

READ ME FIRST

Investigations ©2012 for the Common Core State Standards...

A focused, comprehensive, and cohesive program for grades K-5

In updating *Investigations* 2nd edition to encompass the Common Core State Standards and Mathematical Practice, the TERC authors carefully considered the what, where, when, and how to do this to ensure and maintain its cohesive curriculum. Carefully considering and analyzing the Common Core standards to determine what they actually asked for, the authors then determined where the new content to be added made the best connection for student learning. They added Common Core content at appropriate points by building on current content, contexts and representations already in the curriculum to create the comprehensive and cohesive program: *Investigations ©2012 for the Common Core State Standards*.

- New content is addressed in Teaching Notes and Math Notes where the content already existed, but connection to the standards needs to be more explicit.
- New content is addressed in Classroom Routines and Ten-Minute Math when the content in the Standards is more about practice than deepening understanding.
- New content is addressed in new Sessions when the mathematical idea can be extended and/or explained with one or two new Sessions.
- New content is addressed in a new Investigation when mathematical content extends beyond what was in the curriculum.

All of these new Sessions build on existing contexts and representations within the grade level, rather than introducing new contexts and representations used in a higher grade level. In some instances it may appear that a single new Session addresses a new concept. But, that new concept will be further developed and integrated into subsequent routines, games, homework, and practice pages.

Some sessions are recommended by the authors to be skipped to allow for new Common Core material. Before making these decisions, the authors carefully considered how it would impact the integrity of the grade level, of the curriculum. *Investigations ©2012 for the CCSS* program maintains coherence, focus and clarity to support all K-5 students in making sense of mathematics and learning that they can become mathematical thinkers.

The foundation of this Scope and Sequence is the Scope and Sequence found in the *Implementing Investigations* book at each grade level. This Common Core Scope and Sequence includes all Common Core content new to the *Investigations*, 2nd edition curriculum.

Math Focus Points from Sessions in *Investigations and the CCSS* guidebook are color-coded. **Color Key** to *Investigations ©2012 for the Common Core* Scope and Sequence:

BLUE

- indicates new Math Focus Points based on Common Core content in new Sessions
- indicates new Sessions that support Math Focus Points already in the program

GREEN

- indicates new Math Focus Points based on Common Core content in Classroom Routines and Ten-Minute Math
- indicates new Math Focus Points based on Common Core content in the Common Core Adaptations: Teaching Notes, and Math Notes

RED

- indicates Math Focus Points from sessions that the TERC authors recommend to be skipped, based on Common Core State Standards

Number and Operations

Whole Number Operations Reasoning about numbers and their factors

Unit 1 Math Focus Points

- determining whether one number is a factor or multiple of another
- identifying prime, square, even, and odd numbers
- using known multiplication combinations to find equivalent multiplication combinations (e.g., $18 = 3 \times 6 = 3 \times (2 \times 3)$)
- using known multiplication combinations to find multiplication combinations for numbers related by place value (e.g., $3 \times 6 = 18$; $3 \times 6 \times 10 = 180$)
- finding all the ways to multiply whole numbers for a given product
- finding all the factors of a number
- using properties (even, odd, prime, square) and relationships (factor, multiple) of numbers to solve problems
- determining the prime factorization of a number

Computational Fluency Solving multiplication problems with 2-digit numbers

Unit 1 Math Focus Points

- solving 2-digit by 2-digit multiplication problems
- describing and comparing strategies used to solve multiplication problems
- breaking up multiplication problems efficiently
- multiplying fluently by multiples of 10
- estimating the products of two numbers
- comparing multiplication problems to determine which product is greater
- identifying and learning multiplication combinations ("facts") not yet known fluently
- using clear and concise notation

Whole Number Operations Understanding and using the relationship between multiplication and division to solve division problems

Unit 1 Math Focus Points

- solving division problems with 2-digit divisors
- using knowledge of multiples of 10 to solve division problems
- using and interpreting notation that represents division and relating division and multiplication notations (e.g., $170 \div 15 = \underline{\quad}$ and $\underline{\quad} \times 15 = 170$)
- describing and comparing strategies used to solve division problems
- comparing division problems to determine which quotient is greater
- solving a division problem by breaking the dividend into parts

Unit 3 Math Focus Point

- solving division problems related to the multiplication combinations to 12×12 (the division "facts", e.g., $64 \div 8$, $54 \div 6$) with fluency

Whole Number Operations Representing the meaning of multiplication and division

Unit 1 Math Focus Points

- writing multiplication equations that describe dot arrangements
- using arrays to model multiplication
- representing a multiplication or division problem with a picture or diagram
- creating a story problem represented by a multiplication or division expression
- solving problems using the order of operations (2.4A)
- writing and interpreting expressions involving grouping symbols (2.4A)
- making sense of remainders in terms of problem contexts

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Unit 7 Math Focus Points

- representing equivalent expressions in multiplication
- representing equivalent expressions in division
- representing a division problem with a picture or diagram
- creating a story context for a division expression

Whole Number Operations Reasoning about equivalent expressions in multiplication and division

Unit 7 Math Focus Points

- generating equivalent multiplication expressions by doubling (or tripling) one factor and dividing the other by 2 (or 3)
- developing arguments about how to generate equivalent expressions and multiplication
- using story contexts and representations to support explanations of the relationship between equivalent expressions
- generating equivalent division expressions
- comparing equivalent multiplication expressions to equivalent division expressions

Computational Fluency Solving multiplication problems with 2-digit and 3-digit numbers

Unit 7 Math Focus Points

- describing and comparing strategies used to solve multidigit multiplication problems
- solving 2-digit by 2-digit or 3-digit multiplication problems fluently
- estimating answers to multiplication and division problems
- understanding the U.S. algorithm for multiplication

Grade 5 Scope and Sequence

Computational Fluency Solving division problems with 2-digit divisors

Unit 7 Math Focus Points

- solving division problems with a 2-digit divisor fluently
- describing and comparing strategies used to solve division problems

The Base-Ten System Extending knowledge of the number system to 100,000 and beyond

Unit 3 Math Focus Points

- reading, writing, and sequencing numbers to 10,000 and 100,000
- understanding the place value relationships between 10, 100, 1,000, and 10,000
- learning the names of places larger than 100,000: million, billion, trillion
- recognizing and writing a power of ten number in exponential form (e.g., $1,000 = 10^3 = 10 \times 10 \times 10$) **(1.5)**
- recognizing and writing numbers in expanded form using exponents (e.g., $2,534 = 2 \times 10^3 + 5 \times 10^2 + 3 \times 10 + 4$) **(1.5)**

Unit 6 Math Focus Points

- recognizing and writing numbers with decimals in expanded form (e.g., $321.45 = 3 \times 100 + 2 \times 10 + 1 + 4 \times 1/10 + 5 \times 1/100$) **(1.2)**
- rounding decimals to the nearest one, tenth, and hundredth **(1.5A)**

Computational Fluency Adding and subtracting accurately and efficiently

Unit 3 Math Focus Points

- adding and subtracting multiples of 100 and 1,000
- finding the difference between a number and 10,000
- finding combinations of 3-digit numbers that add to 1,000

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- solving addition and subtraction problems with large numbers by focusing on the place value of the digits
- solving whole-number addition and subtraction problems efficiently
- using clear and concise notation for recording addition and subtraction strategies
- interpreting and solving multistep problems
- using story context and representations, such as number lines, to explain and justify solutions to subtraction problems

Unit 7 Math Focus Points

- using clear and concise notation
- solving multistep word problems
- using all four operations to solve problems

Whole Number Operations Examining and using strategies for subtracting whole numbers

Unit 3 Math Focus Points

- identifying, describing, and comparing subtraction strategies by focusing on how each strategy starts
- analyzing and using different subtraction strategies
- developing arguments about how the differences represented by two subtraction expressions are related (e.g., $1,208 - 297$ and $1,208 - 300$)
- understanding the meaning of the steps and notation of the U.S. algorithm for subtraction **(2.4)**

Rational Numbers Understanding the meaning of fractions and presents

Unit 4 Math Focus Points

- interpreting everyday uses of fractions, decimals, and percents
- finding fractional parts of a whole or of a group (of objects, people, and so on)
- finding fractional parts of a rectangular area
- representing fractions on the number line

Grade 5 Scope and Sequence

- finding a percentage of a group (of objects, people, and so on)
- finding a percentage of a rectangular area
- identifying fraction and percent equivalents through reasoning about representations and known equivalents and relationships
- interpreting the meaning of the numerator and denominator of a fraction
- using equivalent fractions and percents to solve problems

Rational Numbers Comparing fractions

Unit 4 Math Focus Points

- ordering fractions and justifying their order through reasoning about fraction equivalents and relationships
- comparing fractions and percents to the landmarks 0, $\frac{1}{2}$, and 1
- finding and comparing fractional parts and percents of a whole or a group
- comparing fractional parts of different-sized wholes
- using equivalencies to place fractions on a set of number lines (fraction tracks)
- comparing fractions on a number line
- ordering mixed numbers and fractions greater than 1

Rational Numbers Understanding the meaning of decimal fractions

Unit 6 Math Focus Points

- identifying everyday uses of fractions and decimals
- representing decimal fractions as parts of an area
- reading and writing tenths, hundredths, and thousandths
- identifying decimal, fraction, and percent equivalents
- representing decimals using a number line
- interpreting fractions as division
- interpreting the meaning of digits in a decimal number

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Rational Numbers Comparing decimal fractions

Unit 6 Math Focus Points

- ordering decimals and justifying their order through reasoning about decimal representations, equivalents, and relationships
- comparing decimals to the landmarks 0, $\frac{1}{2}$, and 1

Computation with Rational Numbers Adding and subtracting fractions

Unit 4 Math Focus Points

- finding fractional parts of the rotation around the circle
- adding fractions by using a rotation model
- adding and subtracting fractions through reasoning about fraction equivalents and relationships
- adding and subtracting fractions using a number line
- finding combinations of fractions with sums between 0 and 2

Unit 9 Math Focus Point

- using operations on fractions to solve problems involving information given in line plots (**1.5A, 1.6A**)

Computation with Rational Numbers

Multiplying and dividing with fractions

Unit 4 Math Focus Points

- using a representation to multiply a fraction and a whole number (**4A.1**)
- extending understanding of the operation of multiplication to include fractions (**4A.1**)
- writing multiplication equations for multiplying a fraction and a whole number (**4A.1**)
- writing and interpreting multiplication equations involving a fraction and a whole number (**4A.2**)

Grade 5 Scope and Sequence

- using a representation and reasoning to multiply a whole number by a fraction or mixed number (**4A.2**)
- multiplying a fraction or mixed number and a whole number (**4A.3, 4A.7**)
- using a representation and reasoning to multiply a whole number by a fraction or mixed number (**4A.3**)
- multiplying a fraction by a fraction (**4A.4, 4A.5, 4A.7**)
- representing a fractional part of a fractional quantity (**4A.4, 4A.7**)
- understanding the relationship between the denominators of the factors and the denominator of the product (**4A.4**)
- understanding the relationship between the numerators of the factors and the numerator of the product (**4A.5**)
- developing an algorithm for multiplying fractions (**4A.5, 4A.6**)
- using arrays to represent multiplication of fractions (**4A.6**)
- using representations to solve problems involving dividing a whole number by a unit fraction (**4A.8, 4A.10**)
- using reasoning, and the relationship between division and multiplication, to divide a whole number by a unit fraction (**4A.8, 4A.10**)
- using representations to solve problems involving dividing a unit fraction by a whole number (**4A.9, 4A.10**)
- using reasoning, and the relationship between division and multiplication, to divide a unit fraction by a whole number (**4A.9, 4A.10**)

Unit 9 Math Focus Point

- using operations on fractions to solve problems involving information given in line plots (**1.5A, 1.6A**)

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Computation with Rational Numbers Adding and subtracting decimals

Unit 6 Math Focus Points

- estimating sums of decimal numbers
- using representations to add tenths, hundredths, and thousandths
- adding decimals to the thousandths through reasoning about place value, equivalents, and representations
- using representations to subtract tenths and hundredths (2.5A)
- subtracting decimals to the hundredths through reasoning about place value, equivalents, and representations (2.5A)

Computation with Rational Numbers Multiplying and dividing with decimals and powers of 10

Unit 6 Math Focus Points

- using representations and reasoning to multiply whole numbers by powers of 10 (including 1, 0.1, and 0.01) (3A.1)
- explaining the patterns in the placement of the decimal point when the decimal is multiplied by a power of 10 (3A.1)
- estimating products of decimal numbers (3A.2, 3A.3, 3A.4)
- multiplying decimals to hundredths through reasoning about place value and multiplication (3A.2, 3A.3, 3A.4)
- writing a rule for multiplying decimal numbers (3A.3, 3A.4)
- using representations and reasoning to divide whole numbers by powers of 10 (including 1, 0.1, and 0.01) (3A.5)
- explaining the patterns in the placement of the decimal point when the decimal is divided by a power of 10 (3A.5)
- estimating quotients of decimal numbers (3A.6)
- dividing decimals to hundredths through reasoning about place value and division (3A.6)

Grade 5 Scope and Sequence

- multiplying and dividing decimals to the hundredths through reasoning about place value and multiplication/division (3A.7)

Patterns, Functions, and Change

Using Tables and Graphs Using tables to represent change

Unit 8 Math Focus Point

- using tables to represent the relationship between two quantities

Using Tables and Graphs Using graphs to represent change

Unit 8 Math Focus Points

- plotting points on a coordinate grid to represent a situation in which one quantity is changing in relation to another
- identifying points in a graph with corresponding values in a table and interpreting the numerical information in terms of the situation the graph represents
- describing the relative steepness of graphs or parts of graphs in terms of different rates of change
- comparing situations by describing differences in their graphs

Linear Change Describing and representing situations with a constant rate of change

Unit 8 Math Focus Points

- describing the relationship between two quantities in a situation with a constant rate of change, taking into account a beginning amount and a constant increase (or decrease)
- finding the value of one quantity in a situation with a constant rate of change, given the value of the other (e.g., if you know the age, what is the height? or if you know the number of rows, what is the perimeter?)

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- writing an arithmetic expression for finding the value of one quantity in terms of the other in a situation with a constant rate of change
- making rules that relate one variable to the other in situations with a constant rate of change
- using symbolic letter notation to represent the value of one variable in terms of another variable

Nonlinear Change Describing and representing situations in which the change is not constant

Unit 8 Math Focus Points

- comparing tables, graphs, and situations with a constant rate of change with those in which the rate of change is not constant
- describing a situation in which the rate of change is not constant but can be determined
- describing how a graph represents a situation in which the rate of change is not constant

Data and Probability

Data Analysis Representing data

Unit 9 Math Focus Points

- using a line plot to represent ordered, numerical data
- representing two sets of data in order to compare them **(2.3, 2.4, 3.5)**
- considering how well a data representation communicates to an audience **(2.4)**
- making a line plot to display a data set of measurements involving fractions **(1.5A)**

Grade 5 Scope and Sequence

Data Analysis Describing, summarizing, and comparing data

Unit 9 Math Focus Points

- comparing sets of data using the shape and spread of the data **(1.6A)**
- describing the shape of a set of data: where the data are concentrated, the median, what is typical, highest and lowest values, range and outliers
- using medians to compare groups

Data Analysis Analyzing and interpreting data

Unit 9 Math Focus Points

- developing arguments based on data
- drawing conclusions based on data **(1.6A)**
- considering how well conclusions are supported by data **(2.6)**

Data Analysis Designing and carrying out a data investigation

Unit 9 Math Focus Points

- designing an experiment to answer a question about two groups, objects or conditions **(2.1)**
- developing and carrying out consistent procedures for collecting data from an experiment **(2.1, 2.2, 2.3)**
- recording and keeping track of a set of data **(2.2, 2.3)**
- carrying out multiple trials in an experiment **(2.5, 3.2)**

Probability Describing the probability of an event

Unit 9 Math Focus Points

- comparing the expected probability of an event with the actual results of repeated trials of that event **(3.1, 3.2, 3.3)**
- using numbers from 0 to 1 as measures of probability **(3.1, 3.2)**

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- determining the fairness of a game based on the probability of winning for each player (3.3, 3.4, 3.5)

Geometry

Features of Shape Translating between two-dimensional and three-dimensional shapes

Unit 2 Math Focus Point

- decomposing 3-D shapes and then recombining them to make a given building

Features of Shape Describing and classifying two-dimensional figures

Unit 5 Math Focus Points

- identifying attributes of polygons
- describing triangles by the sizes of their angles and the lengths of their sides
- using attributes to describe and compare quadrilaterals including parallelograms, rectangles, rhombuses, and squares
- defining a regular polygon as a polygon with all sides and all angles equal

Features of Shape Describing and measuring angles

Unit 5 Math Focus Point

- using known angles to find the measures of other angles (2.7A)

Features of Shape Creating and describing similar shapes

Unit 5 Math Focus Points

- recognizing and building similar figures (3.1, 3.2, 3.5)
- examining the relationship among angles, line lengths, and areas of similar polygons (3.1, 3.2, 3.4)
- making a generalization about the changes in area of similar figures (3.3)

Grade 5 Scope and Sequence

- building similar figures for polygons made from two or more Power Polygon pieces (3.3, 3.4)
- using Power Polygons to find the areas of similar hexagons (3.3, 3.4)

Measurement

Linear and Area Measurement Finding perimeter and area of rectangles

Unit 5 Math Focus Points

- comparing the perimeters and areas of rectangles when the dimensions are multiplied by given amounts
- using numerical and/or geometric patterns to describe how the perimeters and areas of rectangles change when the dimensions change
- using representations to explain how perimeters and areas of rectangles change
- creating different rectangles with the same area but different perimeters
- understanding square units as a unit of measure
- creating different rectangles with the same perimeter but different areas (2.7A)
- describing the shapes of rectangles that have the same area or the same perimeter

Unit 8 Math Focus Points

- measuring length with meters and centimeters
- finding the perimeter of a rectangle
- finding the area of a rectangle

Volume Structuring rectangular prisms and determining their volume

Unit 2 Math Focus Points

- determining the number of cubes that will fit into the box made by a given pattern
- developing a strategy for determining the volume of rectangular prisms

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- designing patterns for boxes that hold a given number of cubes
- finding the volume of rectangular prisms
- recognizing volume formulas: $V = b \times h$ and $V = l \times w \times h$ as strategies for finding volume (1.2, 2.1, 2.3)
- using formulas to find the volume of rectangular prisms (1.5A)
- finding the volume of a solid composed of two rectangular prisms (1.5A)
- considering how the dimensions of a box change when the volume is changed (doubled, halved, or tripled) (2.4A)
- organizing rectangular packages to fit into rectangular boxes
- designing a box that can be completely filled with several differently-shaped rectangular packages
- determining the volume, in cubic centimeters, of a small prism (2.4A)
- constructing units of volume - cubic centimeter, cubic inch, cubic foot, cubic yard (optional), cubic meter
- choosing an appropriate unit of volume to measure a large space
- finding the volume of a large space, such as a classroom, using cubic meters
- describing and defending measurement methods
- building rectangular solids

Volume Structuring prisms, pyramids, cylinders, and cones and determining their volume

Unit 2 Math Focus Points

- comparing volumes of differently-shaped containers (3.1)
- building rectangular solids (3.1)
- finding volume relationships between solids, particularly those with the same base and height (3.2)
- building a prism with three times the volume of a given pyramid (3.3)

Grade 5 Scope and Sequence

- demonstrating the 3:1 relationship between rectangular prisms and pyramids with the same base and height (3.3, 3.5)
- finding volume, in cubic centimeters, of prisms, pyramids, cylinders, and cones (3.4)

Measurements Converting measurements

Unit 6 Math Focus Points

- converting measurements within a given measurement system (3A.8)
- converting weights and masses (3A.9)
- converting capacities (3A.9)

Ten-Minute Math

Estimation and Number Sense

Units 2–4 and 6–9 Math Focus Points

- estimating solutions to 2- and 3-digit multiplication and division problems
- estimating solutions to 4- and 5-digit addition and subtraction problems
- breaking apart, reordering, or changing numbers mentally to determine a reasonable estimate
- estimating solutions to products of whole numbers and fractions or mixed numbers (U4 4A.3, 4A.4, 4A.5, 4A.6, 4A.7, 4A.8, 4A.9, 4A.10)
- estimating solutions to products of whole numbers and decimals (U6 3A.5, 3A.6)
- estimating solutions to quotients of whole numbers and decimals (U6 3A.7)

Guess My Rule

Unit 4 Math Focus Points

- identifying fractions of a group
- using evidence and formulating questions to make hypotheses about the common characteristics in a group
- systematically eliminating possibilities

Number Puzzles

Unit 1 and 7 Math Focus Points

- identifying prime, square, even, and odd numbers
- determining if one number is a factor or multiple of another

Practicing Place Value

Units 3, 6, and 8 Math Focus Points

- recognizing and interpreting the value of each digit in 4- and 5-digit numbers
- finding different combinations of a number, using only 1,000s, 100s, 10s, and 1s and recognizing their equivalency (i.e., 1 hundred, 3 tens, and 7 ones = 1 hundred, 2 tens, and 17 ones = 13 tens and 7 ones = 12 tens and 17 ones, etc.)
- reading and writing numbers up to 100,000
- recognizing and writing numbers in expanded form using exponents (e.g., $2,534 = 2 \times 10^3 + 5 \times 10^2 + 3 \times 10 + 4$) (U3 3.1, 3.2, 3.5; U6 1.5A, 2.5A)
- adding multiples of 10 to, and subtracting multiples of 10 from 4- and 5-digit numbers
- reading and writing decimal fractions and decimal numbers
- recognizing and writing numbers with decimals in expanded form (e.g., $321.45 = 3 \times 100 + 2 \times 10 + 1 + 4 \times 1/10 + 5 \times 1/100$) (U6 1.2, 1.10, 2.3, 2.5, 2.6, 3A.1, 3A.2, 3A.3, 3A.4; U8 1.3, 1.4, 2.1, 2.2, 2.5, 2.6)
- adding tenths or hundredths to, and subtracting them from, decimal fractions and decimal numbers
- rounding to the nearest hundredth, tenth, one, ten (U6 3A.1, 3A.2, 3A.3, 3A.4)

Quick Images

Units 1, 2, and 5 Math Focus Points

- organizing and analyzing visual images
- developing language and concepts needed to communicate about spatial relationships

- writing equations to describe dot patterns (Unit 1)
- writing multiplication and division equations (using parentheses) to represent the total number of shapes in a pattern (U1 1.2)
- decomposing images of 2-D shapes and then recombining them to make a given design (Unit 2)
- decomposing images of 3-D shapes and then recombining them to make a given structure (Unit 5)

Quick Survey

Units 5 and 9 Math Focus Points

- describing features of the data
- interpreting and posing questions about the data

Order of Operations

Units 2 and 6 Math Focus Point

- solving equations involving parentheses and brackets (U2 1.5A, 2.4A; U6 3A.8, 3A.9)