

## Curriculum Map: Common Core Math Grade 4(B)

Course: Fourth-Math Subtopic: General

Grade(s): 4

**Course Description:** Fourth grade students learn problem solving through the mathematical concepts of place value for whole numbers, interpret and model decimals, demonstrate fluency with multiplication facts up to 10 and related division facts, multiply numbers up to 100 by single digit numbers and by 10 and model addition and subtraction of simple fractions. Students use spatial reasoning to recognize, describe and analyze geometric shapes and principles describing relationships between two and three dimensional shapes and analyze attributes and properties of geometric shapes determining area of polygons and surface area and volume of three dimensional shapes and constructing and analyzing reasonable conclusions from data and applying basic concepts of probability. Students learn Operations and Algebraic Thinking, Numbers and Operations in Base Ten, Numbers and Operations of Fractions, Measurement and Data, and Geometry through whole group instruction, small group instruction, including flexible learning groups, cooperative learning, and learning centers. The Mathematical Practice Standards apply across all mathematics courses and together with the content standards, prescribe that students experience mathematics as a coherent, useful and logical subject that makes use of their ability to make sense of problem situations.

**Course Textbooks, Workbooks, Materials Citations:**

Buckle Down to the Common Core State Standards. (2011). New York: Triumph Learning

Common Core Coach, Mathematics, First Edition, Grade 4. (2010). New York: Triumph Learning

Crosswalk Coach for the Common Core State Standards, Mathematics, Grade 4.(2011). New York: Triumph Learning

Measuring Up to the Pennsylvania Academic Standards. (2007). Saddle Brook, NJ: Peoples Education, Inc.

McGraw-Hill Mathematics (textbook, Daily Practice Homework workbook, Reteach/Practice worksheets). (2002). New York: Macmillan/McGraw-Hill

Everyday Mathematics. (2012). Chicago: McGraw-Hill

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### Course Notes: KEY TERMINOLOGY AND DEFINITIONS

Grade 4

**Acute Angle** – an angle with a measure less than 90 degrees

**Addend** – any number that is being added

**Analog Time** – time displayed on a timepiece with hour and minute hands

**Area** – the measure, in square units, of the inside of a plane figure

**Array** – a rectangular arrangement of objects in equal rows or columns

**Axis** – a perpendicular ray on a grid; plural axes

**Bar Graph** – a graph that uses bars of different heights to compare information

**Base** – the top or bottom of a three-dimensional figure

**Capacity** – the measure that tells how much liquid a container can hold

**Circle** – a round two-dimensional figure

**Closed Figure** – a figure with no gaps or opening

**Combination** – a group of items. Placing these items in a different does not create a new combination

**Common Denominator** – denominator that is the same number in two or more fractions

Compare - when you decide which number is greater than the other OR which number is less

than the other

**Cone** – a solid figure that has a circular base and one vertex

**Congruent** – having the same size and shape. Congruent angles have the same measure. Congruent segments have the same length

**Counting Number** – the numbers 1, 2, 3, 4, 5, 6, 7,...

**Cube** – a rectangular solid having 6 congruent square faces

**Cylinder** – a three-dimensional figure with two circular bases, which are parallel and congruent

**Decimal** – a number with a decimal point to show tenths, hundredths, etc.

Decimal Point - a period separating the whole number part from the decimal part of the number

**Denominator** – in a fraction, the number below the fraction bar

Digit - any of the symbols used to write numbers (0,1,2,3,4,5,6,7,8,9)

**Dividend** – the number that is being divided

**Divisor** – the number that divides the dividend

**Edge** – the line segment where two faces of a solid figure meet

**Elapsed Time** – the amount of time that passes between two events

**Endpoint** – a point that marks the beginning or end of a line segment or the beginning of a ray

**Equal To (=)** – shows that two values are the same. For example,  $10 = 10$

**Equation** – a statement that two mathematical expressions are equal

**Equivalent** – having the same value

**Estimate** – an answer that is close to, but not equal to, an exact answer

**Expanded Form** – a number written as the sum of the products of each digit and its place value. For example, the number 314 in expanded form is  $300 + 10 + 4$ .

**Expression** – a variable, or any combination of numbers, variables, and symbols that represents a mathematical relationship. For example:  $24 \times 2 + 5$  or  $4a - 9$

**Face** – a plane figure that serves as one side of a solid figure

**Fact Family** – a set of related addition and subtraction, or multiplication and division equations using the same numbers. For example,  $6+9 = 15$ ,  $15-9 = 6$ ,  $9+6 = 15$ ,  $15-6 = 9$

**Factor** – a whole number that divides evenly into another whole number. For example, 1, 3, 5, and 15 are factors of 15

**Fraction** – a number that names a part of a whole or part of a set

**Function** – a relation in which every input value has a unique output value

**Geometric Pattern** – a pattern made up of shapes

**Graph** – drawing that uses lines, points, pictures, or bars to show information

**Greater Than ( $>$ )** – shows that one value is more than another value. For example,  $10 > 5$

Height - the measurement of distance between two points; tells how high/tall something is

**Hexagon** – a polygon with 6 sides

**Inequality** – a mathematical sentence that contains a symbol that shows the terms on either side of the symbol are unequal. For example,  $3+4 < 6$

**Input-Output Table** – a table that shows a number, a rule, and a second number; the second number is found by applying the rule to the first number

**Intersect** - when two lines meet or cross

**Inverse Operations** - opposite math signs, such as addition and subtraction or multiplication and division

**Length** – the distance between two points or objects. It also refers to the longer side of a rectangle

**Less Than ( $<$ )** – shows that one value is less than another value. For example,  $5 < 10$

**Like Denominators** – see common denominators

**Line** – a straight path extending in both directions with no endpoints

**Line Segment** - a part of a line with two endpoints

**Line of Symmetry** – a line that divides a figure into two halves that are mirror images of each other

**Mean (average)** – the number found by dividing the sum of a set of numbers by the number of addends

**Median** – the middle number in an ordered set of data, or the average of the two middle numbers when the set has two middle numbers

**Mixed Number** – a number that has a whole number part and a fraction part

**Mode** – the number(s) that occurs most often in a set of data

**Multiples** – the product of a given whole number and another whole number. For example, multiples of 4 are 4, 8, 12, 16...

**Number Sentence** – an equation or inequality with numbers

**Numerator** – in a fraction, the number above the fraction bar

**Obtuse Angle** – an angle with a measure more than 90 degrees

**Octagon** – a polygon with 8 sides

**Order** - when you write the given numbers in order from greatest to least OR least to greatest

**Ordered Pair** – a pair of numbers used to locate a point on a coordinate grid. The first number tells how far to move horizontally, and the second number tells how far to move vertically.

**Origin** – the point on a grid where the x-axis and the y-axis meet. The ordered pair that describes the origin is (0,0)

**Parallel Lines** – lines that never intersect and are always the same distance apart

**Parallelogram** – a quadrilateral whose opposite sides are parallel and congruent

**Pattern** – a relationship between a set of numbers or shapes

**Pentagon** – a polygon with 5 sides

**Perimeter** – the distance around a figure

**Period** - each group of three digits in a place value chart

**Perpendicular Lines** – two lines, segments or rays that intersect to form right angles

**Pictograph** – a graph that uses pictures to show and compare information

**Place Value** – the value indicated by the position of a digit in a number

**Place Value Chart** – a chart used to show the values of the digits in a number

**Point** – particular place or location

**Polygon** – a closed figure made up of line segments that meet at their endpoints

**Prediction** – a statement of something that may happen in the future, based on information

**Pyramid** – a solid figure with a polygon base and triangular that met at a single point (vertex)

**Quadrilateral** – a polygon with 4 sides

**Quotient** – the result of division

**Ray** – a part of a line that has one endpoint and continues without end in one direction

Reasonable - makes sense

**Rectangle** – a two-dimensional figure with 4 sides and 4 square corners

**Rectangular Prism** – a solid figure in which all 6 faces are rectangles

Rectangular Pyramid - a three-dimensional figure with a rectangular base and 5 total faces, 8 edges, and 5 vertices

**Reflection (flip)** – a transformation that produces the mirror image of a figure

**Rhombus** – a parallelogram with 4 equal sides

**Right Angle** – an angle that measures exactly 90 degrees

**Right Triangle** – a triangle that has a 90 degree angle

**Rotation (turn)** – a movement of a figure that turns that figure around a fixed point

**Rounding** – expressing a number to the nearest 10, 100, 1,000 and so on

**Scale** – an arrangement of numbers that increase by uniform intervals

**Side of a Polygon** – one of the line segments that make up a polygon

**Sphere** – a solid figure with all points the same distance from the center

**Square** – a rectangle with all 4 sides the same length

**Standard Form** – a number written with commas used to separate groups of three digits. For example, the number 2, 385 is written in standard form

**Table** – an information display that uses rows and columns to show information

**Tally Chart** – a table that uses tally marks to record data

**Three-Dimensional Figure** – a figure that has length, width, and height

**Translation (slide)** – a movement of a figure to a new position without turning or flipping it

**Trapezoid** – a quadrilateral with exactly one pair of parallel sides

**Triangle** – a closed figure with 3 sides and 3 vertices

**Triangular Pyramid** – a pyramid with a triangular base

**Vertex** – a point where lines, rays, sides of a polygon or edges of a polyhedron meet (corner)

**Vertex of a polygon** – the common point where two side meet in a polygon

**Vertex of a three-dimensional figure** – the common point where three edges meet in a three-dimensional figure

**Volume (capacity)** – the amount of space (in cubic units) that a solid figure can hold

Weight - the measurement that tells how heavy an object is

Width - the measurement of distance between two endpoints; tell how wide something is

**Whole Numbers** – the counting numbers plus zero; 1, 2, 3, 4 ...

Word Form - a way to write a number using only words

**X-axis** – the horizontal number line in a grid

**X-coordinate** – the first number in an ordered pair

**Y-axis** – the vertical number line in a grid

**Y-coordinate** – the second number in an ordered pair

## Unit: Numbers & Operations in Base Ten

### STANDARDS

STATE: PA Common Core Standards (2012)

[CC.2.1.4.B.1 \(Advanced\)](#) Apply place value concepts to show an understanding of multi-digit whole numbers.

[CC.2.1.4.B.2 \(Advanced\)](#) Use place value understanding and properties of operations to perform multi-digit arithmetic.

STATE: PA Common Core Anchors and Eligible Content (May 2012)

[M04.A-T.1.1.1 \(Advanced\)](#) Demonstrate an understanding that in a multi-digit whole number (through 1,000,000), a digit in one place represents ten times what it represents in the place to its right. Example: Recognize that in the number 770, the 7 in the hundreds place is ten times the 7 in the tens place.

[M04.A-T.1.1.2 \(Advanced\)](#) Read and write whole numbers in expanded, standard and word form through 1,000,000.

[M04.A-T.1.1.3 \(Advanced\)](#) Compare two multi-digit numbers through 1,000,000 based on meanings of the digits in each place, using  $>$ ,  $=$ , and  $<$  symbols.

[M04.A-T.1.1.4 \(Advanced\)](#) Round multi-digit whole numbers (through 1,000,000) to any place.

[M04.A-T.2.1.1 \(Advanced\)](#) Add and subtract multi-digit whole numbers (limit sums and subtrahends up to and including 1,000,000).

[M04.A-T.2.1.2 \(Advanced\)](#) Multiply a whole number of up to four digits by a one-digit whole number and multiply 2 two-digit numbers.

[M04.A-T.2.1.3 \(Advanced\)](#) Divide up to four-digit dividends by one-digit divisors with answers written as whole-number quotients and remainders.

[M04.A-T.2.1.4 \(Advanced\)](#) Estimate the answer to addition, subtraction, and multiplication problems using whole numbers through six digits (for multiplication, no more than 2 digits  $\times$  1 digit, excluding powers of 10).

### Lesson Topic: Extending Place Value

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| <b>Core Lesson/Topic Instructional Procedures &amp; Activities:</b> | <ul style="list-style-type: none"><li>- recognize whole numbers by reading and saying numbers up to 1,000,000</li><li>- recognize the difference between the place and value of a digit in a number</li><li>- identify the value of a digit by looking at its place in a number</li><li>- recognize that the value of a digit increases by ten (<math>\times 10</math>) as it moves to the left and decreases by ten (<math>\div 10</math>) as it moves to the right and in a number</li><li>- identify patterns that occur when multiplying or dividing whole numbers by 10 (e.g., when a number is multiplied by 10, each digit shifts one place to the left)</li><li>- explain the relationship between ones, tens, hundreds, thousands, ten thousands, hundred thousands, and millions</li><li>- recognize that in a place value, the digit to the left is ten times (<math>\times 10</math>) larger than the digit to its right</li></ul> |
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### Lesson Topic: Reading and Writing Whole Numbers

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| <b>Core Lesson/Topic Instructional Procedures &amp; Activities:</b> | <ul style="list-style-type: none"><li>- read and write multi-digit numbers up to one million</li><li>- represent numbers in standard form, word form and expanded form</li><li>- represent numbers using base ten concepts (e.g., 234 can be represented as 2 hundreds, 3 tens and 4 ones, but it can also be represented as 23 tens and 4 ones, or as 234 ones)</li></ul> |
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### Lesson Topic: Comparing and Ordering Whole Numbers

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| <b>Core Lesson/Topic Instructional Procedures &amp; Activities:</b> | <ul style="list-style-type: none"><li>- determine the meaning of <math>&lt;</math>, <math>&gt;</math>, <math>=</math></li><li>- compare numbers using the meaning of the digits in each place with the use of appropriate symbols</li><li>- order multi-digit whole numbers from least to greatest and greatest to least</li></ul> |
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### Lesson Topic: Rounding Whole Numbers

- Core** - identify the place of the digits being rounded
- Lesson/Topic** - round numbers using a variety of tools (e.g., number lines and hundreds chart)
- Instructional** - round and use estimation strategies (i.e., a number line or a hundreds chart) to solve
- Procedures &** problems involving all operations
- Activities:** - determine when rounding is appropriate in specific situations
- generalize a rule for how to round numbers when given the place value
- use place value understanding to round multi-digit whole numbers to any place (up to millions)

### Lesson Topic: Adding and Subtracting Whole Numbers

- Core** - understanding of whole numbers
- Lesson/Topic** - recall the order of place value names and positions
- Student** - use properties to create and solve addition and subtraction problems
- Learning** - fluently add multi-digit whole numbers with and without regrouping
- Outcomes:** - fluently subtract multi-digit whole numbers with and without regrouping

### Lesson Topic: Multiplying Whole Numbers

- Core** - recognize mathematical relationships using the identity, commutative, associative, distributive and zero properties when multiplying up to four digits by a one digit whole number
- Lesson/Topic** - use knowledge of properties to create and solve multiplication problems up to four digits by a
- Instructional** one digit whole number
- Procedures &** - multiply a whole number of up to 4 digits by a one digit whole number
- Activities:** - multiply two 2 digit numbers
- apply the distributive property of multiplication to solve two 2 digit problems

### Lesson Topic: Dividing Whole Numbers

- Core** - identify relationships between multiplication and division fact families, knowing that dividing is the inverse.=/opposite of multiplying
- Lesson/Topic** - divide numbers using a variety of strategies (e.g., arrays, scaffolding, standard algorithm, repeated subtraction)
- Instructional** - apply understanding of identity and zero properties to divide quantities
- Procedures &** - interpret the context of the remainder when given a division problem
- Activities:** - find whole number quotients and remainders with up to four digit dividends and one digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division

### Lesson Topic: Estimation

- Core**
- Lesson/Topic** - estimation of sums and differences
- Instructional** - estimation of products and quotients
- Procedures &**
- Activities:**

## Unit: Operations and Algebraic Thinking

### STANDARDS

STATE: PA Common Core Standards (2012)

[CC.2.2.4.A.1 \(Advanced\)](#) Represent and solve problems involving the four operations.

[CC.2.2.4.A.2 \(Advanced\)](#) Develop and/or apply number theory concepts to find factors and multiples.

[CC.2.2.4.A.4 \(Advanced\)](#) Generate and analyze patterns using one rule.

STATE: PA Common Core Anchors and Eligible Content (May 2012)

[M04.B-O.1.1.1 \(Advanced\)](#) Interpret a multiplication equation as a comparison. Represent verbal statements of multiplicative comparisons as multiplication equations. Example 1: Interpret  $35 = 5 \times 7$  as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Example 2: Know that the statement 24 is 3 times as many as 8 can be represented by the equation  $24 = 3 \times 8$  or  $24 = 8 \times 3$ .

[M04.B-O.1.1.2 \(Advanced\)](#) Multiply or divide to solve word problems involving multiplicative comparison, distinguishing multiplicative comparison from additive comparison. Example: Know that  $3 \times 4$  can be used to represent that Student A has 4 objects and Student B has 3 times as many objects, and not just 3 more objects.

- [M04.B-O.1.1.3 \(Advanced\)](#) Solve multi-step word problems posed with whole numbers using the four operations. Answers will be either whole numbers or have remainders that must be interpreted yielding a final answer that is a whole number. Represent these problems using equations with a symbol or letter standing for the unknown quantity.
- [M04.B-O.1.1.4 \(Advanced\)](#) Identify the missing symbol (+, -, ×, ÷, =, <, >) that makes a number sentence true (single-digit divisor only).
- [M04.B-O.2.1.1 \(Advanced\)](#) Find all factor pairs for a whole number in the interval 1 through 100. Recognize that a whole number is a multiple of each of its factors. Determine whether a given whole number in the interval 1 through 100 is a multiple of a given onedigit number. Determine whether a given whole number in the interval 1 through 100 is prime or composite.
- [M04.B-O.3.1.1 \(Advanced\)](#) Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself. Example 1: Given the rule "Add 3" and the starting number 1, generate terms in the resulting sequence and observe that the terms alternate between odd and even numbers. Example 2: Given the rule "increase the number of sides by 1" and starting with a triangle, observe that the tops of the shapes alternate between a side and a vertex.
- [M04.B-O.3.1.2 \(Advanced\)](#) Determine the missing elements in a function table (limit to +, -, or × and to whole numbers or money).
- [M04.B-O.3.1.3 \(Advanced\)](#) Determine the rule for a function given a table (limit to +, -, or × and to whole numbers).

### **Lesson Topic: Interpreting Multiplication Equations**

- Core Lesson/Topic Instructional Procedures & Activities:**
- understand the relationship between multiplication and repeated addition
  - tell the number that is being multiplied in an equation
  - locate the number in an equation that tells how many times a number is multiplied
  - describe situations where multiplication can be used for comparisons (e.g., 5 times as large)
  - demonstrate skip counting by multiples
  - generate an equation to represent a multiplicative comparison situation and generate a multiplicative comparison situation to represent a given equation and using pictures, numbers, and words
  - recognize the properties of multiplication (ie the commutative property) to multiplicative situations (e.g., 6X3 can mean 6 times as many as 3 or 3 times as many as 6)
  - model a multiplication equation using various methods including repeated addition

### **Lesson Topic: Problem Solving: Using Multiplication and Division to Make Comparisons**

- Core Lesson/Topic Instructional Procedures & Activities:**
- recall multiplication facts through 10
  - distinguish between multiplicative and additive comparisons in a word problem
  - understand context clues to determine which operation (multiplication or division) is necessary
  - interpret information in a word problem into pictures to illustrate multiplication or division
  - multiply or divide in order to solve a word problem using drawings or equations
  - solve multiplication and division computations, using strategies (ie area model, various algorithms, drawing, etc) as needed.
  - translate comparative situations into an equation
  - understand that a symbol represents an unknown quantity
  - find the solution for the unknown quantity by multiplying or dividing

### **Lesson Topic: Problems Solving: Multi-Step Problems**

- Core Lesson/Topic Instructional Procedures & Activities:**
- determine which operations are necessary from context clues and identify the relationship between the numbers in a problem
  - define what the problem is looking for, and which operations are needed to solve the problem
  - solve computations involving all four operations (some division problems have remainders)
  - apply strategies such as: guess and check, draw a picture, estimate, make a table, work backward, look for a pattern, solve a simpler problem, write an equation, use compatible numbers, mental computation, rounding, representing an unknown, etc.
  - interpret the remainder within a division word problem to determine its purpose
  - develop strategies to determine the reasonableness of the solution to a multi-step word problem by comparing estimation to the actual answer, understanding how a remainder affects the solution to a real-world problem, using the concept of equality in order to find the solution of an unknown
  - solve multi-step word problems
  - represent problems using equations with a letter standing for the unknown quantity

- assess the reasonableness of answers using mental computation and estimation strategies including rounding

### Lesson Topic: Factors and Multiples

- Core Lesson/Topic Instructional Procedures & Activities:**
- know basic multiplication facts to 10
  - demonstrate skip counting is a method for finding multiples
  - demonstrate an understanding of factors and multiples using models, manipulatives and drawings
  - understand how to determine the factors of a number
  - recognize that some factor pairs have the same product
  - justify that a whole number is a multiple of each of its factors
  - describe the relationship between multiples and factors by discovering patterns and using divisibility rules
  - realize that factors of a number are also factors of the multiples of that number
  - prove that prime numbers have exactly 2 factors and composite numbers have more than 2 factors
  - compose a list of factor pairs for a whole number in the range 1-100
  - analyze a number, within the range 1-100, in order to determine the relationship between factors and multiples, and whether the number is prime or composite

### Lesson Topic: Identifying and Generating Number and Shape Patterns

- Core Lesson/Topic Instructional Procedures & Activities:**
- when given a number/shape pattern, determine the next set of numbers/shapes in the series
  - create a table of values when given a number rule and starting values
  - analyze features of number and shape patterns that may or may not be explicit in the given rule
  - defend your generalizations with evidence from the pattern, rule or picture
  - apply a generalized rule to determine the nth term in a pattern
  - develop a number or shape pattern that follows a given rule
  - generate a number or shape pattern using a rule of choice

### Lesson Topic: Algebraic Concepts

- Core Lesson/Topic Instructional Procedures & Activities:**
- identify the missing symbol in a number sentence
  - determine the missing elements in a function table
  - determine the rule for a function, given the table

## Unit: Numbers & Operations of Fractions

### STANDARDS

STATE: PA Common Core Standards (2012)

- [CC.2.1.4.C.1 \(Advanced\)](#) Extend the understanding of fractions to show equivalence and ordering.
- [CC.2.1.4.C.2 \(Advanced\)](#) Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.
- [CC.2.1.4.C.3 \(Advanced\)](#) Connect decimal notation to fractions, and compare decimal fractions (base 10 denominator, e.g., 19/100).

STATE: PA Common Core Anchors and Eligible Content (May 2012)

- [M04.A-F.1.1.1 \(Advanced\)](#) Recognize and generate equivalent fractions.
- [M04.A-F.1.1.2 \(Advanced\)](#) Compare two fractions with different numerators and different denominators (denominators limited to 2, 3, 4, 5, 6, 8, 10, 12, and 100) using the symbols  $>$ ,  $=$ , or  $<$ , and justify the conclusions.
- [M04.A-F.2.1.1 \(Advanced\)](#) Add and subtract fractions with a common denominator (denominators limited to 2, 3, 4, 5, 6, 8, 10, 12, and 100; answers do not need to be reduced; no improper fractions as the final answer).
- [M04.A-F.2.1.2 \(Advanced\)](#) Decompose a fraction or a mixed number into a sum of fractions with the same denominator (denominators limited to 2, 3, 4, 5, 6, 8, 10, 12, and 100), recording the decomposition by an equation. Justify decompositions (for example, by using a visual fraction model). Example 1:  $\frac{3}{8} = \frac{1}{8} + \frac{1}{8} + \frac{1}{8}$  OR  $\frac{3}{8} = \frac{1}{8} + \frac{2}{8}$  Example 2:  $2 \frac{1}{12} = 1 + 1 + \frac{1}{12} = \frac{12}{12} + \frac{12}{12} + \frac{1}{12}$
- [M04.A-F.2.1.3 \(Advanced\)](#) Add and subtract mixed numbers with a common denominator (denominators limited to 2, 3, 4, 5, 6, 8, 10, 12, and 100; no regrouping with subtraction; fractions do not need to be



reduced; no improper fractions as the final answers).

[M04.A-F.2.1.4 \(Advanced\)](#) Solve word problems involving addition and subtraction of fractions referring to the same whole or set and having like denominators (denominators limited to 2, 3, 4, 5, 6, 8, 10, 12, and 100).

[M04.A-F.2.1.5 \(Advanced\)](#) Multiply a whole number by a unit fraction (denominators limited to 2, 3, 4, 5, 6, 8, 10, 12, and 100; final answers do not need to be reduced or written as a mixed number).  
Example:  $5 \times (1/4) = 5/4$

[M04.A-F.2.1.6 \(Advanced\)](#) Multiply a whole number by a non-unit fraction (denominators limited to 2, 3, 4, 5, 6, 8, 10, 12, and 100; final answers do not need to be reduced or written as a mixed number).  
Example:  $3 \times (5/6) = 15/6$

[M04.A-F.2.1.7 \(Advanced\)](#) Solve word problems involving multiplication of a whole number by a fraction (denominators limited to 2, 3, 4, 5, 6, 8, 10, 12, and 100).

[M04.A-F.3.1.1 \(Advanced\)](#) Add two fractions with respective denominators 10 and 100.  
Example: Express  $3/10$  as  $30/100$ , and add  $3/10 + 4/100 = 30/100 + 4/100 = 34/100$ .

[M04.A-F.3.1.2 \(Advanced\)](#) Use decimal notation for fractions with denominators 10 or 100. Example: Rewrite 0.62 as  $62/100$  and vice versa.

[M04.A-F.3.1.3 \(Advanced\)](#) Compare two decimals to hundredths using the symbols  $>$ ,  $=$ , or  $<$ , and justify the conclusions.

### Lesson Topic: Equivalent Fractions

- Core Lesson/Topic Instructional Procedures & Activities:**
- use visual fraction models to develop an understanding of equivalent fractions
  - create and label models that demonstrate dividing a shaded region into various equal parts to produce equivalent fractions
  - explain why a fraction  $n/n$  has a value of 1
  - understand that when both the numerator and denominator are multiplied by the same number ( $n/n$ ), the fraction is being multiplied by 1
  - generate equivalent fractions by multiplying or dividing by forms of 1 ( $n/n$ ) and recognize this as an application of the identity property
  - understand the idea that equivalent fractions can be created by multiplying the numerator and denominator by the same number
  - recognize equivalent fractions by finding the least common multiple and greatest common factor
  - create equivalent fractions using multiplication and division of both the numerator and denominator

### Lesson Topic: Comparing Fractions

- Core Lesson/Topic Student Learning Outcomes:**
- review benchmark fractions ( $1/2$ ,  $1/4$ , etc.)
  - recognize that when the numerator is half of the denominator, the fraction has a value of  $1/2$
  - identify approximate locations of fractions on a number line
  - divide models into equal parts to compare fractions
  - recognize that fractions can only be compared when they are referring to the same whole
  - recognize that the size of a fraction depends on the size of the whole (e.g.,  $1/2$  of 10 is not equal to  $1/2$  of 50)
  - recognize that if the denominators of fractions are the same, the pieces are the same size, and the numerator can be used to determine which fraction is larger (e.g., the larger the numerator, the larger the fraction)
  - recognized that if the numerators of fractions are the same size, the denominator can be used to determine which fraction is larger (e.g., the smaller the denominator, the larger the fraction)
  - compare two fractions that have different numerators and different denominators by using a visual fraction model

### Lesson Topic: Problem Solving: Adding and Subtracting Fractions and Mixed Numbers

- Core Lesson/Topic Instructional Procedures & Activities:**
- determine the size of each fractional unit by looking at the denominator
  - compose and decompose fractions by joining unit fractions or separating fractions into unit fractions ( $4/5 = 1/5 + 1/5 + 1/5 + 1/5$ )
  - break apart (decompose) fractions by using visual fraction models in more than one way
  - convert mixed numbers to improper fractions by replacing mixed numbers with equivalent fractions (i.e., improper fractions)
  - decompose mixed numbers into the sum of a whole number and a proper fraction in order to add and subtract more efficiently
  - apply the commutative property to add fractions efficiently
  - use benchmark fractions to estimate sums and differences to determine the reasonableness of solutions (e.g.,  $5/6$  is almost 1, and  $4/5$  is almost 1, therefore  $5/6 + 4/5$  is almost 2)

- use a variety of strategies to solve problems involving addition and subtraction of fractions and mixed numbers
- solve problems involving the addition and subtraction of mixed numbers with like denominators (with and without regrouping)

### Lesson Topic: Problem Solving: Multiplying Fractions by Whole Numbers

- Core Lesson/Topic Instructional Procedures & Activities:**
- recognize that repeated addition is used when multiplying a fraction (e.g.,  $4/5 = 1/5 + 1/5 + 1/5 + 1/5$ , which is  $4 \times 1/5$ )
  - decompose fractions to express them as multiples of unit fractions (e.g.,  $4/5 = 4 \times 1/5$ )
  - multiply a fraction  $1/b$  by a whole number using visual models for products
  - explain the relationship between the numerator of  $1/b$ , whole number factor, and the numerator of the product (i.e.,  $1/5 \times 4 = 4/5$ )
  - solve word problems involving multiplication of a fraction by a whole number

### Lesson Topic: Adding Fractions: Denominators of 10 and 100

- Core Lesson/Topic Instructional Procedures & Activities:**
- apply knowledge of place value to express fractions with denominators of 10 as equivalent fractions with denominators of 100
  - express fractions with denominators of 10 or 100 using a variety of models
  - recognize the relationship between tenths and hundredths (i.e.,  $4/10 = 40/100$ )
  - add fractions involving only tenths and hundredths using various strategies
  - express a fraction with denominator 10 as an equivalent fraction with denominator 100

### Lesson Topic: Introducing Decimals

- Core Lesson/Topic Instructional Procedures & Activities:**
- read and write decimal notation
  - recognize the place value of tenths and hundredths as the denominator of a fraction (i.e.,  $0.47 = 47/100$ )
  - recognize the value of tenths and hundredths as the numerator of a fraction
  - recognize that the numerator of a fraction over 10 or 100 can be converted into decimal notation
  - understand that a fraction and a decimal can be used to represent the same number
  - use a variety of models to identify and represent fractions and decimal numbers up to hundredths as both tenths and hundredths
  - use decimal notation for fractions with denominators 10 or 100

### Lesson Topic: Comparing and Ordering Decimals

- Core Lesson/Topic Instructional Procedures & Activities:**
- explain the relationship between two decimals by reasoning about their size
  - compare decimal notation involving tenths and hundredths using  $<$ ,  $>$ , and  $=$
  - recognize that comparisons are only valid when they are compared to the same whole (i.e. one decimal amount of .25 can be bigger than another decimal amount of .25)
  - use various models to represent and compare decimals (i.e.  $10 \times 10$  grids, decimal circles, number line, meter sticks, area models, etc.)
  - compare two decimals to hundredths by reasoning about their size
  - recognize that comparisons are valid only when the two decimals refer to the same whole
  - record the results of comparisons with the symbols  $<$ ,  $>$ , or  $=$ , and justify the conclusions, e.g., by using the visual model

## Unit: Measurement & Data

### STANDARDS

STATE: PA Common Core Standards (2012)

[CC.2.4.4.A.1 \(Advanced\)](#) Solve problems involving measurement and conversions from a larger unit to a smaller unit.

[CC.2.4.4.A.2 \(Advanced\)](#) Translate information from one type of data display to another.

[CC.2.4.4.A.4 \(Advanced\)](#) Represent and interpret data involving fractions using information provided in a line plot.

[CC.2.4.4.A.6 \(Advanced\)](#) Measure angles and use properties of adjacent angles to solve problems.

STATE: PA Common Core Anchors and Eligible Content (May 2012)

[M04.D-M.1.1.1 \(Advanced\)](#) Know relative sizes of measurement units within one system of units including standard units (in., ft, yd, mi; oz., lb; c, pt, qt, gal), metric units (cm, m, km; g, kg; mL, L), and time (sec, min, hr, day, wk, mo, yr). Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. A table of equivalencies will be provided.  
Example 1: Know that 1 kg is 1,000 times as heavy as 1 g.  
Example 2: Express the length of a 4-foot snake as 48 in.

- [M04.D-M.1.1.2 \(Advanced\)](#) Use the four operations to solve word problems involving distances, intervals of time (such as elapsed time), liquid volumes, masses of objects; money, including problems involving simple fractions or decimals; and problems that require expressing measurements given in a larger unit in terms of a smaller unit.
- [M04.D-M.1.1.3 \(Advanced\)](#) Apply the area and perimeter formulas for rectangles in real-world and mathematical problems (may include finding a missing side length). Whole numbers only. The formulas will be provided.
- [M04.D-M.1.1.4 \(Advanced\)](#) Identify time (analog or digital) as the amount of minutes before or after the hour. Example 1: 2:50 is the same as 10 minutes before 3:00. Example 2: Quarter past six is the same as 6:15.
- [M04.D-M.2.1.1 \(Advanced\)](#) Make a line plot to display a data set of measurements in fractions of a unit (e.g., intervals of  $\frac{1}{2}$ ,  $\frac{1}{4}$ , or  $\frac{1}{8}$ ).
- [M04.D-M.2.1.2 \(Advanced\)](#) Solve problems involving addition and subtraction of fractions by using information presented in line plots (line plots must be labeled with common denominators, such as  $\frac{1}{4}$ ,  $\frac{2}{4}$ ,  $\frac{3}{4}$ ).
- [M04.D-M.2.1.3 \(Advanced\)](#) Translate information from one type of display to another (table, chart, bar graph, or pictograph).
- [M04.D-M.3.1.1 \(Advanced\)](#) Measure angles in whole-number degrees using a protractor. With the aid of a protractor, sketch angles of specified measure.
- [M04.D-M.3.1.2 \(Advanced\)](#) Solve addition and subtraction problems to find unknown angles on a diagram in real-world and mathematical problems. (Angles must be adjacent and non-overlapping.)

### **Lesson Topic: Customary and Metric Measurements**

- Core Lesson/Topic Instructional Procedures & Activities:**
- count money and make change by the use of subtraction
  - identify time as the amount of minutes before or after the hour
  - calculate elapsed time
  - recognize customary units of length, weight, and capacity
  - recognize metric units of length, weight, and capacity
  - recognize the connection between place value and metric conversions
  - use the four operations to solve word problems involving length, weight, and capacity

### **Lesson Topic: Perimeter and Area**

- Core Lesson/Topic Instructional Procedures & Activities:**
- recognize when perimeter and area are used
  - understand that area is measured in square units
  - determine the perimeter and area of a rectangle
  - use customary and metric units of length to find perimeter and area of a rectangle
  - apply multiplication strategies to area problems
  - given the perimeter of a polygon, determine the length of the missing side
  - given the area of a rectangle, determine the length of the missing side
  - generate real-world situations involving area and perimeter

### **Lesson Topic: Using Line Plot Data to Solve Problems**

- Core Lesson/Topic Instructional Procedures & Activities:**
- make a line plot to display a data set of measurements in fractions of a unit (e.g., intervals of  $\frac{1}{2}$ ,  $\frac{1}{4}$ , or  $\frac{1}{8}$ )
  - use line plots to solve problems involving addition and subtraction of given fractions

### **Lesson Topic: Recognizing Angles**

- Core Lesson/Topic Instructional Procedures & Activities:**
- identify two rays make an angle
  - recognize that for any angle, the common endpoint of the rays can be thought of as the center of a circle
  - identify the angle measure of a circle as 360 degrees, a three quarter circle as 270 degrees, a half circle as 180 degrees, and a quarter circle as 90 degrees
  - identify that  $\frac{n}{360}$  of a circle is equivalent to  $n$  degrees
  - recognize angles as fractional pieces of a whole circle whose vertex is located at the center
  - identify the measure of a complete rotation/turn as 360 degrees (e.g., complete turn of the minute hand of a clock)
  - relate angles to rotations/turns (e.g., make a 90 degree right turn)

### Lesson Topic: Measuring Angles

- Core** - identify the parts of a protractor
- Lesson/Topic** - estimate the angle measures
- Instructional** - measure angles using a protractor
- Procedures &** - create benchmark angles (45, 90, 180, 360) using a protractor and/or free hand
- Activities:** - create angles of specific measure

### Lesson Topic: Adding and Subtracting Angles

- Core** - understand that an angle can be broken into parts (decompose)
- Lesson/Topic** - recognize that any angles can be placed with sides touching to create a new angle
- Student** - recognize that decomposed angles have the same measure as the original angle
- Learning** - calculate the total angle measure when 2 or more angles are combined
- Outcomes:** - calculate the unknown angle when given the total angle measure and one smaller angle
- create an equations from the illustration of angles when given a real world math problem

## Unit: Geometry

### STANDARDS

STATE: PA Common Core Standards (2012)

[CC.2.3.4.A.1 \(Advanced\)](#) Draw lines and angles and identify these in two-dimensional figures.

[CC.2.3.4.A.2 \(Advanced\)](#) Classify two-dimensional figures by properties of their lines and angles.

[CC.2.3.4.A.3 \(Advanced\)](#) Recognize symmetric shapes and draw lines of symmetry.

STATE: PA Common Core Anchors and Eligible Content (May 2012)

[M04.C-G.1.1.1 \(Advanced\)](#) Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.

[M04.C-G.1.1.2 \(Advanced\)](#) Classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines, or the presence or absence of angles of a specified size. Recognize right triangles as a category, and identify right triangles.

[M04.C-G.1.1.3 \(Advanced\)](#) Recognize a line of symmetry for a twodimensional figure as a line across the figure such that the figure can be folded along the line into mirroring parts. Identify line-symmetric figures and draw lines of symmetry (up to two lines of symmetry).

### Lesson Topic: Identifying and Drawing Lines and Angles

- Core** - identify and/or draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines.
- Lesson/Topic** - identify these is two-dimensional figures
- Instructional** - identify these is real-life objects
- Procedures &**
- Activities:**

### Lesson Topic: Classifying Two-Dimensional Figures

- Core** - identify two-dimensional figures (ie, triangles, quadrilaterals, etc.) by properties of lines and angles
- Lesson/Topic** - classify two-dimensional figures (ie, triangles, quadrilaterals, pentagons, etc.) by properties of lines and angles
- Instructional** - describe the properties of a variety of shapes, including but not limited to triangles (right, obtuse, acute, scalene, isosceles, equilateral), quadrilaterals (parallelograms, trapezoids, rectangles, rhombuses, squares) and pentagons, hexagons, and octagons
- Procedures &** - recognize the presence and/or absence of acute, right, and/or obtuse angles within regular and irregular figures
- Activities:** - analyze the angles in shapes in order to categorize (e.g., noticing that a polygon has all congruent angles helps you categorize it as a regular polygon)
- determine how changing specific properties would change the classification of a figure (e.g., a square where one side is lengthened is no longer a square)
- classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines, or the presence of absence of angels of a specified size
- recognize right triangles as a category, and identify right triangles.

### Lesson Topic: Identifying Lines of Symmetry

- Core** - recognize that a line of symmetry divides a polygon into congruent, equal parts
- Lesson/Topic** - determine if a given figure has a line of symmetry and identify all lines of symmetry, if

**Instructional  
Procedures &  
Activities:**

- applicable
- apply knowledge of the properties of figures to predict whether or not a figure will have symmetry (e.g., all regular polygons have line symmetry)
  - identify patterns in figures with line symmetry and use those patterns to make conjectures about line symmetry in additional figures.
  - recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded along the line into matching parts
  - identify line-symmetric figures and draw lines of symmetry

**Unit:**

This Curriculum Map Unit has no Topics to display