Sessions 1-9</p>

Grade Four Knowledge Base Indicators	Investigations in Number, Data, and Space
<p>3. describes the solids (cubes, rectangular prisms, cylinders, cones, spheres, triangular prisms) using the terms faces, edges, and vertices (corners) (2.4.K1f).</p>	<p>Seeing Solids and Silhouettes Investigation 1: Sessions 1-2 Investigation 2: Sessions 1-5 Investigation 3: Sessions 1-3 Investigation 4: Sessions 1-4</p>
<p>4. recognizes and describes the square, triangle, rhombus, hexagon, parallelogram, and trapezoid from a pattern block set (2.4.K1f).</p>	<p>Mathematical Thinking at Grade 4 Investigation 4: Sessions 1-6</p>
<p>5. recognizes (2.4.k1f): a. squares, rectangles, rhombi, parallelograms, trapezoids as special quadrilaterals;</p>	<p>Mathematical Thinking at Grade 4 Investigation 4: Sessions 2-6 Seeing Solids and Silhouettes Ten-Minute Math: Quick Images Different Shapes, Equal Pieces Investigation 1: Sessions 1-5 Investigation 2: Sessions 1-4 Changes Over Time Ten-Minute Math: Quick Images Sunken Ships and Grid Patterns Investigation 2: Sessions 1-9</p>
<p>b. similar and congruent figures;</p>	<p>Different Shapes, Equal Pieces Investigation 1: Session 1 Money, Miles, and Large Numbers Investigation 2: Session 4 Investigation 3: Sessions 2-4 Sunken Ships and Grid Patterns Investigation 2: Sessions 6-7</p>

Grade Four Knowledge Base Indicators	Investigations in Number, Data, and Space
<p>c. points, lines (intersecting, parallel, perpendicular), line segments, and rays.</p>	<p>Grade 4 students gain experience with points, lines, segments, and rays as they use the computer to construct and manipulate points, segments, and rectangles on coordinate grids.</p> <p>References: Sunken Ships and Grid Patterns Investigation 1: Sessions 1-6 Investigation 2: Sessions 1-9 Ten-Minute Math: Lengths and Perimeters</p>
<p>6. determines if geometric shapes and real-world objects contain line(s) of symmetry and draws the line(s) of symmetry if the line(s) exist(s) (2.4.K1f).</p>	<p>Mathematical Thinking at Grade 4 Investigation 4: Sessions 1-6 Sunken Ships and Grid Patterns Investigation 2: Sessions 2-3, 6-9</p>

Benchmark 2: Measurement and Estimation – The student estimates and measures using standard and nonstandard units of measure including the use of concrete objects in a variety of situations.

Grade Four Knowledge Base Indicators	Investigations in Number, Data, and Space
<p>The student...</p> <p>1. uses whole number approximations (estimations) for length, width, weight, volume, temperature, time, perimeter, and area using standard and nonstandard units of measure (2.4.K1a) (\$).</p>	<p>The Shape of the Data Investigation 1: Sessions 1-4 Money, Miles, and Large Numbers Investigation 2: Sessions 1-3 Investigation 3: Sessions 2-4 Sunken Ships and Grid Patterns Investigation 2: Session 5</p>

Grade Four Knowledge Base Indicators	Investigations in Number, Data, and Space
<p>2. ▲ selects, explains the selection of, and uses measurement tools, units of measure, and degree of accuracy appropriate for a given situation to measure (2.4.K1a) (\$):</p> <p>a. length, width, and height to the nearest fourth of an inch or to the nearest centimeter;</p>	<p>The Shape of the Data Investigation 2: Sessions 1-4 Money, Miles, and Large Numbers Investigation 2: Sessions 1-4 Investigation 3: Sessions 2-4 Changes Over Time Unit Preparation: Session 3 Sunken Ships and Grid Patterns Investigation 1: Sessions 1-6</p>
<p>b. volume to the nearest cup, pint, quart, or gallon; to the nearest liter; or to the nearest whole unit of a nonstandard unit;</p>	<p>Seeing Solids and Silhouettes Investigation 1: Sessions 1-2 Landmarks in the Thousands Investigation 1: Session 2</p>
<p>c. weight to the nearest ounce or pound or to the nearest whole unit of a nonstandard unit of measure;</p>	<p>Grade 3 students use nonstandard units with a pan balance to weigh and compare objects. In Grade 5 students order items by weight, and measure and compare the weights of objects using a balance scale and metric and customary weight units.</p>
<p>d. temperature to the nearest degree;</p>	<p>Grade 4 students examine temperature data on weather maps, including temperatures in different locations and changes in temperature in a single location over time. References: Changes Over Time Investigation 2: Sessions 1-2, page 33</p>

Grade Four Knowledge Base Indicators	Investigations in Number, Data, and Space
<p>e. time including elapsed time.</p>	<p>Changes Over Time Unit Preparation: Sessions 1-3 Investigation 1: Sessions 1-4 Investigation 2: Sessions 1-2 Investigation 3: Sessions 1-8</p>
<p>3. states: a. the number of weeks in a year;</p>	<p>Grade 4 students explore ways of showing change over time over a period of years and also in the course of a day. References: Changes Over Time Investigation 2: Sessions 1-2</p>
<p>b. the number of ounces in a pound;</p>	<p>Grade 3 students use nonstandard units with a pan balance to weigh and compare objects. In Grade 5 students order items by weight, and measure and compare the weights of objects using a balance scale and metric and customary weight units.</p>
<p>c. the number of milliliters in a liter, grams in a kilogram, and meters in a kilometer;</p>	<p>The Shape of the Data Investigation 2: Session 4 Money, Miles, and Large Numbers Investigation 2: Sessions 3-4 Investigation 3: Sessions 2-4</p>
<p>d. the number of items in a dozen.</p>	<p>Grade 4 students examine one dozen eggs as an example of an array. References: Arrays and Shares Investigation 2: Sessions 1-3</p>

Grade Four Knowledge Base Indicators	Investigations in Number, Data, and Space
<p>4. converts (2.4.K1a):</p> <p>a. within the customary system: inches and feet, feet and yards,</p>	<p>The Shape of the Data Investigation 2: Session 4 Money, Miles, and Large Numbers Investigation 2: Sessions 3-4 Investigation 3: Sessions 2-4</p>
<p>b. inches and yards, cups and pints, pints and quarts, quarts and gallons;</p>	<p>The Shape of the Data Investigation 2: Session 4 Money, Miles, and Large Numbers Investigation 2: Sessions 3-4 Investigation 3: Sessions 2-4</p>
<p>c. within the metric system: centimeters and meters.</p>	<p>Grade 4 students use rulers to measure to the nearest half-centimeter. Reference: Changes Over Time Preparation Session 3</p>
<p>5. finds(2.4.K1f):</p> <p>a. the perimeter of two-dimensional figures given the measures of all the sides.</p>	<p>Sunken Ships and Grid Patterns Ten-Minute Math: Lengths and Perimeters</p>
<p>b. the area of squares and rectangles using concrete objects.</p>	<p>Arrays and Shares Investigation 2: Sessions 1-6 Landmarks in the Thousands Investigation 1: Session 2 Different Shapes, Equal Pieces Investigation 1: Sessions 1-5 Investigation 2: Sessions 1-4</p>

Benchmark 3: Transformational Geometry – The student recognizes and performs one transformation on simple shapes or concrete objects in a variety of situations.

Grade Four Knowledge Base Indicators	Investigations in Number, Data, and Space
<p>The student...</p> <p>1. describes a transformation using cardinal points or positional directions (2.4.K1a), e.g., go north three blocks and then west four blocks or move the triangle three units to the right and two units up.</p>	<p>Mathematical Thinking at Grade 4 Investigation 4: Sessions 1-6 Different Shapes, Equal Pieces Investigation 1: Session 1 Money, Miles, and Large Numbers Investigation 2: Session 4 Investigation 3: Sessions 2-4 Sunken Ships and Grid Patterns Investigation 2: Sessions 1-9</p>
<p>2. ▲ recognizes, performs, and describes one transformation (reflection/flip, rotation/turn, translation/slide) on a two-dimensional figure or concrete object (2.4.K1a).</p>	<p>Mathematical Thinking at Grade 4 Investigation 4: Sessions 1-6 Different Shapes, Equal Pieces Investigation 1: Session 1 Money, Miles, and Large Numbers Investigation 2: Session 4 Investigation 3: Sessions 2-4 Sunken Ships and Grid Patterns Investigation 2: Sessions 1-9</p>
<p>3. recognizes three-dimensional figures (rectangular prisms, cylinders) and concrete objects from various perspectives (top, bottom, sides, corners) (2.4.K1f).</p>	<p>Seeing Solids and Silhouettes Investigation 1: Sessions 1-2 Investigation 2: Sessions 1-5 Investigation 3: Sessions 1-3 Investigation 4: Sessions 1-4 Ten-Minute Math: Quick Images</p>

Benchmark 4: Geometry From An Algebraic Perspective – The student relates geometric concepts to a number line and the first quadrant of a coordinate plane in a variety of situations.

Grade Four Knowledge Base Indicators	Investigations in Number, Data, and Space
<p>The student...</p> <p>1. uses a number line (horizontal/vertical) to model whole number multiplication facts from 1 x 1 through 12 x 12 and corresponding division facts (2.4.K1a).</p>	<p>Students name and locate points, determine distances, and graph rectangles and patterns on a coordinate grid. References: Sunken Ships and Grid Patterns Investigation 1: Sessions 1-6 Investigation 2: Sessions 1-9</p>
<p>2. uses points in the first quadrant of a coordinate plane (coordinate grid) to identify locations (2.4.K1a).</p>	<p>Sunken Ships and Grid Patterns Investigation 1: Sessions 1-6 Investigation 2: Sessions 1-9 Ten-Minute Math: Lengths and Perimeters Geo-Logo Teacher Tutorial</p>
<p>3. ▲ identifies and plots points as whole number ordered pairs in the first quadrant of a coordinate plane (coordinate grid) (2.4.K1a).</p>	<p>Sunken Ships and Grid Patterns Investigation 1: Sessions 1-6 Investigation 2: Sessions 1-9 Ten-Minute Math: Lengths and Perimeters Geo-Logo Teacher Tutorial</p>
<p>4. organizes whole number data using a T-table and plots the ordered pairs in the first quadrant of a coordinate plane (coordinate grid) (2.4.K1a,e).</p>	<p>Sunken Ships and Grid Patterns Investigation 1: Sessions 1-6 Investigation 2: Sessions 1-9 Ten-Minute Math: Lengths and Perimeters Geo-Logo Teacher Tutorial</p>

Standard 4: Data – The student uses concepts and procedures of data analysis in a variety of situations.

Benchmark 1: Probability – The student applies the concepts of probability to draw conclusions and to make predictions and decisions including the use of concrete objects in a variety of situations.

Grade Four Knowledge Base Indicators	Investigations in Number, Data, and Space
<p>The student...</p> <p>1. recognizes that the probability of an impossible event is zero and that the probability of a certain event is one (2.4.K1g) (\$).</p>	<p>Landmarks in the Thousands Ten-Minute Math: What Is Likely? Money, Miles, and Large Numbers Ten-Minute Math: Likely or Unlikely? Three Out of Four Like Spaghetti Ten-Minute Math: What Is Likely?</p>
<p>2. lists all possible outcomes of a simple event in an experiment or simulation including the use of concrete objects (2.4.K1g-h).</p>	<p>Arrays and Shares Investigation 2: Sessions 1-6 Landmarks in the Thousands Investigation 1: Session 2 Different Shapes, Equal Pieces Investigation 1: Sessions 1, 5 Investigation 2: Sessions 3-4</p>
<p>3. recognizes and states the probability of a simple event in an experiment or simulation (2.4.K1g), e.g., when a coin is flipped, the probability of landing heads up is $\frac{1}{2}$ and the probability of landing tails up is $\frac{1}{2}$. This can be read as one out of two or one half.</p>	<p>Landmarks in the Thousands Ten-Minute Math: What Is Likely? Money, Miles, and Large Numbers Ten-Minute Math: Likely or Unlikely? Three Out of Four Like Spaghetti Ten-Minute Math: What Is Likely?</p>

Benchmark 2: Statistics – The student collects, organizes, displays, explains, and interprets numerical (whole numbers) and non-numerical data sets including the use of concrete objects in a variety of situations.

Grade Four Knowledge Base Indicators	Investigations in Number, Data, and Space
<p>The student...</p> <p>1. ▲ organizes, displays, and reads numerical (quantitative) and non-numerical (qualitative) data in a clear, organized, and accurate manner including a title, labels, categories, and whole number intervals using these data displays (2.4.K1h) (\$):</p> <p>a. graphs using concrete objects;</p>	<p>The Shape of the Data Investigation 1: Sessions 1-3 Three out of Four Like Spaghetti Investigation 2: Sessions 1-2, 5-7</p>
<p>b. pictographs with a symbol or picture representing one, two, five, ten, twenty-five, or one-hundred including partial symbols when the symbol represents an even amount;</p>	<p>Changes Over Time Investigation 2: Sessions 1-2 Sunken Ships and Grid Patterns Investigation 1: Sessions 1-6 Investigation 2: Sessions 1-9 Three Out of Four Like Spaghetti Investigation 2: Sessions 1-2, 5-7</p>

Grade Four Knowledge Base Indicators	Investigations in Number, Data, and Space
<p>c. frequency tables (tally marks);</p>	<p>Mathematical Thinking at Grade 4 Ten-Minute Math: Exploring Data The Shape of the Data Investigation 1: Session 1 Investigation 2: Sessions 5 Investigation 3: Sessions 1-5 Investigation 3: Sessions 1-8 Packages and Groups Ten-Minute Math: Exploring Data Investigation 2: Sessions 1-7</p>
<p>d. horizontal and vertical bar graphs;</p>	<p>Mathematical Thinking at Grade 4 Ten-Minute Math: Exploring Data The Shape of the Data Investigation 1: Session 1 Investigation 2: Sessions 2-3 Investigation 3: Sessions 1-2 Packages and Groups Ten-Minute Math: Exploring Data Three out of Four Like Spaghetti Investigation 2: Sessions 1-2, 5-7</p>

Grade Four Knowledge Base Indicators	Investigations in Number, Data, and Space
<p>e. Venn diagrams or other pictorial displays, e.g., glyphs;</p>	<p>Grade 4 students use a variety of structures to organize and display categorical data, including tally charts and line plots.</p> <p>Sample References:</p> <p>The Shape of the Data Investigation 3 Sessions 1-2 Sessions 3-5: Teacher Note, pages 63-64</p> <p>Changes Over Time Investigation 1: Sessions 1-4</p> <p>Three Out of Four Like Spaghetti Investigation 2: Sessions 1-7</p>
<p>f. line plots;</p>	<p>Mathematical Thinking at Grade 4 Ten-Minute Math: Exploring Data</p> <p>The Shape of the Data Investigation 1: Session 1 Investigation 2: Sessions 2-3, 5-7 Investigation 3: Sessions 1-5</p> <p>Packages and Groups Ten-Minute Math: Exploring Data</p> <p>Three Out of Four Like Spaghetti Investigation 2: Sessions 1-2</p>

Grade Four Knowledge Base Indicators	Investigations in Number, Data, and Space
<p>g. charts and tables;</p>	<p>Mathematical Thinking at Grade 4 Ten-Minute Math: Exploring Data The Shape of the Data Investigation 1: Sessions 1-3 Investigation 2: Sessions 1-7 Investigation 3: Sessions 1-5 Changes Over Time Unit Preparation: Sessions 1-3 Investigation 1: Sessions 1-6 Investigation 2: Sessions 1-2 Investigation 3: Sessions 1-8 Packages and Groups Ten-Minute Math: Exploring Data Three out of Four Like Spaghetti Investigation 2: Sessions 1-7</p>
<p>h. line graphs;</p>	<p>Changes Over Time Investigation 1: Sessions 1-4 Investigation 3: Sessions 1-8</p>

Grade Four Knowledge Base Indicators	Investigations in Number, Data, and Space
<p>i. circle graphs.</p>	<p>Students interpret and construct bar graphs, line graphs, and line plots.</p> <p>References:</p> <p>The Shape of the Data Investigation 2: Sessions 2-7 Investigation 3: Sessions 3-5</p> <p>Changes Over Time Preparation Session 3 Investigation 1: Sessions 1-4 Investigation 3: Sessions 1-8</p> <p>Three Out of Four Like Spaghetti Investigation 2: Sessions 1-2, 5-7</p>
<p>2. collects data using different techniques (observations, polls, surveys, interviews, or random sampling) and explains the results (2.4.K1h) (\$).</p>	<p>Mathematical Thinking at Grade 4 Ten-Minute Math: Exploring Data</p> <p>The Shape of the Data Investigation 1: Sessions 1-3 Investigation 2: Sessions 1-7 Investigation 3: Sessions 1-5</p> <p>Changes Over Time Unit Preparation: Sessions 1-3 Investigation 1: Sessions 1-6 Investigation 2: Sessions 1-2 Investigation 3: Sessions 1-8</p>

Grade Four Knowledge Base Indicators	Investigations in Number, Data, and Space
(continued)	Packages and Groups Investigation 1: Sessions 4-5 Ten-Minute Math: Exploring Data Three out of Four Like Spaghetti Investigation 1: Sessions 1, 3 Investigation 2: Sessions 1-7
3. identifies, explains, and calculates or finds these statistical measures of a data set with less than ten whole number data points using whole numbers from 0 through 1,000 (2.4.K1a) (\$): a. minimum and maximum values,	Students find largest and smallest, as well as average, data values and describe their significance relative to the data set. References: The Shape of the Data Investigation 2: Sessions 4-7
b. range,	Students find largest and smallest, as well as average, data values and describe their significance relative to the data set. References: The Shape of the Data Investigation 2: Sessions 4-7

Grade Four Knowledge Base Indicators	Investigations in Number, Data, and Space
<p>c. mode,</p>	<p>Students gain experience with measures of central tendency and dispersion as they find the median of a set of data and discuss the spread and clustering of data.</p> <p>References: Between Never and Always Investigation 1: Sessions 3-6 Data: Kids, Cats, and Ads Investigation 1: Sessions 1-4 Investigation 2: Session 1</p>
<p>d. median when data set has an odd number of data points,</p>	<p>The Shape of the Data Investigation 2: Sessions 4-7</p>
<p>e. mean when data set has a whole number mean.</p>	<p>Students gain experience with measures of central tendency and dispersion as they find the median of a set of data and discuss the spread and clustering of data.</p> <p>References: Between Never and Always Investigation 1: Sessions 3-6 Data: Kids, Cats, and Ads Investigation 1: Sessions 1-4 Investigation 2: Session 1</p>